MONETARY INCENTIVES
FOR LOW-STAKES TESTS

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Foreword

The Research and Development (R&D) series of the reports has been initiated:

To share studies and research that are developmental in nature. The results of such studies may be revised as the work continues and additional data become available.

To share results of studies that are, to some extent, on the "cutting edge" of methodological developments. Emerging analytical approaches and new computer software development often permit new, and sometimes controversial, analysis to be done. By participating in "frontier research," we hope to contribute to the resolution of issues and improve analysis.

To participate in discussions of emerging issues of interest to educational researchers, statisticians, and the federal statistical community in general. Such reports may document workshops and symposiums sponsored by the National Center for Education Statistics (NCES) that address methodological and analytical issues, or may share and discuss issues regarding NCES practice, procedures, and standards.

The common theme in all three goals is that these reports present results or discussions that do not reach definitive conclusions at this time, either because the data are tentative, the methodology is new and developing, or the topic is one on which there are divergent views. Therefore, the techniques and inferences made from the data are tentative and are subject to revision. To facilitate the process of closure on the issues, we invite comments, criticism, and alternatives to what we have done. Such response should be directed to:

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Executive Summary

Recent information in the 1990's on international assessments (e.g., the Third International Mathematics and Science Study, or TIMSS) indicates that 12th-grade students in the United States are doing extremely poorly on such assessments compared with their peers in other countries (TIMSS, 1998). Similarly, many 12th-grade students are doing poorly on the National Assessment of Educational Progress (NAEP). In such tasks and assessments, in almost all cases, U.S. 12th-grade students perform relatively more poorly than 8th-grade students. For example, in TIMSS, 12th-grade students are below the international average whereas 8th-grade students are at the international average.

These poor results are usually attributed to cognitive factors such as students' opportunities to learn, teachers' lack of professional preparation, etc. However, a partial explanation of these results may be motivational. Because the low-stakes (for students) tests were administered late in these 12th-graders' final year in high school, the timing may have negatively affected motivation, and thus performance. This phenomenon has been labeled "senioritis." For the high school senior going into the world of work or on to postsecondary education, tests like TIMSS are clearly low stakes. Thus, one of the major questions about these tests concerns the possible impact of motivational factors on the results. If students are not motivated to perform well on low-stakes tests, then the results may underestimate what students could do if they gave these assessments their best effort.

Our basic approach was to provide a sufficient monetary incentive to maximize student effort and therefore increase performance. We expected that we could stimulate a 0.5 standard deviation increase in performance due to such incentives. Our results will not generalize, without additional research, to either TIMSS or NAEP.

Further, our results will not generalize to the impact of motivation variables (e.g., effort, self-efficacy) on the teaching and learning of math. However, we expected our results to constitute a proof of concept of the importance of manipulating motivation in low-stakes assessments for 12th graders.

We have promising results based on our prior NAEP motivation research sponsored by the National Assessment Governing Board (NAGB), and the Office of Educational Research and Improvement (OERI), National Center for Education Statistics (NCES). We hypothesized that the incentives would increase effort, which along with prior knowledge, would improve performance. The effective incentive in this earlier study was money. In the study (O'Neil, et al., 1992), we manipulated various incentives (money, task, ego, standard NAEP instructions) for 8th- and 12th-grade samples of students of various ethnicities (White, Black, Hispanic, and Asian American).

In general, only the money incentive worked in the 8th grade. The results showed, in the best case, that the money incentive was effective for a subsample of the 8th-grade students (those who remembered their incentive/treatment group) with easy- and medium-difficulty items. With respect to item difficulty results, because the motivational effect was at test time, it was not expected that this increased effort would improve performance on hard items, because students did not know the content. With respect to remembering one's treatment group, presumably if one doesn't remember the incentive (money), then one would not increase one's effort, and thus performance. However, no incentives were effective for 12th-grade students, even those who remembered their treatment. The executive summary for a revised version of this study can be found in Appendix A.

We hypothesized that in our prior study, the lack of effect for 12th graders was because (a) the amount of money ($1.00 per item) was not large enough for 12th graders, and further (b) many 12th graders did not believe they would get the money.

Our approach for the current study consisted of manipulating the amount of money per item correct so as to increase the motivational effect and thus increase performance. The amount of money given per correct item was either $0 (low-stakes administration, e.g., TIMSS) or $10 per item correct (which we expected to be effective). The incentive group was compared with a group receiving standard low-stakes TIMSS instructions. Consistent with our prior NAEP study, we also collected information on effort, self-efficacy, and worry. For our assessment we used the released TIMSS math literacy scale items. This set of items included both multiple-choice and free-response items.

We hypothesized that students receiving $10 per item correct would perform significantly higher in math than those who were not receiving any monetary incentive (the control group). Such students would also exhibit higher effort and self-efficacy but less worry than control group participants. Our approach consisted of manipulating the amount of money per item correct so as to increase effort and thus increase math performance. In general, we expected overall anxiety levels to be low given the low-stakes nature of the test.

This investigation with 12th graders included a focus group study, a pilot study, a main study, and a supplementary study with Advanced Placement (AP) students in mathematics. This latter group was called the AP study. In the focus group study we explored various levels of incentives. This research is documented in Mastergeorge (1999). Parents and students who participated in the focus groups suggested that $5 to $10 per item correct would provide enough motivation for students in Grade 12 to work harder on math test items. Based on these findings, in the present investigation we offered students $10 per item correct to find out whether students' performance on the selected math items could be increased under such a high-stakes testing condition. We then compared the performance of students receiving $10 per item correct with the performance of students who responded to the same set of items with no monetary incentive.

A total of 725 students participated in the pilot, main, and AP studies. There were 144 students in the pilot study, 415 students in the main study, and 166 students in the AP study. For the pilot, main, and AP studies, students were selected from 23 different schools (5 schools in the pilot study, 9 schools in the main study, and 9 schools in the AP study) from southern California school districts in different locations. These schools had different demographics and different levels of overall student performance. However the high non-English language background of the sample limits generalizing the findings. Findings should be interpreted in light of this caution.

Following the focus group study, we conducted the pilot study. The purpose of the pilot study was to test design issues, examine the accuracy and language of the instruments, and resolve logistical problems. The results of the pilot study helped us to refine the instruments and to modify the design. We then conducted the main study and the AP study.

For an approximately one-hour testing session, the average student in the incentive condition in the main study received $100 ($80 for an average of 7.96 items correctly answered and $20 for the two “easy” test items). In the AP study, the average student received $200. Such incentives were assumed to be motivational for the 12th graders in our samples. However, the results of the main and AP studies showed no significant difference between the performance of students in the incentive and control groups. Statistically, there was no main effect of the incentive treatment. However, in the main study there was a complex interaction between treatment, sex, and booklet. However, post hoc comparisons indicated that although the overall interaction was significant, none of the comparisons of appropriate means were statistically significant. Thus, we chose to be conservative and not to interpret this interaction as supporting our major hypothesis. Further, the results of the AP study also did not support the major hypothesis. The total number of students in the main study was 393 after excluding students with incomplete data. This number became small when divided into subgroups by the levels of independent variables such as sex, test form, and treatment. Due to a small number of subjects, for some of the analyses, there was not enough power to detect a significant difference, even when the difference was relatively large. However there was a sufficient number of students in both the main study sample and the AP study to detect a reasonable main effect for the incentive treatment.

There was a great deal of consistency in the data in both the main and AP study. For example, males performed significantly better than females in both the main study and the AP study. These results were expected as the task was mathematics, and with our local samples we consistently find gender effects on math tests. Although in the national sample (TIMSS, 1998) there were no significant effects of gender, we find gender effects with our local southern California samples. Students in both the main study and the AP study reported significantly more effort in the incentive condition than in the control condition. Finally, in both studies self-efficacy and effort were positively related. These latter results make theoretical sense, as Bandura (1986, 1993, 1997) would predict that higher levels of self-efficacy should lead to higher levels of effort.

We also predicted, based on our prior NAEP research that the incentive condition should result in higher effort. In both the main and AP studies we found that students in the incentive group had significantly higher effort than students did in the control group. In turn, this increased effort should have resulted in better math performance. So why did we not find a significant main effect of treatment on math performance, given that there was a main effect of treatment on effort? The major reason we felt was the lack of relationship between self-reported effort and math achievement. Unexpectedly, for both the main and AP studies, self-reported effort was not significantly related to math performance (e.g., r = .007 in the AP study). With respect to effort, the research literature and our own research using the same measures indicate that the relationship would be positive (i.e., higher effort leads to better performance). Not surprisingly, we are puzzled by such findings. The obvious next step is to replicate with samples more representative of U.S. students generally or in groups with very different compositions. These studies should be supplemented by a series of focus groups and cognitive laboratory approaches. There was not an issue of enough time to complete this test, given the number of not-reached items was very low, indicating that students had sufficient time to complete almost all items on the test. Further, there were few items omitted in either study. The not-reached and omitted information clearly indicates that students had sufficient time to complete the test. Thus our set of items clearly constituted a power, not a speed test. Further, for the total math correct, there was no ceiling. In the main study, the mean was 7.96 out of a possible 24 points (20 items with a few extended response items getting 2 possible maximum points). For the AP study, the mean was 17.95 out of 24 possible points (same test as the main study).

In summary, effort was not related to performance, and the conclusion for this set of studies is that a strong monetary incentive did not increase math performance on a set of TIMSS released math items with local English Language Learners from samples of convenience. Further, the inability to find few motivational effects, despite a strong incentive, random assignment (with equivalence on background characteristics), tests of high and low performing students, and elimination of non-accurate recall cases, is quite compelling. It raises some fundamental questions about previous assumptions made about the motivation effect on test performance and we think that factors in addition to motivation are coming into play. We believe that there is a senioritis effect, but understanding its specific motivational effect on test performance and its amelioration awaits future research.

Table of Contents

Appendices

List of Tables

List of Figures

Introduction

Recent information on international assessments (e.g., the Third International Mathematics and Science Study, or TIMSS) indicates that 12th-grade students in the United States are doing extremely poorly on such assessments compared with their peers in other countries (TIMSS, 1998). Similarly, many 12th-grade students are doing poorly on the National Assessment of Educational Progress (NAEP). In such tasks and assessments, in almost all cases, U.S. 12th-grade students perform relatively more poorly than 8th-grade students. For example, in TIMSS, 12th-grade students are below the international average whereas 8th-grade students are at the international average.

These poor results in 1994-95 are usually attributed to cognitive factors such as students' opportunities to learn, teachers' lack of professional preparation, etc. However, a partial explanation of these results may be motivational. Because the low-stakes (for students) tests were administered late in these 12th-graders' final year in high school, this timing may have negatively affected motivation, and thus performance. This phenomenon has been labeled "senioritis." For the high school senior going into the world of work or on to post-secondary education, tests like TIMSS are clearly low stakes. Thus, one of the major questions about these tests concerns the possible impact of motivational factors on the results. If students are not motivated to perform well on low-stakes tests, then the results may underestimate what students could do if they gave these assessments their best effort.

Rationale

To our knowledge, based on an extensive literature review (to be reported elsewhere), our research group is the only one conducting research of this type; i.e., meaningful monetary incentives with released items from either NAEP or TIMSS with 12th graders. Our literature review findings are also consistent with a meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation (Deci, E.L., Koestner, R., & Ryan, R. M. 1999). This study does not review any of our type of studies. Further, also missed is our prior study (O'Neil, H. F., Jr., Sugrue, B., & Baker, E. L. 1996). Our basic approach in the present research was to provide sufficient monetary incentives to maximize student effort and therefore increase performance. We expected that we could stimulate a 0.5 standard deviation increase in performance due to monetary incentives. Based on our best case NAEP data (i.e., $1.00 per test item, 8th graders, those who remembered their instructions, on easy items), we got an effect size of .41. Since we tightened up the experimental procedures and were offering $10.00 per correct item for 12th graders (or an average of $100 for the testing session), we expected our monetary incentive to work as well as or better than our prior study's effective size of .41. Thus, we predicted (we thought) conservatively a .5 effect size.

Subsequent studies could tease out the reason for this effect at test time. Our results will not generalize, without additional research, to either TIMSS or NAEP. Further, our results will not generalize to the impact of motivation variables (e.g., effort and self-efficacy) on the teaching and learning of math. As we focused only on the assessment of learning, not its development. However, we expected our results to constitute a proof of concept of the importance of manipulating motivation in low-stakes assessments for 12th graders.

In summary, we have promising results based on our prior NAEP motivation research sponsored by the Office of Educational Research and Improvement (OERI), National Center for Education Statistics (NCES) (See Appendix A for the executive summary of this report). We hypothesized that the incentives would increase effort, which along with prior knowledge would improve performance. The effective incentive in this earlier study was money. In the study (O'Neil, et al., 1992), we manipulated various incentives (money, task, ego, and standard NAEP instructions) for

8th- and 12th-grade samples of students of various ethnicities (White, Black, Hispanic, and Asian American).

Two issues resulting from our NAEP study were controlled for in the current study: (a) The incentive effects might be greater if students believed that they would be rewarded as promised. Some of the participants in our earlier NAEP work were surprised that we actually provided the money. (b) The incentive effort might be greater if students remembered the treatment group they were in. Our prior study indicated that only approximately two thirds of the students remembered (recognized) what treatment group they were in. We believed that some of the students were not reading our written instructions carefully. We attempted to increase students' beliefs and "remembering" by a combination of (a) a two-item pretest that everyone was expected to get right, followed by immediate payment of $20 cash for the incentive condition, followed by (b) oral delivery of test instructions, which required separate rooms for different treatment conditions, and (c) the math literacy assessment.

In general, for our prior study, only the money incentive worked in the 8th grade. The results showed, best case, that the money incentive was effective for a subsample of the 8th-grade students (those who remembered their incentive/treatment group) with easy and medium difficulty items. With respect to item difficulty results, because the motivational effect was at test time, it was not expected that this increased effort would improve performance on hard items, because students did not know the content. With respect to remembering one's treatment group, presumably if one doesn't remember the incentive (money), then one would not increase one's effort, and thus performance. However, no incentives were effective for 12th-grade students, even those who remembered their treatment.

We hypothesized that in our prior study, the lack of effect for 12th graders was because (a) the amount of money ($1.00 per item) was not large enough for 12th graders, and further (b) many 12th graders did not believe they would get the money. Also, we collected the data at the end of the school year for 12th graders (like TIMSS).

Our approach for the current study consisted of manipulating the amount of money per item correct so as to increase the motivational effect and thus increase performance. For our assessment we used the released TIMSS math literacy scale items. This set of items included both multiple-choice and free-response items. The amount of money given per correct item was either $0 (low-stakes administration, e.g., TIMSS) or $10 per item correct (which we expected to be effective). The incentive group was compared with a group receiving standard low-stakes TIMSS instructions. Consistent with our prior NAEP study, we also collected information on effort, self-efficacy, and worry.

Motivational Model

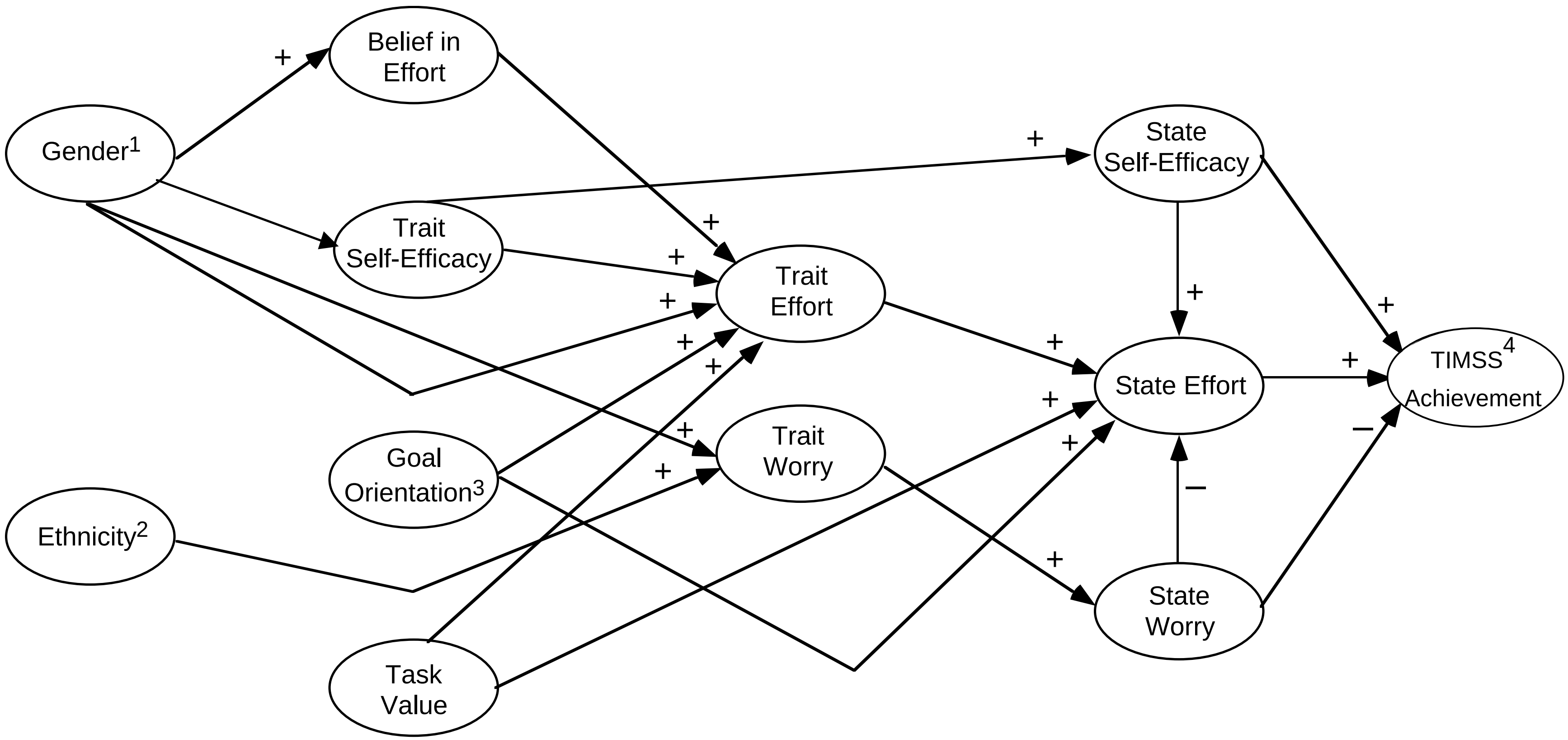
We have provided a first cut of our motivational model for low-stakes testing in Figure 1. The motivational model is adapted from a value and expectancy model (e.g., Pintrich & De Groot, 1990; Wigfield & Eccles, 2000). Basically, one is asking oneself "Why am I doing this?" (e.g., value) and "Can I do the tasks?" (expectancies, e.g., self-efficacy). To this basic model we added two critical individual difference variables—sex and ethnicity. Finally, we added a trait/state conception of most of these variables. In Figure 1, this set of variables and their relationships are based on the literature and our expert opinion. We suggest that the latent variables in Figure 1 constitute the major motivational influences on low-stakes testing. The structural equation modeling format shows the predicted relations between variables, indicated by arrows (—>) and the direction of the effect, indicated by positive (+) or negative (–) signs. For example, it is expected that gender would be positively related to belief in effort (females are expected to attribute their success on academic tasks to effort more strongly than males). In turn, belief in effort would be positively related to trait effort (if one attributes success to effort, then one would be more likely to generally work harder on academic tasks). Further, trait effort is expected to be related positively to state effort (if one generally works hard on academic tasks, then it is likely that one would work hard on a particular low-stakes assessments TIMSS). Finally, state effort is related positively to TIMSS achievement (if one works hard on this particular TIMSS assessment, then one expects TIMSS achievement would be higher than for those who expend less effort).

Many of the relationships in Figure 1 are expected to be the same across all content areas. However, in a particular content area, like TIMSS math, the motivational model includes an arrow with a negative sign between sex and trait self-efficacy because in math, males tend to have higher self-efficacy than females. For other content areas this relationship would not be true.

Finally, variables in the figure labeled as “traits” and “states” (e.g., trait worry and state worry) refer to a trait or state construct. Our definitions of traits and states are informed by Spielberger’s (1975) discussion of trait and state anxiety. Traits are considered stable characteristics of a person and are relatively difficult to change. A trait is a predisposition to manifest a state. Traits are measured in our lab by asking students to rate questionnaire items on a frequency scale (1 = *almost never*, 2 = *sometimes*, 3 = *often*, 4 = *almost always*). Students are asked to describe how they generally think or feel. States refer to the manifestation of the traits in the situation. States (e.g., state worry) change in intensity and vary over time. States are measured in our lab by asking students to rate items on an intensity scale (1 = *not at all*, 2 = *somewhat*, 3 = *moderately so*, 4 = *very much so*). Students are asked to describe either how they feel “right now” or how they felt while they were taking the test.

The most important motivational influences at test time and measured in this study are the following: (a) State effort. If students put more effort into the exam, then they would attempt more items, omit fewer items, and complete the entire set of items. Given the same level of prior knowledge (or content understanding), a student who put more effort into the exam would get a higher score. (b) State self-efficacy. If a student had high self-efficacy concerning the content (e.g., math), he or she would put more effort into the test and thus improve performance. (c) State worry. If a student had higher state worry, it would interfere with test performance, resulting in a lower TIMSS score.

Figure 1. — Motivational model for low-stakes testing



[1] 1 = Male, 2 = Female

[2] 1 = White, 2 = Hispanic

[3] 1 = Avoidance performance goal; 2 = Approach performance goal; 3 = Mastery or learning goal

[4] Math Achievement for this model

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

The constructs in Figure 1 are defined in the following manner:

a. Belief in effort refers to a student's belief, based on an attribution, that his/her performance is determined by his/her effort. A sample item is "I believe effort is the main factor in determining my academic performance in this course" (Wang & O'Neil, 2000).
b. Trait self-efficacy refers to a student's belief about his or her ability to accomplish a specific task (Bandura, 1993). A sample item is "I'm confident I can do an excellent job on the assignments and tests in this course" (O'Neil & Herl, 1998).
c. Goal orientation refers to whether a student has an avoidance performance goal, an approach performance goal, or a mastery or learning goal (Pintrich, 2000). A sample learning goal item is "One of my primary goals on this exam was to improve my knowledge" (Malpass, O'Neil, & Hocevar, 1999).
d. Task value refers to the importance, interest, or utility of the task to the student. A sample item is "I am very interested in the content area of this test" (Malpass, O'Neil, & Hocevar, 1999, modified with permission from the Motivational Strategies for Learning Questionnaire [MSLQ], developed by Pintrich, Smith, Garcia, & McKeachie, 1991).
e. Trait effort refers to the extent to which one generally works hard on a task. A sample item is "I put forth my best effort on tasks" (O'Neil & Herl, 1998).
f. Trait worry refers to cognitive concerns about the consequences of failure in a test situation (Spielberger, 1975). A sample item is "During examinations I get so nervous that I forget facts that I really know" (Spielberger, 1975).
g. State self-efficacy is defined as a student's temporal belief about his/her ability to accomplish a specific task. A sample item is "I expected to do very well on the math test" (O'Neil, Abedi, Lee, Miyoshi, & Mastergeorge, 2000; modified with permission from the Motivational Strategies for Learning Questionnaire [MSLQ], developed by Pintrich et al., 1991).
h. State effort refers to a student's temporal mental exertion expended for a specific task. A sample item is "I worked hard on the math test" (O'Neil, et al., 2000).
i. State worry refers to cognitive concerns about one's performance while taking a test. A sample item is "I was not happy with my performance" (Malpass et al., 1999).

General Methodology

This investigation with 12th graders included a focus group study, a pilot study, a main study, and a supplementary study with Advanced Placement (AP) students in mathematics. This latter group was called the AP study. The focus group study took place in January 1999 with participants from two southern California school districts. The pilot study, main study, and AP study took place between March and December 1999 in multiple southern California school districts. We will first provide an overview of the set of studies and then a detailed description of each study.

The results of earlier research on student motivation from the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) (O'Neil, Sugrue, Abedi, Baker, & Golan, 1997) indicated that a monetary incentive for 8th graders significantly increased students' level of effort and performance on the National Assessment of Educational Progress (NAEP) math items. However, there was no effect of incentives for 12th graders. We hypothesized that the level of monetary incentive ($1.00 per correct test item) was not sufficient to motivate southern Californian 12th graders. Thus the focus group study explored various levels of incentives. This research is documented in Mastergeorge (1999). Parents and students who participated in the focus groups suggested that $5 to $10 per item correct would provide enough motivation for students in Grade 12 to work harder on math test items. Based on these findings, in the present investigation we offered students $10 per item correct to find out whether students' performance on the selected math items (Third International Mathematics and Science Study, 2000) could be increased under such a high-stakes testing condition. We then compared the performance of students receiving $10 per item correct with the performance of students who responded to the same set of items with no monetary incentive.

For the pilot, main, and AP studies, a test booklet was created that included the following: the released Third International Mathematics and Science Study (TIMSS) math items, along with two practice items, test instructions, a background questionnaire, and a state motivation questionnaire consisting of scales for measuring students' level of effort, self-efficacy, and worry. In the background questionnaire, students were asked to indicate what kind of math class they currently were taking, whether they remembered the testing conditions they were under, and whether a language other than English was spoken in the home. They were also asked to indicate whether they had had the opportunity to learn the materials that were covered in the test and to self-report their Stanford 9 test scores and their grade point average in math.

To control for cheating between students during the testing (e.g., discussing their work with each other), two parallel forms of the math test were created. Students in each classroom were also divided into two groups; one group was randomly assigned to the incentive condition to receive money per item correct, and one group to the control condition to be tested with no monetary incentive. Each group was tested in a separate room. Within each group, one of the parallel forms was given systematically to every other student.

A total of 725 students participated in the pilot, main, and AP studies. There were 144 students in the pilot study, 415 students in the main study, and 166 students in the AP study. For the pilot, main, and AP studies, students were selected from 23 different schools (5 schools in the pilot study, 9 schools in the main study, and 9 schools in the AP study) from southern California school districts in different locations. These schools had different demographics and different levels of overall student performance.

Following the focus group study, we conducted the pilot study. The purpose of the pilot study was to test design issues, examine the accuracy and language of the instruments, and resolve logistical problems. The results of the pilot study helped us to refine the instruments and to modify the design. We then conducted the main study and the AP study.

Summary of Focus Group Study

Parents and students were recruited for participation in the focus groups by teachers at their school sites in January 1999. A total of eight focus groups (four student groups and four parent groups) were conducted with students and parents from two schools in two different districts in the southern California area. The student groups were composed of sons and daughters of the parent groups. The high math achievement AP student and parent sample included a total of 12 students and 12 parents in two focus groups of 7 and 5 parents each and two focus groups of 7 and 5 students each; the non-AP low/medium math achievement sample included a total of 15 students and 15 parents in two focus groups of 8 and 7 parents each and two focus groups of 8 and 7 students each. Students in the low/medium achievement group were not AP math students. Although we did not originally plan to include Advanced Placement students in the pilot or main studies, we used them for some of the focus groups as we expected these parents and students to be most knowledgeable about the educational system and most verbal and vocal regarding possible problems/issues with our design.

The focus group high schools were chosen for their diverse representation of students across ethnicities, socioeconomic status, and academic performance, and for their participation/non-participation in Advanced Placement (AP) courses. Two groups—senior high school students (17- and 18-year-olds) taking AP mathematics and their parents, and senior high school students (17- and 18-year-olds) taking non-AP courses and their parents—were recruited in order to investigate any similarities or differences among the students and parents regarding their thoughts about incentives on low-stakes testing (Mastergeorge, 1999).

The focus groups were conducted in January 1999 to obtain both parent and student perspectives on monetary incentives. A verbal script was read aloud to all participants and included general information about the format, confidentiality issues, and any risk or benefit involved in being a participant in the focus group study (See Mastergeorge, 1999, for focus group script). Focus group consent, assent, and parental permission forms were then distributed accordingly to all participants (See Appendix B for Focus Group consent forms for AP participants; see Mastergeorge, 1999, for focus group consent forms for non-AP participants).

The groups were facilitated by two researchers who engaged participants in discussion in order to ascertain those conditions that might affect students' performance and the amount of money that might increase students' motivation to perform on a low-stakes test, as well as to uncover other variables and parameters that might impact the study (e.g., the amount of incentive per item, parental concerns for monetary incentives, hurt feelings regarding students chosen for incentive versus non-incentive groups, etc.). The following description summarizes the results of the focus groups we conducted with parents and students. A more extensive report was provided in Mastergeorge (1999). The text below by Mastergeorge is meant to give a flavor of the results. In general, the results supported our hypotheses, but they also allowed us to refine our ideas and procedures.

Parent Focus Groups Discussion: Questions and Answers

1. Suppose your child was given an incentive for getting correct answers on a test. Can you describe/discuss the kinds of "rewards" you would feel comfortable with for correct test items?
   {Query: amount, payment type (e.g., cash, check, and gift certificate)}
   {Query: types of stores in the neighborhood available to students}

Parents suggested grades, promoting competition between the schools, a year of paid auto insurance (if they drive), test/class exemptions, extra credit, gift certificates, and tickets to sports games or concerts. Even if they did not totally agree with the study being done (paying students to perform well), they were okay with having money as an incentive as long as the students understood that this was a one-time study. Many of the parents reward their kids for good grades by taking them out to dinner, granting them driving privileges, or giving them the chance to make their own decisions, etc., or punish them for not getting good grades by removing driving privileges or "grounding" them. They believe the motivation should come from the home, but most of the parents seemed to agree that since this was a one-time thing, they would agree to participate and not be worried about the money and their children's motivation. They felt that cash, checks, and direct deposit would be equally as motivating. Gift certificates would be motivating as well, but most of the parents thought their children would prefer money since they would have more choice about what to do with it. They agreed that savings bonds would not be as motivating since the payoff is not as immediate. The parents felt that any amount of money would motivate their teenagers. One group of parents, who had children in Advanced Placement classes, felt that they would be comfortable with their children receiving $50 at the most, but the rest of the groups felt they would not have a problem with their children receiving as much as $250.

2. Discuss any concerns you might have about your child receiving such an incentive.

   {Query: other students' envy/jealousy; safety issues; value conflict}

Having students receive cash is not a safety concern (in their schools) especially if they pick it up at the office and the other students do not know how much they got. Of course, it depends on the area in which you choose to do the study. If it comes in the form of a check, it could be sent to the house.

3. Are there other issues that might affect your child's performance that we should think about related to a "reward"?

   {Query: status of seniors, concern with other issues (e.g., college acceptances rather than test performance), amount of reward}

   There could be hurt feelings. The students may think it is not fair, or they might feel bad if they do not do well. They should be given a minimum of something for trying—although they should not be told they would be getting it.

Student Focus Groups Discussion: Questions and Answers

1. Suppose you were given an incentive (or reward) for getting correct answers on a test. What kinds of rewards might motivate you to care about getting a correct answer?

   (a) cash {query amounts: $5.00 per item, $10.00 per item}

   (b) check {query: check as opposed to cash}

   (c) gift certificate {query: types of stores (e.g., Wherehouse, Gap, and McDonalds}

   The most popular answer for all of the students was, as expected, money. Many thought other incentives, such as certificates, scholarships, grades, extra credit, class/test exemption, and college recognition, would be motivating as well, but not as motivating as the cash incentive. The problems with gift certificates were that students would need to know before the test where the certificate would be from, and they would have to like the place. The places that were popular would be clothing stores in Los Angeles such as Macy's, Old Navy, Footlocker, and the Gap; music stores such as Sam Goody's and Blockbuster; restaurants such as the Olive Garden and TGI Friday's; and movie theatres such as AMC. Many also thought a choice of stores would be a good motivating factor, and the places of choice would depend on the areas that the students lived in. Things like savings bonds would be less motivating because the rewards are not immediate.

Since many of the students we talked to were planning to go to college next year, money seemed to be the most useful. The college-bound students considered money in the form of direct deposit just as motivating as cash (if they had a bank account), or a check (as long as it was easily cashed.) However, some of the students stated that cashing a check or money order can be a big hassle for them, and often involved a service charge for doing so. Amounts as small as $25 ($1 per question correct for a 25-item test) could be motivating; students would try for any money they could get. They felt $5, even $10, per item would be even more motivating, especially if the test was especially difficult. The value of the amount of money they could get may be influenced by whether they work or not since they would consider how much time they would need to spend on the job in order to get that amount.

2. Do you have any concerns about receiving a reward?

   Some students taking the test will be in a group without getting a reward, and we want to know if you have concerns about this {query: safety issues}.

   Most of the students felt that safety was not a concern at their schools. Students often bring money to school and feel safe doing so since no one really knows how much they have and there is not much of a problem with theft at school. Even the students of lower income backgrounds felt that it would not matter if you received as much as $250 because unless someone knew how much you had, no one would bother you. You could be robbed at any time, whether you had cash, a check, or a money order. Their suggestion was to have the school make an announcement that the participants of the study go to the principal's office after school and have them pick up an envelope with the money.

3. Are there any other issues or concerns you might have if you were chosen to participate in a test like this?

   {Query: issues that would facilitate participation, barriers to participation, e.g., senior status issues/concerns}

   There is a concern that some students might feel bad if they tried their best and did not get any right. If they did not get anything from the study, then everyone would know that they performed badly. They felt that if you at least show up and try, you should get something for just participating—even if it is only a small gift certificate. A few felt that the non-incentive group should even receive something for participating—of course, they would not be told before they took the test. (We plan to do this.) There was also a concern about the unfairness that some students may not have been taught the material that is covered on the test. They suggested that the best time of the day to do the study would be in the morning because that is when they will be the most awake and many students are excused at the end of the day for sports or other extracurricular activities. Most of the students felt their parents would support their participation in the study because they would be getting money that they could use for college. Since the study is one time only, they did not feel that participation in this study would affect their motivation to perform on other tests that have no incentives.

In summary, we were examining the effect of fewer dollars per item correct ($2 to $5 per item correct versus $10 per item correct) in the focus group studies. Thus, we were investigating the magnitude of standard incentives to be used in the main study. We believed that $10 per test item correct would be appropriate. The $10 figure was also agreed on (instead of $20 per correct test item) at the National Center for Education Statistics (NCES) design review of our study, before we initiated the pilot study. For the focus groups with parents, we were mainly interested in parents’ reaction to the incentive idea, security concerns in regard to giving students cash, and whether we should provide payment in the form of checks or certificates. We believed that parental fears were minimal and that because it was a one-time only study, there would not be potential opposition. We provided checks as payment.

Summary of the Pilot Study

The results of the pilot study guided us in modification of both instruments and the administration procedures. A more complete description of the pilot study can be found in Appendix C. Based on what we learned from the pilot study, we made several major modifications to the consent forms and the logistics of test administration for subsequent data collection. Among the most important issues emerging from the pilot testing was the issue that is technically referred to as "diffusion of treatment" (McMillan & Schumacher, 1997). As indicated in Appendix C there were no significant differences in math performance between the incentive and control group. We suspected that in the pilot study, some of the students in the control group may have found out that there was a monetary incentive and thus were motivated to perform better on the math test. The source of this possible contamination was the consent letter and form that we sent to the parents and the school, as required by the University of California, Los Angeles (UCLA) Human Subjects Protection Committee. Parents and students had to sign a consent form in order to participate in the study. The consent form indicated that some students would receive money for each item that they answered correctly (See Appendix D). Since students in the control group should have been tested under the "no money was paid to students" testing condition, learning about the experimental condition may have impacted their performance on the math test.

We also made some major modifications to the test instructions and the background questions, beginning with the fourth pilot school site. For example, we added a question on opportunity to learn (OTL) to see whether students had had an opportunity to learn the materials that were covered in the math test items. Since we did not have any other measures of students' academic progress, we also asked students to self-report their last year's Stanford 9 scores and their grades in math.

In summary, in the pilot study, we did not find evidence to support our hypotheses that money would increase students' performance in math. Male students performed better on the math items than female students. There was no significant effect of booklets. The incentive condition did not increase students' effort or their self-efficacy or worry. However, we felt that with the revised consent forms and procedures we were ready to test the hypothesis of this investigation in the main and AP study.

Main Study

Hypotheses

We hypothesized that those students receiving $10 per item correct would perform significantly higher in math than those who were not receiving any monetary incentive (the control group). Such students would exhibit higher effort and self-efficacy, but less anxiety than control group participants. Our approach consisted of manipulating the amount of money per item correct so as to increase effort and thus increase math performance. In general, we expected overall anxiety levels to be low given the low-stakes nature of the test. The latter findings would replicate our prior NAEP findings.

To test the main effects and interaction of treatment and sex, a three-factor completely crossed Analysis of Variance (ANOVA) model was applied to the data. In this model, factor 1 was the treatment effect (incentive versus control) factor 2 was sex (female versus male) and factor 3 was booklet format (A vs. B). It was expected that the mean math score of the subjects in the incentive group would be higher that the mean for the control group and males would perform higher on the math test than females. There were no explicit hypotheses for booklet effect, as this variable was meant to minimize cheating.

Participants

There were 415 non-AP students from nine school sites in the main study.

Table 1. — Categories of participants in the main study

	Main
Total participants	415
Males	210
Females	205
AP participants	22
Participants in incentive group	208
Participants in control group	207
Participants incorrectly identified treatment group	113*
Calculators not available	41

* Totals do not add up due to missing data.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Students in Advanced Placement (AP) classes in mathematics and physic were excluded from the main study. The first reason for this exclusion was that the admission standards for AP math classes vary dramatically from school to school in Los Angeles. Another reason that we chose not to include them in the main study, was that there are so few AP students in Los Angeles in general and in our sample of schools. Due to a miscommunication with the selected schools, a number AP students were included in the sample for our main study. Twenty-two students of the 415 participants in the main study indicated that they were currently in an AP class or had been enrolled in an AP class (either AP math and/or AP physics.) We decided to exclude these students from our sample because there were not enough math test items with a high enough level of discrimination power for this advanced group. However, we ran additional analyses with these AP students included in the main study. These results, reported in Appendix E, suggest that inclusion of AP students in the analysis does not change the conclusion.

For some of the data analyses, students were also excluded based on their response to a question asking them to identify which treatment group they were assigned to. The purpose of this question was to identify the issue of treatment as intended vs. treatment as remembered. Those participants who could not correctly identify their treatment group were dropped from the analyses. In the main study, 150 students in the incentive group correctly identified they were to receive money. However, 5 of those students also responded that they could not remember. In the control group, 9 students inappropriately responded that they were to receive money and another 6 students had invalid data; 192 students did not respond to this alternative. However, there were 35 out of the 192 students who also responded that they could not remember the instructions.

A few students received booklets that did not contain all test questions; data from those students were excluded from the analyses. One student answered "1" for all questions on one section of the test motivation questionnaire and that student's responses were excluded from the motivation part of the analyses. In the main study, due to an unanticipated increase in the number of eligible participants in four classrooms, calculators were not available for 41 students.

Materials

Mathematics Tests. We used the 20 released math literacy items from the Third International Mathematics and Science Study (TIMSS). The items ranged in level of difficulty, with the probability of responding correctly in the national sample ranging from .26 to .86 (p values). The items included 12 multiple-choice questions and 8 free-response questions. The multiple-choice items had either four- or five-answer options (See Figure 2 below for a multiple-choice item example with correct answer keyed). The free-response items required that the participants show the calculation process, write down an explanation for the response, or draw a graph (See Figure 3 below for an item example and Figure 4 for the scoring rubric).

Figure 2. — Example of multiple-choice item

From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, how many defective light bulbs would be expected in the entire batch?

A.	*15*
B.	*60*
*C.**	*150*
D.	*300*
E.	*600*

NOTE: * correct answer

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Figure 3. — Example of free-response item

The following two advertisements appeared in a newspaper in a country where the units of currency are zeds.

BUILDING A	**BUILDING B**
Office Space Available	Office Space Available
85 - 95 square meters 475 *zeds* per month	35 - 260 square meters 90 *zeds* per square meter per year
100 - 120 square meters 800 *zeds* per month	

If a company is interested in renting an office of 110 square meters in that country for a year, at which office building, A or B, should they rent the office in order to get the lower price? Show your work.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Figure 4. — Scoring rubric for example of free-response item

Scoring Rubric	
Points	Response
Correct response	
2 points	Building A. Correct calculation of rents for both buildings. 9600 / 800 AND 9900 / 825, or 825 to compare with 800 given.
2 points	Other correct.
Partial correct	
1 point	Building A. Correct calculation of rent for Building A OR B but not both.
1 point	Building B OR building is not named. Correct calculation of rents for both
1 point	Building A. Calculations or explanations are incorrect or inadequate.
1 point	Building A. No work shown.
1 point	Building B, OR building is not named. Correct calculation of rent for Building A OR B but not both.
1 point	Building A. Explanation is given only in the form of extracts from the advertisements.
1 point	Other partial.
Incorrect response	
0 point	Building B. Incorrect or inadequate calculations
0 point	Building B. No work shown.
0 point	Other incorrect.
0 point	Crossed out / erased, illegible, or impossible to interpret.
0 point	BLANK

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Motivation questionnaire. In addition to the math items, a state motivation questionnaire was given to participants. This questionnaire (the State Thinking Questionnaire) consisted of three 6-item scales: self-efficacy, worry, and effort. Participants were instructed to indicate how they thought or felt during the math test. The state motivation questionnaire is a modified version of O'Neil et al.'s (1997) questionnaire, with an added scale for self-efficacy. O'Neil et al. reported acceptable reliability and validity for these scales.

According to O'Neil and Abedi (1996), "states" vary in intensity and fluctuate depending on the situation, so the state items used for this study were rated on an intensity dimension with the following responses: *not at all*, *somewhat*, *moderately so*, and *very much so.* These options were scored as 1, 2, 3, and 4 respectively. The directions were as follows:

> A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase that best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, give the answer that seems to describe how you thought or felt during the math test.

An example of a state effort item is “I worked hard on the math test.” An example of a state self-efficacy item is “I expected to do very well on the math test.” An example of a state worry item is “I was not happy with my performance.” The entire motivation questionnaire can be found in the test booklet (See Appendix F or Appendix G).

Background questions. As may be seen in Figure 5, questions were asked to collect background data on students’ math experience (Question 1) and to determine whether students remembered their assigned treatment group (Question 2). As indicated in Question 2 of Figure 5, the directions indicated students should choose as many as apply. In retrospect, we should have indicated to choose the best or most representative of their instructions and a series of questions like the following could be implemented. “Did you know that you would be paid $10 for each correct answer?” “How much did you expect to earn by taking this test?” “Did you try harder on this test than other tests because you thought you would earn a significant amount of money?”

For Question 2 the “A” alternative was a distractor—no one got these instructions; the “B” alternative was the correct response for the incentive group; the “C” was true for all students’ directions, and thus we expected the control group students to pick this alternative; the “D” was meant to be used by those students who could not remember their treatment group. We also collected additional information and students' math achievement (Question 3), language background (Question 4), SAT-9 score (Question 5), and opportunity to learn (Questions 6 and 7) (See Figure 5).

In addition, after school site 7, we shortened the answer options for Question 2. This modified version was used for sites 8–14 and all of the AP sites.

Figure 5. — Background questions

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year
   (B) Regular classes in mathematics
   (C) AP classes in mathematics
   (D) Regular classes in physics
   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets, each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

   (A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world."
   (B) "There are a total of 20 questions…we will give you $10 for each correct answer, just like the easier test you completed."
   (C) "There are a total of 20 questions…if you finish early, you can go back to those questions you could not answer in this section only."
   (D) "Some of the questions will be followed by four or five possible answers indicated with a letter next to it. For these questions, circle the letter next to the answer you consider to be correct, as shown in Example 1."
   (E) "I can't remember."

3. Mark the statement that best describes your math grades since ninth grade.

   (A) Mostly A's
   (B) Mostly B's
   (C) Mostly C's
   (D) Mostly D's
   (E) Mostly below D

4. How often do the people in your home speak a language other than English?

   (A) Never
   (B) Sometimes
   (C) Always

5. What was your total SAT 9 score last year? ________________________

6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes
   (B) No

7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Test Booklets. There were two test booklets. The same item set was used within reversed order of items (e.g., Item 1 in Booklet A was Item 20 in Booklet B, and Item 2 in Booklet A was item 19 in Booklet B, etc.). Booklet A presented a few multiple-choice questions first, followed by a mixture of multiple-choice and free-response questions (this order was the same order for the released items in TIMSS). Booklet B presented a few free-response questions first, followed by a mixture of multiple-choice and free-response questions. Equal numbers of Booklets A and B were distributed to students within each classroom.

Table 2 shows the order, type of question, and number of score points for the items in the two booklets, A and B. "M" represents a multiple-choice question and "O" represents an open-response question. Booklet A questions were presented in the order MMMOOOMMMMMMMMMOOOOO; Booklet B questions were presented in the reversed order, OOOOOMMMMMMMMMOOOMMM. In the table, Score refers to the total number of scorable parts. For example, Item 1 in Booklet A was a multiple-choice item that was scored correct (1) or incorrect (0), whereas Item 1 in Booklet B was scored either incorrect (0), partially correct (1), or correct (2) according to the TIMSS scoring rubric. In Table 2, p refers to the probability of correctly responding in the national sample for this item.

Table 2. — Order, type, number of total score points, and probability correct for items in Booklets A and B

	Booklet A			Booklet B		
Item #	Question type	Score	p	Question type	Score	p
1	M	1	.57	O	2	.14
2	M	1	.69	O	1	.27
3	M	1	.45	O	1	.41
4	O	2	.21	O	1	.67
5	O	2	.11	O	1	.85
6	O	2	.39	M	1	.62
7	M	1	.61	M	1	.62
8	M	1	.68	M	1	.17
9	M	1	.50	M	1	.32
10	M	1	.65	M	1	.54
11	M	1	.54	M	1	.65
12	M	1	.32	M	1	.50
13	M	1	.17	M	1	.68
14	M	1	.62	M	1	.61
15	M	1	.62	O	2	.39
16	O	1	.85	O	2	.11
17	O	1	.67	O	2	.21
18	O	1	.41	M	1	.45
19	O	1	.27	M	1	.69
20	O	2	.14	M	1	.57

NOTE: "M" represents a multiple-choice question, "O" represents an open-response question, and p is the probability of responding correctly in the national sample.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Procedure

Human Subject Approval. Human Subjects Protection Committee approval to conduct the investigation for all studies was received from both the University of California, Los Angeles (UCLA) and the University of Southern California (USC). In addition, approval from the Committees on Research Studies from the school districts where the studies were conducted was also received.

Test Administrators. Test administrators included retired teachers and administrators, and the National Center for Research on Evaluation, Standards, and Student Testing (CRESST) research staff. All test administrators had prior experience with test administration. However, to inform test administrators about the test administration procedures germane to this study, a training session was held in February 1999. The co-project directors provided background information about the study and reviewed the protocol for preparing for and administering the test, which included information about answering student questions. Test administrators were instructed to read directly from the test administration script so that all participants across sites would receive the same directions. Two test administration scripts were developed (see Appendix H), one for the incentive group and one for the control group.

The training session concluded with a review of the test administration script. The test administrators worked in pairs and practiced reading the script aloud in order to familiarize themselves with it.

Four test administrators and a coordinator attended each site. Of the four test administrators, two were assigned to the incentive group and two were assigned to the control group. The test administrator who was not the designated script reader followed along on his/her own copy as the directions were read aloud to the students. This was done to insure that all information was read to the students, and to provide individual assistance to students, if necessary. The coordinator monitored and handled any unforeseen site related questions or issues.

The concept of being paid to do well was explained in the incentive group test administration script and a reminder phrase was written on the board (i.e., $10/QUESTION). The section of the incentive group test directions that addressed the incentive treatment is as follows:

> Congratulations. This class has been chosen to receive money for each correct answer on this test. We will be giving you each $10 for each correct answer on the math assessment. To show you how it works, we will give you a two item, very easy test. You will receive $10 in cash for each sample question you get correct today. So, if you get both sample questions correct, you will get $20.
>
> Then we will give you a much harder math test. You will also get $10 per correct item. [WRITE $10 / QUESTION on the board.] Since we have to score the math tests, we will get the money to you in 30 days. We will give you the option of receiving a check from UCLA or a post office money order to be sent home once the assessments are corrected.

Test administrators reported anecdotal evidence that the incentive group participants understood their treatment. This was observed in students' expressions and comments. For example, upon hearing about the treatment, many students smiled and some students verbally expressed their excitement. To address the student believability issue, incentive group students received money in class for getting the sample questions correct (see below under Random Assignment). As money was distributed to students for correctly answering the sample questions, many student comments included: "Is this for real?" "You were serious!"

The following directions were read to the control group before taking the test:

> Now turn to the next page titled SECTION 2. Read each question carefully and answer it as well as you can. We will do the two sample questions together in the SECTION 2 and you will complete the other SECTIONS (SECTION 3 and 4) on your own. You will be told when to begin each section.

The control group students appeared to accept these directions as familiar, standard directions, and made no queries about compensation or payment.

Site Selection. For the main study, sites were selected first using the Scholastic Achievement Test (SAT) school average raw scores for 1997 (See Table 3). These levels were assumed to indicate students' general prior achievement. The cut scores for high, medium, and low were above 950, between 780 and 950, and less than 780. Based on these scores, a site was classified as a high-, medium-, or low-achieving school in Los Angeles County. An equal number of schools from each level was preferred. We used this information to select schools because we wanted a range of prior achievement in the sample. However, in our preliminary statistical analysis for the pilot study on math scores, the school effect was unexpectedly not significant. Thus, we investigated the nature of such scores in the selected schools.

As seen in Table 3, with one exception, less than 42% of the students in these schools took the SAT in 1998. Thus, school SAT scores were not a useful variable to categorize schools. However, the Stanford Achievement Test 9 (SAT 9) is taken by all K-11 students in the districts. Thus, we considered a school site's SAT 9 national percentile rank in math to be a better indicator of overall school performance in math. Therefore, in the main study, SAT 9 scores were used in the site selection process. Unfortunately, no high-range SAT 9 performance schools agreed to participate in our study. The best performing school for the 1998 math SAT 9 had a National Percentile Rank (NPR) of 50. Most of the school sites selected for this study fell into the medium to low range for performance level on the SAT 9. An effort was made to recruit school sites that fell in the high range on the SAT 9; main sites that were contacted declined to participate.

Table 3. — Scholastic Assessment Test and Stanford–9 school average raw scores for the participating school sites

School site	SAT 1997 Score	SAT 1998		Stanford–9 1998 Math National Percentile Rank
		Score	Percent tested	
6	816	820	40%	30
7	850	856	33%	36
8	897	921	34%	37
9	965	956	56%	50
10	1001	982	38%	47
11	779	801	32%	28
12	818	775	36%	31
13	823	817	42%	34
14	900	923	37%	40

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Site recruitment procedures. During the recruitment stage for the main study, a letter was faxed to each school site's principal describing the purpose of the study, the amount of money students would receive, and the monetary compensation provided to the school site and to the school site personnel who provided assistance (See Appendix I). The school site personnel consisted of one site coordinator (e.g., a department chairperson) and two teachers who agreed to participate in the study. For the main study, math, English, and social studies department chairs were contacted initially at school sites. When a school agreed to participate, the designated site coordinator would receive a copy of the letter to the principal (See Appendix I), and the Tasks and Timeline form for the site coordinator in preparation for the test administration (See Appendix J).

The site coordinator was responsible for locating two 12th-grade non-AP student classes, two classrooms for testing, and one more school location for non-participant students. Not all students or parents agreed to participate. The site coordinator was to confirm clearance to conduct the study with the school principal who was asked to sign a Principal Verification Form (See Appendix K). Finally, the site coordinator was responsible for reading aloud a script (See Appendix L) to students before distributing consent forms and collecting consent forms (See Appendix D for pilot site consent forms) and sending a list of students eligible to participate in the study to the researchers.

Random Assignment. After the site coordinator collected the signed parental consent forms from the teachers and faxed them to the researchers, we randomly assigned students to either the control group or the experimental group. On the day of testing at the school site, students in participating classes were separated into control, experimental, and non-participant groups. We were concerned about this non-participant issue and publicized the study through the principle, site coordinator and classroom teachers. We were successful. As based on a sample of 4 initial schools, 80% of the students chose to participate in the study. The test materials were handed out, and the test directions were read aloud to the students. At this point, the experimental group participants were told that they would receive $10 for each correct item on the math test (payment by check, sent through the mail). To increase believability and thus motivation, the experimental group students were then given two practice questions (See Figure 6) and told that they would receive $10 for each correct answer. The questions were scored by the test administrators and students were paid $10 in cash immediately for each correct answer. All students answered both practice questions correctly. We gave cash on our test days only (maximum of $20). The "big" money was given to the students via checks following scoring of the test at a later date. This procedure minimized security concerns. The control group participants were also given the same questions found in Figure 6 without a monetary incentive.

Figure 6. — Practice questions

SAMPLE QUESTIONS

DIRECTIONS: Read each question carefully and answer it as well as you can.

1. Which of the numbers below is the smallest?

   (A) 3
   *(B) 1
   (C) 4
   (D) 7

2. Which of the numbers below is an even number?

   *(A) 2
   (B) 5
   (C) 3
   (D) 1

NOTE: Correct answers are starred.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Thus the procedures for the control group and the experimental group were the same with the exception that the control group did not receive payment for any of the questions. However, the control group did receive $20 at the end of the test administration for participating. Students in the control group were unaware during testing that they would receive the $20.

Following the practice questions, students in the experimental group and the control group were given 25 minutes to complete the math section and another 8 minutes to complete the motivation questionnaire and the background questionnaire. Students were instructed that they could not go back to one section of the test booklet once the class had moved on to another section. After the test was completed, the test materials were collected for both the experimental and control groups, and students had the opportunity to ask questions regarding the study.

During the main study, the test administrators met at the school sites to discuss procedures that worked and procedures that needed improvement. Based on these discussions, test direction modifications were made in a way that ensured that the integrity of the TIMSS test directions was not compromised. Meetings also were held at UCLA throughout the pilot study and attended by test administrators and co-project directors to discuss general progress and any concerns.

As was mentioned earlier, we analyzed the pilot study data in Appendix B (i.e., schools 1-5), we unexpectedly found that the control group and experimental group did not significantly differ in math performance. A review of the consent form revealed that a monetary incentive was discussed (See Appendix D). We suspected that some of the control group students may have assumed that they would receive some incentive money and may have been motivated to perform well. We therefore revised the consent form (See Appendix M). The revised consent form was submitted to UCLA's Human Subjects Protection Committee and approved in May 1999 for use beginning at School 6.

Further analyses were conducted after School 8 and again revealed that the control group and experimental group did not significantly differ in math performance. Similar to the consent form review, the principal letter revealed that a monetary incentive was discussed. We suspected that the principal and teachers at some school sites may have revealed information about the incentive money to their students. We therefore revised the principal letter (See Appendix N) and recruited a new group of school sites in the school district for participation in the study. These sites (i.e., Schools 9, 12, 13, and 14) received the revised principal letter and the revised consent form.

The main study was comprised of five schools that received the original principal letter and revised consent form and four school sites that received the revised letter and the revised consent form. Analyses were performed to check whether differences existed within these groups. We grouped schools into three categories: (a) schools receiving the original principal letter and original parental consent forms, (b) schools receiving the original principal letter and revised consent form, and (c) schools receiving the revised principal letter and revised consent form. The mean math score (M) for the first group (original letter and original consent) was 10.31 with a standard deviation (SD) of 4.81, and a sample size (n) of 144; for the second group, the mean was 7.84 (SD = 4.00, n = 238); and for the third group, the mean was 8.53 (SD = 4.00, n = 177).

To test the performance between the three groups of schools across the categories of treatment (treatment, control), a two-factor ANOVA model was used. Mean difference between treatment and control groups for all 14 schools (Factor A main effect) was not significant. Mean differences between the three groups of schools were significant. To compare the means of the three groups we used the Tukey Honest Significant Difference (HSD) multiple comparison approach. The results of analyses indicated the means for group 1 schools were significantly different from group 2 and from group and that the group 2 mean was not different from the mean for group 3.

The interaction between the school groups and treatment was not significant. Thus, the school factor (the three groups) had no statistical effects as a function of treatment.

Main Study Analyses

All analyses reported below are for two different samples in the main study. The first sample (n = 393) consists of all appropriate participants (for example, not including AP students); the second sample (n = 307) consists of students who correctly identified which treatment instruction they received. For power analyses and computation of sample size, we used data from our current pilot study and from the earlier CRESST motivational studies. We estimated the number of subjects that are needed to detect reasonable differences; for example, a .5 unit difference in math test.

Based on the main study participants' background information (See Table 4, Question 1), in regard to the types of math and physics class taken, 13 students in the incentive group and 9 students in the control group responded that they were enrolled in either AP math classes and/or AP physics classes. These 22 students were excluded from all of the analysis in the main study.

Likewise, for Question 2 (See Table 5), in the incentive group, 141 students responded correctly that they were to receive money. However, 5 of these same students also responded to the alternative that he/she could not remember the instructions. Thus, 136 out of 195 students of the incentive group correctly identified their treatment condition. In the control group, 8 out of 198 students inappropriately responded that they were to receive money and 190 students did not respond to this alternative. Moreover, data for 6 students were considered invalid due to errors in test administration. Among the remaining 184 students, 34 students responded simultaneously that they did not remember their instructions. Thus, 150 students of the control group correctly identified their treatment condition.

For Question 3 (Table 5), many students confused SAT scores with SAT 9 scores, and many did not take the SAT. Thus, the answers for this question were mostly invalid and the data from Question 3 were not included in any of our analyses.

For Question 4 (Table 5), 23 students from the incentive group and 25 students from the control group self-reported that they never used a language other than English at home. Fifty-eight students from the incentive group and 63 students from the control group self-reported that they sometimes use a language other than English at home. One hundred ten students from the incentive group and 102 students from the control group self-reported that they always use a language other than English at home.

In the background questionnaire, we asked students whether they speak a language other than English at home and if they do, how often they use that language. The response to this question used three categories: *always*, *sometimes*, and *rarely*. We used a one-factor ANOVA model to compare students' math performance across the categories of this variable. Mean score for category 1 (*always*) was 8.53 ($\underline{SD}$ = 4.66, $\underline{n}$ = 48), for category 2 the mean was 7.29 ($\underline{SD}$ = 3.59, $\underline{n}$ = 121), and for category 3, the mean was 8.31 ($\underline{SD}$ = 3.68, $\underline{n}$ = 212). The results of analyses of variance showed the difference between the three groups to be significant. The significant difference is mainly due to the difference between group 2 (*sometimes*) and 3 (*rarely*). Tukey HDS tests showed only one significant difference and that is between the mean of group 2 and group 3.

For Question 5 (Table 5), most students in the main study reported that their math grade was C or below. However, in Question 6, most students responded they had been taught the concepts.

Table 4. — Summary of the descriptive statistics for Background Question 1 for the entire main study sample

Question	Incentive group		Control group	
	Number	Percent	Number	Percent
1. Type of math and physics classes				
Total response	208	100.0	207	100.0
Not taking math	111	53.4	118	57.0
Regular math	74	35.6	73	35.3
AP math and/or AP physics	13	6.3	9	4.3
Regular physics	14	6.7	12	5.8

NOTE: Detail may not sum to totals due to multiple responses and rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 5. — Summary of the descriptive statistics for background questions for the main study sample

Question		Incentive group		Control group	
		Number	Percent	Number	Percent
2.	Remember directions				
	Total response	195	100.0	198	100.0
	Compare your math skills with others	26	13.3	48	24.2
	$10 for each correct answer	141	72.3	[1] 8	4.0
	Questions are followed by four or five answers	58	29.7	108	54.5
	Can't remember the directions	11	5.6	35	17.7
3.	Your Total SAT 9 [2]				
4.	Language other than English spoken in the home				
	Total response	191	100.0	190	100
	Never	23	12.0	25	13.2
	Sometimes	58	30.4	63	33.2
	Always	110	57.6	102	53.7
5.	Math grade				
	Total response	190	100.0	190	100.0
	Mostly As	13	6.8	15	7.9
	Mostly Bs	49	25.8	56	29.5
	Mostly Cs	108	56.8	102	53.7
	Mostly Ds or below	20	10.5	17	8.9
6.	Concepts in math been taught				
	Total response	185	100.0	159	100.0
	Yes	148	80.0	125	78.6
	No	37	20.0	34	21.4

[1] Data for 6 other students were invalid.

[2] These data were not analyzed as the participants seemed to confuse this question with the SAT.

NOTE: Detail may not sum to totals due to multiple responses and rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

The main research hypotheses focus on the differences between the math performance of the incentive and control groups. We included sex and booklet as two additional independent variables in this study. Thus, a three-factor completely crossed ANOVA model was applied to the data. Table 6 shows the means and standard deviations for students in the incentive and control groups by sex and booklet. The range of scores could vary from 0-24. As the reader may recall there were 20 items but some items were scored 0-2 points.

Table 6. — Descriptive statistics for math test score by treatment, sex, and booklet for the main study sample

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	9.13	6.33	7.62	7.91	6.84	7.32	8.51	6.59	7.47
SD	4.34	3.55	4.15	3.81	3.10	3.46	4.10	3.32	3.81
N	42	49	91	43	52	95	85	101	186
Booklet B									
M	8.46	8.07	8.28	9.58	7.19	8.51	9.04	7.65	8.39
SD	3.53	3.08	3.31	4.42	3.33	4.13	4.03	3.22	3.73
N	54	50	104	57	46	103	111	96	207
Total									
M	8.75	7.21	7.97	8.86	7.00	7.94	8.81	7.11	7.96
SD	3.90	3.42	3.73	4.23	3.20	3.86	4.06	3.31	3.79
N	96	99	195	100	98	198	196	197	393

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

As the data in Table 6 show, students in the incentive group (M = 7.97, SD = 3.73) performed no better than the students in the control group (M = 7.94, SD = 3.86. However, males had higher mean math scores (M = 8.81, SD = 4.06) than females (M = 7.11, SD = 3.31). This gender difference was statistically significant. In addition, the booklet format appeared to make a difference. In the main study, students who received Booklet B (M = 8.39, SD = 3.73) had higher scores than students who received Booklet A (M = 7.47, SD = 3.81). The difference between booklets was statistically significant. The treatment by sex by booklet interaction was also statistically significant. For Booklet A, males in the incentive group outperformed males in the control group ($\underline{M}$ = 9.31 vs. $\underline{M}$ = 7.91), while mean scores for females in the incentive and control groups were similar ($\underline{M}$ = 6.33 and $\underline{M}$ = 6.84 respectively). However, for Booklet B, males in the control group outperformed males in the incentive group ($\underline{M}$ = 9.58 vs. $\underline{M}$ = 8.46), whereas females in the incentive group outperformed females in the control group ($\underline{M}$ = 8.07 vs. $\underline{M}$ = 7.18). Yet, post hoc analyses of these mean differences indicated that they were not significantly different. Although the overall interaction was significant, these means were not significantly different from each other. The results of Tukey HSD showed that in Booklet A, incentive males scored higher than incentive females, while in Booklet B, there was no significant difference in mean scores of incentive males and incentive females. Also, in Booklet A, control males did not score differently from control females, but in Booklet B, Control males outperformed control females.

A two-factor analysis of covariance design was used to test the main and interaction effects of treatment and gender on math when students' reading performance is controlled for. Thus, SAT 9 reading score was used as a covariate. For the main study, the mean math score for the incentive group was 7.72 ($\underline{SD}$ = 3.73, $\underline{n}$ = 62) and for the control group, the mean was 7.62 ($\underline{SD}$ = 4.02, $\underline{n}$ = 61). The means for the two groups are very similar, thus, no significant difference was found. For male subjects, the mean was 8.42 ($\underline{SD}$ = 3.84, $\underline{n}$ = 68), for females, the mean was 6.75 ($\underline{SD}$ = 3.72, $\underline{n}$ = 55). The difference between performance of males and females was significant. The interaction between treatment and sex was not significant. The smaller number of subjects in this design is caused by missing data on the SAT 9 reading scores. The adjusted means are: for males M = 8.42; for females M = 6.76; for the control group M = 7.53; for the incentive group M = 7.65.

Subsample (n = 291) Who Correctly Identified Treatment Group. Table 7 shows the means and standard deviations for those students who correctly identified their treatment in the incentive and control conditions by sex and booklet. Consistent with the findings for the entire main study sample, males had higher mean math scores (M = 9.11, SD = 4.03) than females (M = 7.13, SD = 3.12). This gender difference was statistically significant. There was no main effect of treatment. In addition, the booklet form did not make a difference. Students who received Booklet B (M = 8.59, SD = 3.67) had higher scores than students who received Booklet A (M = 7.60, SD = 3.72). The difference between booklets did not reach statistical significance. The interaction of treatment by sex and booklet was also significant. For Booklet A, males in the incentive group outperformed males in the control group (M = 9.46 vs. M = 7.38), while females in the two groups performed similarly (M = 6.74 in the incentive group vs. M = 7.07 in the control group). For Booklet B there was a reversal: males in the control group outperformed males in the incentive group (M = 10.50 vs. M = 8.54), whereas females again performed similarly (incentive M = 7.70; control M = 7.13). However, post hoc comparison analyses indicated that although the interaction was significant, the mean differences above were not.

Table 7. — Descriptive statistics for math test score by treatment, sex, and booklet for the main study subsample who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	9.46	6.74	7.97	7.38	7.07	7.20	8.48	6.90	7.60
SD	4.47	3.63	4.23	3.28	2.92	3.06	4.07	3.28	3.72
n	34	41	75	30	41	71	64	82	146
Booklet B									
M	8.54	7.70	8.13	10.50	7.13	8.97	9.64	7.40	8.59
SD	3.17	2.69	2.95	4.32	3.15	4.16	3.95	2.93	3.67
n	34	32	66	43	36	79	77	68	145
Total									
M	9.00	7.16	8.05	9.22	7.10	8.13	9.11	7.13	8.09
SD	3.88	3.26	3.68	4.20	3.01	3.78	4.03	3.12	3.72
n	68	73	141	73	77	150	141	150	291

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Item Difficulty. The motivational effect was investigated at test time, so it was not expected that increased effort (See prior effort analyses) would improve performance on difficult items, because students were unlikely to be familiar with the content. We expected (as in our prior study) that the motivation effect at test time would be most salient on easy items as “easy” would indicate prior knowledge and thus, incentives would lead to more effort, and more effort with prior knowledge would lead to higher math performance. Based on the TIMSS item p values (proportion of item correct response), which we obtained from the 1997 TIMSS assessment, subsets of TIMSS test items were used to create two test scores: (a) scores of easy items, and (b) scores of difficult items. Five items (Questions 2, 8, 10, 16, and 17, percent correct > .64) were considered easy items (See Appendix B Booklet A only). Five items (Questions 4, 5, 13, 19, and 20, percent correct <. 28) were considered difficult items (See Appendix B, Booklet A only). The mean for the five easy items was 3.54 and for the five difficult items the mean was 0.9., a substantial difference. The maximum possible score for the five easy items was 5 points. The maximum possible score for the five difficult items was 8 points.

The easy and difficult test scores were used successively in a $2 \times 2 \times 2$ completely crossed ANOVA model, which we applied to the total math scores. Easy and difficult composite test scores were used as the dependent variable, and treatment, sex, and booklet were used as the independent variables.

Easy Items. Table 8 presents descriptive statistics for the easy items by treatment, sex, and booklet. The overall mean score for easy items in the main study was 2.95 (SD = 1.26). Thus, for the easy items (based on national norms), the percent correct for the main study sample was 59%, which in our sample would not constitute "easy." The mean score for the five easy items for the incentive group was 2.97 (SD = 1.25), and for the control group it was 2.93 (SD = 1.27). There was no main effect of treatment. There was, however, a large, significant gender difference on the easy items. The mean score for males was 3.27 (SD = 1.16) and for females was 2.63 (SD = 1.28). This difference was significant. Students who used Booklet B (M = 3.13, SD = 1.11) performed significantly better than those who used Booklet A (M = 2.74, SD = 1.38. The interactions among treatment, sex, and booklet was not statistically significant.

Table 8. — Descriptive statistics for easy items by treatment, sex, and booklet for the main study

	Treatment								
	Incentive			Control			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	3.33	2.17	2.71	2.95	2.63	2.78	3.14	2.41	2.74
SD	1.18	1.35	1.40	1.38	1.37	1.38	1.29	1.38	1.38
n	42	49	91	43	52	95	85	101	186
Booklet B									
M	3.41	2.95	3.19	3.32	2.77	3.07	3.36	2.86	3.13
SD	1.01	1.07	1.06	1.07	1.20	1.16	1.04	1.13	1.11
n	54	50	104	57	46	103	111	96	207
Total									
M	3.38	2.57	2.97	3.16	2.70	2.93	3.27	2.63	2.95
SD	1.08	1.28	1.25	1.22	1.29	1.27	1.16	1.28	1.26
n	96	99	195	100	98	198	196	197	393

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 5 questions with a possible score ranging from 0 to 5.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Difficult Items. Table 9 presents results of the descriptive analyses for the difficult items. The mean score for difficult items was 1.42 (SD = 1.38). The maximum possible score for the five difficult items was 8 points. Thus, for the difficult items the percent correct for the main study sample was 18%, indicating a very difficult set of items. There was no treatment main effect for the incentive group (M = 1.45, SD = 1.36) versus the control group (M = 1.39, SD = 1.39. There was a significant difference between scores for males (M = 1.61, SD = 1.50) and females (M = 1.23, SD = 1.21) on the difficult items. There was no booklet effect. Finally, none of the interactions was significant.

Table 9. — Descriptive statistics for the difficult items by treatment, sex, and booklet for the main study

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	1.73	1.24	1.47	1.58	1.05	1.29	1.65	1.15	1.38
SD	1.54	1.32	1.43	1.54	1.04	1.31	1.53	1.18	1.37
n	42	49	91	43	52	95	85	101	186
Booklet B									
M	1.41	1.45	1.43	1.74	1.15	1.48	1.58	1.31	1.46
SD	1.34	1.26	1.30	1.61	1.21	1.47	1.49	1.24	1.38
n	54	50	104	57	46	103	111	96	207
Total									
M	1.55	1.35	1.45	1.67	1.10	1.39	1.61	1.23	1.42
SD	1.43	1.29	1.36	1.57	1.12	1.39	1.50	1.21	1.38
n	96	99	195	100	98	198	196	197	393

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. There were 5 questions with a possible score ranging from 0 to 8.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Participants who correctly identified their treatment condition. Table 10 and Table 11 provide results of the descriptive analyses for participants in the main study who correctly identified their treatment condition. The patterns of results in Table 10 and Table 11 are very similar to those in Table 8 and Table 9, respectively. They are similar with respect to gender. In both cases, males outperformed females. There was no significant difference between the incentive and the control. For easy items only, booklet form had a main effect on math performance. There were no significant interactions.

Table 10. — Descriptive statistics for the easy items by treatment, sex, and booklet for the main study sample of students who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	3.53	2.33	2.87	2.92	2.66	2.77	3.24	2.49	2.82
SD	1.16	1.36	1.40	1.44	1.35	1.39	1.32	1.36	1.39
n	34	41	75	30	41	71	64	82	146
Booklet B									
M	3.42	2.89	3.16	3.47	2.83	3.18	3.45	2.86	3.17
SD	1.08	0.96	1.05	1.08	1.16	1.15	1.07	1.06	1.10
n	34	32	66	43	36	79	77	68	145
Total									
M	3.48	2.57	3.01	3.24	2.74	2.98	3.35	2.66	3.00
SD	1.12	1.23	1.25	1.26	1.26	1.28	1.19	1.24	1.27
n	68	73	141	73	77	150	141	150	291

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 5 questions with a possible score ranging from 0 to 5.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 11. — Descriptive statistics for the difficult items by treatment, sex, and booklet for the main study sample of students who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	1.82	1.38	1.58	1.30	1.15	1.21	1.58	1.26	1.40
SD	1.61	1.38	1.49	1.34	1.05	1.18	1.50	1.22	1.36
n	34	41	75	30	41	71	64	82	146
Booklet B									
M	1.55	1.35	1.45	2.04	1.19	1.65	1.82	1.26	1.56
SD	1.29	1.10	1.20	1.67	1.19	1.53	1.53	1.14	1.38
n	34	32	66	43	36	79	77	68	145
Total									
M	1.69	1.37	1.52	1.74	1.16	1.44	1.71	1.26	1.48
SD	1.46	1.25	1.36	1.58	1.11	1.38	1.52	1.18	1.37
n	68	73	141	73	77	150	141	150	291

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. There were 5 questions with a possible score ranging from 0 to 8.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Motivation

Internal consistency coefficients were computed for the three motivation scales. Table 12 reports the internal consistency statistics e.g. Cronbach's coefficient alpha (Cronbach, 1951) for the main study.

As the data in Table 12 show, the three motivation scales have a high level of internal consistency, i.e. the main study alpha coefficients of .85 for effort, .84 for self-efficacy, and .72 for worry.

Table 12. — Internal consistency statistics for the main study sample

Items	Effort		Self-efficacy		Worry	
	Item / Total correlation	Alpha if item deleted	Item / Total correlation	Alpha if item deleted	Item / Total Correlation	Alpha if item deleted
1	.65	.83	.68	.80	.50	.67
2	.70	.82	.44	.85	.45	.68
3	.54	.85	.73	.79	.36	.71
4	.74	.81	.71	.80	.45	.68
5	.76	.81	.57	.82	.44	.69
6	.48	.86	.58	.82	.52	.66
Alpha	.85		.84		.72	

NOTE: The sample size was 369.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

To compare students' responses across categories of treatment (incentive / control), sex (male / female) and booklets (A / B), a 2 × 2 × 2 ANOVA model was used. Scores for the three motivation scales (effort, self-efficacy, and worry) were used as the dependent variables in separate ANOVAs.

Effort: Total Sample. Table 13 reports descriptive statistics including means, standard deviations, and numbers of subjects for the effort scale. The overall mean score for effort for the main study was 18.09 (SD = 4.15) out of a possible 24 points, indicating that the students in the main study exhibited moderate effort. The mean effort for females and for males was almost identical. The mean effort score for females was 18.25 (SD = 3.30) and for males it was 17.92 (SD = 4.48). No significant difference between scores for females and males was obtained. There was a significant difference between the levels of effort across the treatment groups. The mean effort score for the incentive group was 19.17 (SD = 3.70) and for the control group, the mean was 17.00 (SD = 4.30). This difference of about 2 score points is significant, which indicates that the incentive group put more effort into this test. The booklet form did not have a significant effect on effort. The interactions were not significant.

Table 13. — Descriptive statistics for the effort scale by treatment, sex, and booklet for the total main study sample

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	18.95	19.56	19.28	16.05	17.40	16.79	17.52	18.48	18.05
SD	4.34	3.91	4.10	5.33	3.53	4.45	5.04	3.86	4.44
n	40	48	88	39	48	87	79	96	175
Booklet B									
M	19.61	18.52	19.07	16.92	17.48	17.19	18.24	18.01	18.13
SD	3.17	3.42	3.32	4.24	4.14	4.18	3.97	3.81	3.88
n	49	48	97	51	46	97	100	94	194
Total									
M	19.31	19.04	19.17	16.54	17.44	17.00	17.92	18.25	18.09
SD	3.73	3.69	3.70	4.74	3.82	4.30	4.48	3.83	4.15
n	89	96	185	90	94	184	179	190	369

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Effort: Subsample. Table 14 reports descriptive statistics including means, standard deviations, and numbers of subjects for the effort scale for those participants who correctly identified their treatment group. The mean score for effort for the sample of students in the main study who correctly identified their treatment was 18.24 (SD = 4.02) out of a possible 24 points indicating that these students exhibited moderate effort. There was a significant difference between the levels of effort across the treatment groups. The mean effort score for the incentive group was 19.37 (SD = 3.47) and for the control group, the mean effort score was 17.18 (SD = 4.22). This difference of about 2 score points is significant, which indicates that the incentive group put more effort in this math test. The mean effort scores for females and for males were very close and not significant. The mean effort score for females was 18.63 (SD = 3.65), and for males it was 17.81 (SD = 4.36). Booklet form did not have an effect on effort. There were no significant interactions.

Table 14. — Descriptive statistics for the effort scale by treatment, sex, and booklet for the main study sample of students who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	19.18	20.00	19.62	15.89	17.78	17.00	17.69	18.89	18.37
SD	3.86	3.84	3.85	5.27	3.42	4.35	4.81	3.78	4.29
n	34	40	74	28	40	68	62	80	142
Booklet B									
M	19.34	18.77	19.06	16.80	17.94	17.34	17.92	18.32	18.11
SD	3.23	2.67	2.96	4.16	4.05	4.12	3.96	3.49	3.74
n	32	30	62	41	36	77	73	66	139
Total									
M	19.26	19.47	19.37	16.43	17.86	17.18	17.81	18.63	18.24
SD	3.54	3.42	3.47	4.63	3.71	4.22	4.36	3.65	4.02
n	66	70	136	69	76	145	135	146	281

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Self-efficacy: Total Sample. Table 15 reports descriptive statistics including means, standard deviations, and numbers of subjects for the self-efficacy scale. The overall mean score for self-efficacy was 14.66 (SD = 3.90) from a maximum of 24 possible points, indicating low self-efficacy. The mean score for the incentive group was 15.23 (SD = 3.87), which is significantly higher than the mean score of 14.09 (SD = 3.86) for the control group. The results also showed a significant gender difference. The mean self-efficacy score for males (M = 15.72, SD = 3.82) was significantly higher than the mean score for the females (M = 13.66, SD = 3.72. Booklet form had no significant impact on self-efficacy; Booklet A had a mean of 14.29 (SD = 4.10), and Booklet B had a mean of 14.99 (SD = 3.69). None of the interactions was significant.

Table 15. — Descriptive statistics for the self-efficacy scale by treatment, sex, and booklet for the total main study

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	16.28	14.27	15.18	14.44	12.54	13.39	15.37	13.41	14.29
SD	4.41	3.92	4.24	3.97	3.39	3.76	4.27	3.75	4.10
n	40	48	88	39	48	87	79	96	175
Booklet B									
M	16.73	13.77	15.27	15.29	14.07	14.71	16.00	13.91	14.99
SD	3.25	3.14	3.51	3.44	4.22	3.86	3.41	3.69	3.69
n	49	48	97	51	46	97	100	94	194
Total									
M	16.53	14.02	15.23	14.92	13.29	14.09	15.72	13.66	14.66
SD	3.80	3.54	3.87	3.68	3.87	3.86	3.82	3.72	3.90
n	89	96	185	90	94	184	179	190	369

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Self-efficiency: Subsample. Table 16 presents means and standard deviations for the self-efficacy scale for the main study sample of students who correctly identified their treatment. The overall mean score for self-efficacy was 14.68 (SD = 3.91) from a maximum of 24 possible points, indicating low self-efficacy. The mean score for the incentive group was 15.25 (SD = 3.94), which is significantly higher than the mean score of 14.14 (SD = 3.81) for the control group. The results also show a significant gender difference. The mean score self-efficacy for males (M = 15.74, SD = 3.68) was higher than the mean score for the females (M = 13.70, SD = 3.86). Booklet form did not have a significant impact. Students who received Booklet A had a mean self-efficacy score of

14.38 (SD = 4.08), whereas students who received Booklet B had a mean score of 14.99 (SD = 3.72). None of the interactions was significant.

Table 16. — Descriptive statistics for the self-efficacy scale by treatment, sex, and booklet for the total main study sample and students who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	16.32	14.40	15.28	14.36	12.73	13.40	15.44	13.56	14.38
SD	4.16	4.18	4.25	3.69	3.52	3.65	4.05	3.93	4.08
n	34	40	74	28	40	68	62	80	142
Booklet B									
M	16.59	13.73	15.21	15.54	13.97	14.81	16.00	13.86	14.99
SD	3.25	3.33	3.57	3.39	4.21	3.85	3.35	3.81	3.72
n	32	30	62	41	36	77	73	66	139
Total									
M	16.45	14.11	15.25	15.06	13.32	14.14	15.74	13.70	14.68
SD	3.72	3.83	3.94	3.54	3.88	3.81	3.68	3.86	3.91
n	66	70	136	69	76	145	135	146	281

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Worry: Total Sample. Table 17 reports descriptive statistics including means, standard deviations and numbers of participants for the worry scale. The overall mean worry score for the main study sample was 12.21 (SD = 3.96) from a maximum of 24 points, indicating very low worry. The mean worry scores for the incentive group (M = 12.47, SD = 4.16) and for the control group (M = 11.94, SD = 3.74) were approximately equal. The mean worry score for females was 12.65 (SD = 3.86), and for males, the mean score was 11.73 (SD = 4.02). This difference was significant. Booklet form also had a significant impact on the worry level. The mean worry score for students who used Booklet A was 12.75 (SD = 3.78), and for students who used Booklet B it was 11.72 (SD =

3.58). Given that Booklet B was easier, these results are consistent as worry tracks task difficulty.

Table 17. — Descriptive statistics for the worry scale by treatment, sex, and booklet for the total main study sample

	Treatment						Total		
	Incentive Treatment			Control Treatment					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	12.28	13.15	12.75	11.79	13.52	12.75	12.04	13.33	12.75
SD	4.05	4.08	4.07	3.80	3.61	3.78	3.91	3.84	3.91
n	40	48	88	39	48	87	79	96	175
Booklet B									
M	12.16	12.27	12.22	10.84	11.63	11.22	11.49	11.96	11.72
SD	4.71	3.79	4.25	3.38	3.79	3.58	4.12	3.78	3.95
n	49	48	97	51	46	97	100	94	194
Total									
M	12.21	12.71	12.47	11.26	12.60	11.94	11.73	12.65	12.21
SD	4.40	3.94	4.16	3.58	3.80	3.74	4.02	3.86	3.96
n	89	96	185	90	94	184	179	190	369

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Worry: Subsample. Table 18 reports means and standard deviations for the worry scale for the main study sample of students who correctly identified their treatment. The overall mean score for worry was 12.16 (SD = 3.98) from a maximum of 24 points, indicating that worry was low. The mean worry scores for the incentive group (M = 12.63, SD = 4.16) and for the control group (M = 11.72, SD = 3.75) were similar. The mean worry score for females was 12.62 (SD = 3.81) and for males, the mean was 11.67 (SD = 4.10). The difference was not significance. The mean worry score for students who used Booklet A was 12.68 (SD = 3.96), and for who students used Booklet B was 11.64 (SD = 3.93). This difference was not statistically significant.

Table 18. — Descriptive statistics for the worry scale by treatment, sex, and booklet for the main study sample of students who correctly identified their treatment

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	12.47	12.85	12.68	11.68	13.38	12.68	12.11	13.11	12.68
SD	3.78	4.32	4.06	4.23	3.51	3.89	3.98	3.92	3.96
n	34	40	74	28	40	68	62	80	142
Booklet B									
M	12.44	12.73	12.58	10.39	11.44	10.88	11.29	12.03	11.64
SD	5.02	3.51	4.32	3.18	3.66	3.43	4.18	3.62	3.93
n	32	30	62	41	36	77	73	66	139
Total									
M	12.45	12.80	12.63	10.91	12.46	11.72	11.67	12.62	12.16
SD	4.39	3.97	4.16	3.67	3.69	3.75	4.10	3.81	3.98
n	66	70	136	69	76	145	135	146	281

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 19. —Correlation coefficients between math test scores and motivation scale scores for the total main study sample

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
	n	393			
Effort	r	.10	1.00		
	n	382	382		
Self-efficacy	r	.40**	.44**	1.00	
	n	376	395	396	
Worry	r	-.34**	.14*	-.26**	1.00
	n	378	376	370	378

*Significant at $p < .05$, two-tailed.

** Significant at $p < .01$, two-tailed.

NOTE: r represents the correlation coefficient, and n, the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 20. — Correlation coefficients between test scores and motivation scale scores for the main study and students who correctly identified their treatment

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
	n	291			
Effort	r	.10	1.00		
	n	287	287		
Self-efficacy	r	.46**	.39**	1.00	
	n	285	284	285	
Worry	r	-.35**	.16**	-.27**	1.00
	n	286	284	282	286

* Significant at $p < .05$, two-tailed.

** Significant at $p < .01$, two-tailed.

NOTE: r represents the correlation coefficient, and n, the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Relationship Between Math Performance and Motivation

Table 19 presents the set of correlations between math performance and motivation. Similar information is provided in Table 20 for the students in the main study who correctly identified their treatment. Table 21 and Table 22 report the correlations for students in the incentive and control group separately. The patterns of correlation for the incentive and control groups are similar to each other and also similar to the correlations for the total sample in the main study. There was no significant relationship between level of effort and math performance, but the other expected relationships are significant (e.g., more worry/poorer performance). A comparison, in Table 23, between the correlations in Table 21 and Table 22 show this interesting trend.

Table 21. — Correlation coefficients between test scores and motivation scale scores for the main study incentive group

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
	n	208			
Effort	r	.03	1.00		
	n	205	205		
Self-efficacy	r	.38**	.34**	1.00	
	n	201	201	201	
Worry	r	-.38**	.17*	-.30**	1.00
	n	203	202	198	203

* Significant at p < .05, two-tailed.

** Significant at p < .01, two-tailed.

NOTE: r represents the correlation coefficient, and n, the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 22. — Correlation coefficients between test scores and motivation scale scores for the main study control group

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
	n	207			
Effort	r	.11	1.00		
	n	199	199		
Self-efficacy	r	.45**	.44**	1.00	
	n	196	195	196	
Worry	r	-.38**	.08	-.26**	1.00
	n	196	195	193	196

** Significant at p < .01, two-tailed.

NOTE: r represents the correlation coefficient, and n, the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 23. — Comparison of correlation relationships between motivation and math performance for the entire main sample

		Incentive	Control
Effort / Math performance		.03	.11
	n	205	199
Self-efficacy / Math performance		.38**	.45**
	n	201	196
Worry / Math performance		-.38**	-.38**
	n	203	196

** Significant at $p < .01$, two-tailed.

NOTE: n represents the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Analysis of the Omitted and Not-Reached Items

Another measure of motivation is the number of omits / not reached items. The number of math items that were omitted as well as number of items that were not reached were obtained. Omitted items were defined as those items that were left blank followed by some attempted items. Non-reached items were those that were left blank followed by no attempted items. We hypothesized that the incentive condition would increase effort and that such higher effort would result in fewer omitted items and lower not-reached items.

The number of non-reached items was used as a dependent variable in a two-factor ANOVA in which sex and treatment were the two independent variables. Because of the small N in some cells a 2x2x2 design was not used. The results of analyses on not-reached items showed no significant main effects or interactions. For the omitted items using the same design, however, treatment effect was significant. The incentive group omitted a larger number of items than the control group. The mean number omitted for the incentive group was 1.38 as compared with a mean of 1.01 for the control group.

Table 24. — Frequency distribution of the omits and not reached items by treatment

		Omitted	Not reached
Incentive		1.45	2.69
	n	195	195
Control		1.11	2.42
	n	198	198

NOTE: n represents the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Discussion of Main Study

Based on the findings of our CRESST previous motivation study (O'Neil et al., 1997), the focus group results, and our experimental manipulation of $10 per correct test item, we expected that the monetary incentive would increase students' effort and thus math performance. We assigned students randomly either to an incentive group in which they received $10 per correct response to a 20-item math test, or to a control group in which students responded to the test items under the standard TIMSS testing instructions. For an approximately 1-hour testing session, the average student in the incentive condition in the main study received $100 ($80 for an average of 7.96 items correctly answered and $20 for the two "easy" test items). Such incentives were assumed to be motivational for the 12th graders in our samples.

In general, the results of the main study showed no significant difference between the performance of students in the incentive and control groups. Statistically, there was no main effect of the incentive treatment. However, there was a complex interaction between treatment, sex, and booklet. Post hoc comparisons indicated that although the overall interaction was significant, none of the comparisons of appropriate means were statistically significant. Thus, we chose not to be conservative and to not interpret this interaction as supporting our major hypothesis.

There was a great deal of consistency in the data in the main study. For example, males performed significantly better on the math test than females. Although in the national sample (TIMMS, 1998) there were no significant effects of sex, we find gender effects with our local southern California samples. Students in the main study reported significantly more self-efficacy and effort in the incentive condition than in the control condition. Finally, self-efficacy and effort were positively related. These latter results make theoretical sense as Bandura (1986, 1993, 1997) would predict that higher levels of self-efficacy should lead to higher levels of effort.

We also predicted, based on our prior National Assessment of Educational Progress (NAEP) research, that the incentive condition should result in higher self-reported effort. In turn, this increased effort should have resulted in better math performance. So why did we not find a significant main effect of treatment on math performance given that there was a main effect of treatment on effort? The major reason we felt was the lack of relationship between self-reported effort and math achievement. Unexpectedly, for the main study, self-reported effort was not significantly related to math performance. With respect to effort, the research literature and our own research using the same measure would indicate that the relationship would be positive (i.e., higher effort leads to better performance).

The lack of relationship between effort and math performance is puzzling. The obvious explanatory candidates (e.g., poor reliability of the measures) are not true. The alpha reliability of the effort scale is .85 in the main study. Further, the correlations between effort and self-efficacy and worry are significant in the predicted directions for the main study, indicating that other validity predictions involving effort were consistent with our prior research and the literature.

We also had several other behavioral indicators that the students put effort into other aspects of task performance, e.g., an indicator based on the number of checks cashed by incentive participants. The reader may recall that since we had to score the performance items and to minimize security concerns (cash in the hands of 12th graders), we asked the students, before the math test, to fill out a form indicating where we should send the money they would get for performing successfully on the math test. For the pilot and main study the 279 participants who requested a check (one student requested a money order), 272 students' checks (or 98%) cleared the bank. The reasons why 6 students did not cash their checks are unknown. Thus, students in the incentive condition were motivated to expend effort to correctly fill out the forms in the student test booklet to obtain the money.

Other behavioral information seems to indicate that our oral and written instructions resulted in students paying attention to our instructions on math items in general. For example, the two "easy items" were also completed without error for all incentive and control group participants, indicating that the experimental controls (e.g., for believability) were effective. An interesting finding was that the incentive group had significantly fewer omitted items, thus their strategy was to attempt fewer items (not more as we expected) in order to make sure that they would get the items right. Given that there was no significant difference in total math performance between the two groups, the incentive group strategy resulted in few items attempted but a higher success for those items.

With respect to our other major experimental control, i.e., oral instructions to ensure participants would remember the treatment group they were in, we were less successful. In general, for the main study, few students in the control group thought they would receive money for items correct. In the main study, only 8 out of 198 students (4%) thought they were to receive money. However, only 136 out of 195 incentive group students (70%) correctly identified their experimental condition. In our prior NAEP study, only 66% of the 12th grade students remembered that they were to receive money. Thus, in the main study, combining oral and written instructions was not as effective as we hoped when compared to written instructions in the NAEP study.

There are a couple issues that speaks to our location in Los Angeles. One way in which the sample of students used in this study is not a representative sample of all the students in the United States is that so many of them are from families that do not speak English at home. Well over half never speak English at home, while less than 15 percent only speak English at home. The high non-English language background of the sample limits generalizing the findings. Findings should be interpreted in light of this caution. It may also be that race-ethnicity composition is not representative of the United States as a whole. We do not know the racial-ethnic background of the students as we did not request it.

The findings are also the same for the analyses using a subset of the items (i.e., the "easy" and the “difficult” ones). Moreover, we ran additional analyses with AP students included in the main sample study. The results were exactly the same on math as when the AP students were excluded (See Appendix E). Thus, we feel that, although troubling, the finding that 30% of the students could not remember that they were to receive money does not affect our conclusions.

In our prior NAEP study, in which a money incentive was not motivating for 12th graders, we hypothesized that the lack of effect for 12th graders was because (a) the amount of money ($1.00 per item) was not large enough for 12th graders, and further (b) many 12th graders did not believe they would get the money. By comparison, in the present study, we felt that both conditions (i.e., amount of money and believability) were satisfactory and should have worked, but did not. Like the main study, our chain of logic was that the money would be an incentive to increase effort and therefore improve math performance. We succeeded in increasing effort (measured by self-report and number of checks that cleared), but the incentive condition did not facilitate math performance. The mechanism of high effort leading to better math performance for those with prior knowledge at test time was based on our prior research, the literature, and common sense.

Presumably, since the incentive condition increased effort in the main study, if self-reported effort were related to performance, then the incentive condition would have increased math performance. One might argue that there were suggestions of an incentive effect—for example, the significant triple interaction between incentive, sex, and booklet in the main study. Such an effect was relatively weak, as post hoc comparisons indicated no significant difference for the mean comparisons. Thus, as mentioned earlier, we discounted this interaction. These analyses by "treatments as intended" vs. "treatments as remembered" were preplanned. The first is good practice and exploits randomization. The second is good practice, often less interpretable, and does not exploit randomization. Nonetheless, we got the same conclusions. In summary, effort was not related to performance, and the conclusion for this study is that a monetary incentive did not increase math performance on a set of TIMMS released math items. The high non-English language background of the sample limits generalizing the findings and the findings should be interpreted in light of this caution.

AP Study

Overview of Study

The Advanced Placement (AP) study was performed after the main study, with AP students as participants. Our results in the main study indicated no treatment effect on math scores. Further, in the main study, our overall math achievement levels on the Science Study Third International Mathematics and Science Study (TIMSS) released items were very low (an average of approximately 8 out of a total possible score of 24). We suspected that the low average math scores might reflect both lack of content knowledge and lack of motivation. Therefore, we decided to include AP students in a supplemental study to contrast their results with results from the main study. We expected the AP math students to have more prior knowledge than non-AP students in the main study. Since the incentive effect would be at test time, prior knowledge was essential if students put more effort into the test. They needed to know the material. A new human subjects application form was submitted to the University of California, Los Angeles (UCLA) Human Subjects Protection Committee office and was approved. The revised principal letter and revised consent form from the main study were used in the AP study. To specifically narrow the comparison, only one type of booklet was used instead of two. We used Booklet B, the "easier" booklet. We tried to set up a best case for observing the impact of the money incentive, i.e., students with high prior knowledge (AP students), with an easier booklet (Booklet B). The procedures and measures remained the same as in the main study. The same set of released items was used in both the AP and the main studies. After administration at the third site in the AP study, one question (Question 5) was added to determine how generation affects motivation.

Participants

Nine school sites agreed to participate in the AP study. A total of 166 AP students (90 male and 76 female) participated. However, we dropped one school site (with 3 male and 3 female students) due to an administration error. Thus, in the final sample for this study there were 160 participants (87 males and 73 females).

Table 25 displays the background information for AP students on courses taken, remembering their treatment group, language spoken in the home, math grades, and whether the content had been taught to them. Most of the 160 participants indicated that they were taking an AP math class. In those instances in which a student indicated that s/he was not taking a math class, we reviewed the class roster submitted by the school site's assistant principal for which class this student was enrolled. In each case we found that the class was in fact an AP Calculus class. In addition, we examined the Advanced Placement consent forms that had been signed by these students and their guardians. These forms indicated that each of these students had taken or was currently taking AP Calculus. These students were not dropped from the sample. A few additional students indicated that they were not in an AP math class. We discussed these students with their teachers; the students were in fact AP students and thus were not dropped from the sample. With respect to Question 2, none of the students in the control group made the wrong assumption that they would get paid for this study; however, only 72 students in the incentive group clearly responded that they knew there was a monetary award. Thus, 13 students (15%) did not respond that they were to get $10 for each correct answer. About one third of the students used English all the time at home. And 153 out of 160 students had math grades above B. Only 4 students responded that they had not been taught the concepts before. Question 3 “Last years SAT 9 score” was not analyzed as it was clear to us that students confused this question with asking about the Scholastic Achievement Test (SAT). Likewise, Question 5 about whether the student was born in the United States was not analyzed, nor, in this case, presented on table 25, as it was clear that the students did not understand the question in the way that we asked about the information. The text for Question 5 can be found in appendix G.

Table 25. — Descriptive statistics for the background questions for the AP student sample

Question	Incentive group		Control group	
	Number	Percent	Number	Percent
1. Type of math and physics classes[1]				
Total response	85	100.0	75	100.0
Not taking math	0	0.0	0	0.0
Regular math	0	0.0	0	0.0
AP math	85	100.0	75	100.0
Regular physics	24	28.2	32	42.7
AP physics	27	31.8	15	20.0
2. Remember directions				
Total response	85	100.0	75	100.0
Compare your math skills with others	6	7.1	4	5.3
$10 for each correct answer	72	84.7	([2])	([2])
You can go back to those questions in this section	61	71.8	69	92.0
Can't remember the directions	([2])	([2])	4	5.3
3. Last year's SAT 9 score [3]				
4. Language other than English spoken in the home				
Total response	85	100.0	75	100.0
Never	30	35.3	20	26.7
Sometimes	22	25.9	22	29.3
Always	33	38.8	33	44.0
6. Math grade				
Total response	85	100.0	75	100.0
Mostly As	50	58.8	48	64.0
Mostly Bs	32	37.6	23	30.7
Mostly Cs	3	3.5	4	5.3
Mostly Ds or below	([2])	([2])	([2])	([2])

Table 25. — Descriptive statistics for the background questions for the AP student sample —Continued

Question	Incentive group		Control group	
	Number	Percent	Number	Percent
7. Concepts in math been taught				
Total response	84	100.0	74	100.0
Yes	84	100.0	70	94.6
No	0	0.0	4	5.4

[1] Totals for this question reflect both the students answers and consultation with school faculty.

[2] Less than three students gave this answer.

[3] These data were not analyzed as the participants seemed to confuse this question with the SAT.

NOTE: Detail may not sum to totals due to multiple responses and rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

AP Study Analyses

Table 26 shows the means and standard deviations for students in the incentive and control groups by sex. Consistent with the findings of the main study, there was no treatment main effect. The students in the incentive group (M = 17.81, SD = 4.10) performed equivalently to students in the control group (M = 18.12, SD = 4.18). Males had a higher mean math score (M = 18.91, SD = 3.89) than females (M = 16.82, SD = 4.15). This gender difference was statistically significant. The interaction was not significant.

Table 26. — Descriptive statistics for the math test score by treatment, sex for the AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	18.35	19.54	18.91
SD	3.74	3.99	3.89
n	46	41	87
Female			
M	17.18	16.41	16.82
SD	4.45	3.79	4.15
n	39	34	73
Total			
M	17.81	18.12	17.95
SD	4.10	4.18	4.14
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

For the AP study data, a two-factor analysis of covariance design was used to test the main and interaction effects of treatment and sex when students' reading performance is controlled for. Thus, Stanford Achievement Test 9 (SAT 9) reading score was used as a covariate. For the AP study, mean math score for the incentive group was 17.44 (SD = 4.02, n = 66) and for the control group, the mean was 17.73 (SD =4.40, n = 62). The adjusted means are for incentive: 17.41, and control: 17.60 The means for the two groups are very similar; thus, no significant difference was found. For male subjects, the mean was 18.60 (SD = 4.11, n = 74), for females the mean was 16.19 (SD = 3.93, n = 54). The difference between performance of males and females was not significant. The smaller number of subjects in this case is caused by missing data on the SAT 9 reading score. The adjusted means for male were 18.01; Female adjusted means were 17.01. This was not a significant interaction.

Item Difficulty. As mentioned earlier, the incentive effect was expected only for content that the students already knew, so it was predicted for AP students in the incentive condition that increased effort would improve performance on easier items, because students would be familiar with the content. As with the main study, based on the TIMSS' item p-values (proportion of item correct response), which we obtained from the 1997 TIMSS assessment, subsets of TIMSS test items were used to create two test scores: (a) a score for easy items, and (b) a score for difficult items. Five items (questions 2, 8, 10, 16, and 17, percent correct > .64) were considered easy items (See Appendix B, Booklet A). Five items (Questions 4, 5, 13, 19, and 20, percent correct <. 28) were considered difficult items (See Appendix B, Booklet A). The mean for the five easy items was 3.54 and for the five difficult items the mean was 0.90.

The easy and difficult test scores were used successively in the same 2 × 2 completely crossed Analysis of Variance (ANOVA) models, which we applied to the total math scores. Treatment and sex were used as the independent variables.

Easy Items. Table 27 presents descriptive statistics for the easy items by treatment and sex. The maximum possible score for the five easy items is 5 points. The overall mean score for easy items for AP students was 4.35 (SD = .71). Thus, for the easy items, the percent of correct items for the entire AP sample was 87%, indicating an easy test for these AP students. As the data in Table 27 suggest, there was little difference between control group and incentive group performance. The mean score for the easy items was 4.34 (SD = .68) for the incentive group and 4.36 (SD = .75) for the control group. The mean math score for males (M = 4.45, SD = .66) was significantly higher than for females (M = 4.23, SD = .75. The interaction was not statistically significance.

Table 27. — Descriptive statistics for the easy items by treatment and sex for the AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	4.35	4.56	4.45
SD	0.71	0.59	0.66
n	46	41	87
Female			
M	4.33	4.12	4.23
SD	0.66	0.84	0.75
n	39	34	73
Total			
M	4.34	4.36	4.35
SD	0.68	0.75	0.71
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Difficult Items. Table 28 presents descriptive analyses for the difficult items. The overall mean score for the difficult items was 4.98 (SD = 2.06). The maximum possible score for the five difficult items was 8 points. Thus for the difficult items, the percent of correct items for the entire AP study sample is 62%, indicating a somewhat difficult test. There was no significant difference between incentive (M = 5.00, SD = 2.05) and control (M = 4.96, SD = 2.10) groups on the difficult items. However, the gender difference was significant, with males (M = 5.60, SD = 1.95) performing significantly better than females (M = 4.25, SD = 1.96) on the difficult items. The interaction was not.

Table 28. — Descriptive statistics for the difficult items by treatment, sex, and booklet for the AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	5.43	5.78	5.60
SD	1.94	1.97	1.95
n	46	41	87
Female			
M	4.49	3.97	4.25
SD	2.08	1.82	1.96
n	39	34	73
Total			
M	5.00	4.96	4.98
SD	2.05	2.10	2.06
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Motivation

The three motivation variables (effort, self-efficacy, and worry) were also assessed in the AP study. Analyses conducted with these data were the same as those conducted in the main study. Internal consistency coefficients were computed for the three scales. Table 29 reports the internal consistency statistics for the AP student sample. The three motivation scales had high levels of internal consistency. The internal consistency coefficients (coefficient alpha) were .87 for effort, .91 for self-efficacy and .90 for worry.

Table 29. — Internal consistency statistics for AP student sample

Item #	Effort		Self-efficacy		Worry	
	Item / Total Correlation	Alpha if item Deleted	Item / Total Correlation	Alpha if item Deleted	Item / Total Correlation	Alpha if item Deleted
1	.77	.83	.76	.89	.80	.88
2	.76	.84	.64	.91	.70	.89
3	.45	.89	.85	.87	.77	.88
4	.84	.82	.81	.88	.78	.88
5	.79	.83	.72	.89	.60	.91
6	.55	.89	.69	.90	.82	.87
Alpha	.87		.91		.90	

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

To compare students' responses across categories of treatment (incentive / control) and sex (female / male), a 2×2 ANOVA model was used. Scores on the three motivation scales (effort, self-efficacy, and worry) were used as the dependent variables in successive analyses.

Effort. Table 30 reports descriptive statistics including means, standard deviations, and numbers of participants for the effort scale. The overall mean score for effort for the AP student sample was 20.86 out of a possible 24 points, indicating that the AP students exhibited high effort. There was a difference between the levels of effort across the treatment groups. The mean effort score for the incentive group was 21.99 (SD = 2.25), and for the control group, the mean was 19.57 (SD = 5.52). This difference of about 2 score points was, which indicates that the incentive group put more effort into this test. The mean effort score for females was 20.55 (SD = 3.59) and for males it was 21.11 (SD = 4.79). This difference was not statistically different. The interaction was not significant.

Table 30. — Descriptive statistics for effort by treatment and sex for the AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	22.17	19.93	21.11
SD	2.14	6.44	4.79
n	46	41	87
Female			
M	21.77	19.15	20.55
SD	2.39	4.21	3.59
n	39	34	73
Total			
M	21.99	19.57	20.86
SD	2.25	5.52	4.28
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Self-efficacy. Table 31 presents means and standard deviations for the self-efficacy scale. The overall mean score for self-efficacy was 19.69 (SD = 4.48) from a maximum of 24 possible points. The mean scores for the incentive group (M = 19.59, SD = 3.31) and the control group (M = 19.80, SD = 5.54) were not statistically different. However, the results showed a significant gender difference. The mean self-efficacy for males (M = 20.36, SD = 5.04) was significantly higher than the mean for the females (M = 18.89, SD = 3.58). The interaction was not significant.

Table 31. — Descriptive statistics for self-efficacy by treatment and sex for the AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	20.02	20.73	20.36
SD	3.43	6.41	5.04
n	46	41	87
Female			
M	19.08	18.68	18.89
SD	3.12	4.08	3.58
n	39	34	73
Total			
M	19.59	19.80	19.69
SD	3.31	5.54	4.48
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Worry. Table 32 reports means and standard deviations for the worry scale. The overall mean worry score was 8.73 (SD = 4.69) from a maximum of 24 points, indicating the worry was very low. The mean worry scores for the incentive group (M = 8.61, SD = 2.86) and for the control group (M = 8.87, SD = 6.15) were not significantly different. The mean worry score for females was 8.63 (SD = 3.05) and for males the mean was 8.82 (SD = 5.73). The difference between females' and males' worry was not significant. The interaction was not significant.

Table 32. — Descriptive statistics for the worry scale by treatment and sex for AP student sample

	Treatment		Total
	Incentive	Control	
Male			
M	8.78	8.85	8.82
SD	3.17	7.70	5.73
n	46	41	87
Female			
M	8.41	8.88	8.63
SD	2.47	3.62	3.05
n	39	34	73
Total			
M	8.61	8.87	8.73
SD	2.86	6.15	4.69
n	85	75	160

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size. The maximum score was 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Relationship between Math Performance and Motivation

Correlation coefficients were computed between math score and motivation scale scores to examine the degree of relationship between AP students' math performance and their effort, self-efficacy, and worry. Table 33 reports these correlations for the AP students. There was a significant negative correlation between worry and students' math score (r = -.37). More over, the correlation between math score and mean effort was not significant (r = .007). The correlation between the total math score and self-efficacy was significant (r = .23). Table 34 and Table 35 provide the same analyses for the AP incentive and control groups, separately. These tables are synthesized in Table 36. As may be seen in these tables the conclusions are approximately the same for both groups as well as the total AP sample. These results are also very similar when compared to the main study results.

Table 33. — Correlation coefficients between test scores and motivation scale scores for the AP student sample

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
Effort	r	.01	1.00		
Self-efficacy	r	.23*	.62**	1.00	
Worry	r	-.37**	.41**	.19	1.00

* Significant at p < .05, two-tailed.

** Significant at p < .01, two-tailed.

NOTE: r represents the correlation coefficient. The sample size was 160.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 34. — Correlation coefficients between test scores and motivation scale scores for the AP student incentive group

		Total math	Effort	Self-efficacy	Worry
Total math	r	1.00			
Effort	r	.17	1.00		
Self-efficacy	r	.45**	.27**	1.00	
Worry	r	-.49**	-.21*	-.49**	1.00

** Significant at p < .01, two-tailed.

NOTE: r represents the correlation coefficient. The sample size was 85.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 35. — Correlation coefficients between test scores and motivation scale scores for the AP student control group

		Total math	Effort	Self-efficacy	Worry
Total math	r				
Effort	r	-.05	1.00		
Self-efficacy	r	.10	.76**	1.00	
Worry	r	-.35**	.57**	.41**	1.00

** Significant at p < .01, two-tailed.

NOTE: r represents the correlation coefficient. The sample size was 75.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table 36. — Comparison of correlation relationships between motivation and math performance for the AP student sample

	Treatment	
	Incentive	Control
Effort / Math performance	.17	-.05
Self-efficacy / Math performance	.45**	.10
Worry / Math performance	-.49**	-.35**

** Significant at p < .01, two-tailed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Analysis of Omitted and Not-Reached Items

Numbers of omits / not-reached items were compared across categories of treatment (incentive / control) and sex (male / female) to examine any possible impact of sex and treatment on the number of omits / not-reached items. A two factor ANOVA showed no significant treatment effect on number of not-reached, but the gender effect was significant. This may be seen in Table 37. Female students had a higher number of not-reached items (M=.85, SD=1.54, n=73) than the male students (M=.39, SD=1.23, n=87). However, the effect of treatment on omitted items was not significant. The sex by treatment interaction was.

Table 37. — Frequency distribution of the omitted and not-reached items by treatment of AP students

		Omitted	Not reached
Incentive			
	M	.38	.72
	SD	.87	1.50
	n	85	85
Control			
	M	.17	.47
	SD	.64	1.27
	n	75	75

NOTE: M represents the mean, SD, the standard deviation, and n, the sample size.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Discussion AP Study

For an approximately 1-hour testing session, the average student in the incentive condition in the AP study received $200 ($180 for an average of approximately 18 items correctly answered and $20 for the two "easy" test items). Such incentives were assumed to be motivational for the 12th graders in our samples.

However, the results of the AP study showed no significant difference between the performance of students in the incentive and control groups. Statistically, there was no main effect or interaction of the incentive treatment. Like the main study, there was a great deal of consistency in the data in the AP study. For example, males performed significantly better than females. Although in the national sample (TIMMS, 1998) there were no significant effects of gender, we do find gender effects with our local southern California samples. Students in the AP study reported significantly more effort in the incentive condition than in the control condition. The groups did not differ with respect to self-efficacy and worry. Finally, self-efficacy and effort were positively related.

We also predicted, based on our prior National Assessment of Educational Progress (NAEP) research and the main study, that the incentive condition should result in higher self-reported effort. In turn, this increased effort should have resulted in better math performance. So why did we not find a significant main effect of treatment on math performance, given that there was a main effect of treatment on effort in both the AP and main study? The major reason we felt was the lack of relationship between self-reported effort and math achievement. Unexpectedly, for the AP study, self-reported effort was not significantly related to math performance (i.e. r = .007).

The lack of relationship between effort and math performance is puzzling. Like the main study, the obvious explanatory candidates (e.g., poor reliability of the measures) are not true. The alpha reliability of the effort scale is .87 in the AP study. Further, the correlations between effort and self-efficacy and worry are significant in the predicted directions for the AP study, indicating that other validity predictions involving effort were consistent with our prior research and the literature.

We also had several other behavioral indicators that the students put effort into other aspects of task performance, e.g., an indicator based on the number of checks cashed by incentive participants. The reader may recall that since we had to score the performance items and to minimize security concerns (cash in the hands of 12th graders), we asked the students, before the math test, to fill out a form indicating where we should send the money they would get for performing successfully on the math test. The reader may also recall that for the AP study 85 students were assigned to the incentive group for the final sample. An additional three students participated as incentive group participants, but their data was dropped from the final sample due to an administrative error. However, they were still compensated for being incentive group participants. In total, 88 check request forms were completed by incentive group participants. In most cases checks were issued and cleared the bank. Thus, students in the incentive condition were motivated to expend effort to correctly fill out the forms in the student test booklet to obtain the money.

Other behavioral information seems to indicate that our oral and written instructions resulted in students paying attention to our instructions on math items in general. For example, the two “easy items” were also completed without error for all incentive and control group participants, indicating that the experimental controls (e.g., for believability) were effective.

With respect to our other major experimental control, i.e., oral instructions to ensure participants would remember the treatment group they were in, we were more successful in the AP study than in the main study. In general, for students in the AP study, none of the students in the control group thought they would receive money for items correct. Moreover, 72 out of 85 incentive group students (85%) correctly identified their experimental condition. Thus, in the AP study, combining oral and written instructions was as effective as we hoped, when compared to written instructions in the earlier NAEP study.

Our chain of logic was that the money would be an incentive to increase effort for those with high prior knowledge and would therefore improve math performance. The average of approximately 18 correct was more than double the performance of the non-AP main study students on the same test. Thus, even with high prior knowledge, there was no sign significant effect effort of treatment. We succeeded in increasing effort (measured by self-report and number of checks that cleared), but the incentive condition did not facilitated math performance.

Presumably, since the incentive condition increased effort in the AP study, if self-reported effort were related to performance, then the incentive condition would have increased math performance. In summary, effort was not related to performance, and the conclusion for this AP study is that a monetary incentive did not increase math performance on a set of TIMMS released math items for AP students.

Overall Discussion

Recent information in the 1990's on international assessments (e.g., the Third International Mathematics and Science Study, or TIMSS) indicates that 12th-grade students in the United States are doing extremely poorly on such assessments compared with their peers in other countries (TIMSS, 1998). Similarly, many 12th-grade students are doing poorly on the National Assessment of Educational Progress (NAEP). In such tasks and assessments, in almost all cases, U.S. 12th-grade students perform relatively more poorly than 8th-grade students. For example, in TIMSS, 12th-grade students are below the international average whereas 8th-grade students are at the international average.

These poor results are usually attributed to cognitive factors such as students' opportunities to learn, teachers' lack of professional preparation, etc. However, a partial explanation of these results may be motivational. Because the low-stakes (for students) tests were administered late in these 12th-graders' final year in high school, the timing may have negatively affected motivation, and thus performance. This phenomenon has been labeled "senioritis." For the high school senior going into the world of work or on to post-secondary education, tests like TIMSS are clearly low stakes. Thus, one of the major questions about these tests concerns the possible impact of motivational factors on the results. If students are not motivated to perform well on low-stakes tests, then the results may underestimate what students could do if they gave these assessments their best effort.

Our basic approach was to provide a sufficient monetary incentive to maximize student effort and therefore increase performance. We expected that we could stimulate a 0.5 standard deviation increase in performance due to such incentives. Our results will not generalize, without additional research, to either TIMSS or NAEP.

Further, our results will not generalize to the impact of motivation variables (e.g., effort, self-efficacy) on the teaching and learning of math. However, we expected our results to constitute a proof of concept of the importance of manipulating motivation in low-stakes assessments for 12th graders.

We have promising results based on our prior NAEP motivation research sponsored by the National Assessment Governing Board (NAGB), and the Office of Educational Research and Improvement (OERI), National Center for Education Statistics (NCES). We hypothesized that the incentives would increase effort, which along with prior knowledge, would improve performance. The effective incentive in this earlier study was money. In the study (O'Neil, et al., 1992), we manipulated various incentives (money, task, ego, standard NAEP instructions) for 8th- and 12th-grade samples of students of various ethnicities (White, Black, Hispanic, and Asian American).

In general, only the money incentive worked in the 8th grade. The results showed, in the best case, that the money incentive was effective for a subsample of the 8th-grade students (those who remembered their incentive/treatment group) with easy- and medium-difficulty items. With respect to item difficulty results, because the motivational effect was at test time, it was not expected that this increased effort would improve performance on hard items, because students did not know the content. With respect to remembering one's treatment group, presumably if one doesn't remember the incentive (money), then one would not increase one's effort, and thus performance. However, no incentives were effective for 12th-grade students, even those who remembered their treatment. The executive summary from this study can be found in Appendix A.

We hypothesized that in our prior study, the lack of effect for 12th graders was because (a) the amount of money ($1.00 per item) was not large enough for 12th graders, and further (b) many 12th graders did not believe they would get the money.

Our approach for the current study consisted of manipulating the amount of money per item correct so as to increase the motivational effect and thus increase performance. The amount of money given per correct item was either $0 (low-stakes administration, e.g., TIMSS) or $10 per item correct (which we expected to be effective). The incentive group was compared with a group receiving standard low-stakes TIMSS instructions. Consistent with our prior NAEP study, we also collected information on effort, self-efficacy, and worry. For our assessment we used the released TIMSS math literacy scale items. This set of items included both multiple-choice and free-response items.

We hypothesized that students receiving $10 per item correct would perform significantly higher in math than those who were not receiving any monetary incentive (the control group). Such students would also exhibit higher effort and self-efficacy but less worry than control group participants. Our approach consisted of manipulating the amount of money per item correct so as to increase effort and thus increase math performance. In general, we expected overall anxiety levels to be low given the low-stakes nature of the test.

This investigation with 12th graders included a focus group study, a pilot study, a main study, and a supplementary study with Advanced Placement (AP) students in mathematics. This latter group was called the AP study. In the focus group study we explored various levels of incentives. This research is documented in Mastergeorge (1999). Parents and students who participated in the focus groups suggested that $5 to $10 per item correct would provide enough motivation for students in Grade 12 to work harder on math test items. Based on these findings, in the present investigation we offered students $10 per item correct to find out whether students' performance on the selected math items could be increased under such a high-stakes testing condition. We then compared the performance of students receiving $10 per item correct with the performance of students who responded to the same set of items with no monetary incentive.

A total of 725 students participated in the pilot, main, and AP studies. There were 144 students in the pilot study, 415 students in the main study, and 166 students in the AP study. For the pilot, main, and AP studies, students were selected from 23 different schools (5 schools in the pilot study, 9 schools in the main study, and 9 schools in the AP study) from southern California school districts in different locations. These schools had different demographics and different levels of overall student performance.

Following the focus group study, we conducted the pilot study. The purpose of the pilot study was to test design issues, examine the accuracy and language of the instruments, and resolve logistical problems. The results of the pilot study helped us to refine the instruments and to modify the design. We then conducted the main study and the AP study.

For an approximately one-hour testing session, the average student in the incentive condition in the main study received $100 ($80 for an average of 7.96 items correctly answered and $20 for the two "easy" test items). In the AP study, the average student received $200. Such incentives were assumed to be motivational for the 12th graders in our samples. However, the results of the main and AP studies showed no significant difference between the performance of students in the incentive and control groups. Statistically, there was no main effect of the incentive treatment. However, in the main study there was a complex interaction between treatment, sex, and booklet. However, post hoc comparisons indicated that although the overall interaction was significant, none of the comparisons of appropriate means were statistically significant. Thus, we chose to be conservative and not to interpret this interaction as supporting our major hypothesis. Further, the results of the AP study also did not support the major hypothesis. The total number of students in the main study was 393 after excluding students with incomplete data. This number became small when divided into subgroups by the levels of independent variables such as sex, test form, and treatment. Due to a small number of subjects, for some of the analyses, there was not enough power to detect a significant difference, even when the difference was relatively large. However there was a sufficient number of students in both the main study sample and the AP study to detect a reasonable main effect for the incentive treatment.

There was a great deal of consistency in the data in both the main and AP study. For example, males performed significantly better than females in both the main study and the AP study. These results were expected as the task was mathematics, and with our local samples we consistently find gender effects on math tests. Although in the national sample (TIMSS, 1998) there were no significant effects of sex, we find gender effects with our local southern California samples. Students in both the main study and the AP study reported significantly more effort in the incentive condition than in the control condition. Finally, in both studies self-efficacy and effort were positively related. These latter results make theoretical sense, as Bandura (1986, 1993, 1997) would predict that higher levels of self-efficacy should lead to higher levels of effort.

We also predicted, based on our prior NAEP research that the incentive condition should result in higher effort. In both the main and AP studies we found that students in the incentive group had significantly higher effort than students did in the control group. In turn, this increased effort should have resulted in better math performance. So why did we not find a significant main effect of treatment on math performance, given that there was a main effect of treatment on effort? The major reason we felt was the lack of relationship between self-reported effort and math achievement. Unexpectedly, for both the main and AP studies, self-reported effort was not significantly related to math performance (e.g., r = .007 in the AP study). With respect to effort, the research literature and our own research using the same measures indicate that the relationship would be positive (i.e., higher effort leads to better performance). Not surprisingly, we are puzzled by such findings. The obvious next step is to conduct a series of focus groups and cognitive laboratory approaches to better understand these issues. There was an not issue of enough time to complete this test, given the number of not-reached items was very low, indicating that students had sufficient time to complete almost all items on the test. Further, there were few items omitted in either study. The not-reached and omitted information clearly indicates that students had sufficient time to complete the test. Thus our set of items clearly constituted a power, not a speed test. Further, for the total math correct, there was no ceiling. In the main study, the mean was 7.96 (SD 3.79) out of a possible 24 points (20 items with a few extended response items getting 2 possible maximum points). For the AP study, the mean was 17.95 (SD = 4.14) out of 24 possible points (same test as the main study).

There are a couple issues that speaks to our location in Los Angeles. One way in which the sample of students used in this study is not a representative sample of all the students in the United States is that so many of them are from families that do not speak English at home. Well over half never speak English at home, while less than 15 percent only speak English at home. The high non-English language background of the sample limits generalizing the findings. Findings should be interpreted in light of this caution. It may also be that race-ethnicity composition is not representative of the United States as a whole. We do not know the racial-ethnic background of the students as we did not request it.

In summary, effort was not related to performance, and the conclusion for this set of studies is that a strong monetary incentive did not increase math performance on a set of TIMSS released math items with local English Language Learners from samples of convenience. Further, the inability to find few motivational effects, despite a strong incentive, random assignment (with equivalence on background characteristics), tests of high and low performing students, and elimination of non-accurate recall cases, is quite compelling. It raises some fundamental questions about previous assumptions made about the motivation effect on test performance and we think that factors in addition to motivation are coming into play. We believe that there is a senioritis effect, but understanding its specific motivational effect on test performance and its amelioration awaits future research. However the high non-English language background of the sample limits generalizing the findings and these findings should be interpreted in light of this caution.

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Appendix A

Executive Summary of O'Neil, Sugrue, Abedi, Baker & Golan, 1997

Executive Summary (O'Neil et al., 1997)

Final Report of Experimental Studies on Motivation and NAEP Test Performance

EXECUTIVE SUMMARY

Harold F. O'Neil, Jr., CRESST / University of Southern California
Brenda Sugrue, CRESST / University of California, Los Angeles
Jamal Abedi, CRESST / University of California, Los Angeles
Eva L. Baker, CRESST / University of California, Los Angeles
Shari Golan, CRESST / University of California, Los Angeles

Introduction

The Cognitive Science Laboratory of the University of Southern California has a subcontract with the Center for Research on Evaluation, Standards, and Student Testing (CRESST) at the University of California, Los Angeles, to assist in the research on the experimental effects of motivation on the National Assessment of Educational Progress (NAEP). The University of Colorado / CRESST has conducted a study on embedded NAEP tests in a state assessment. In turn, CRESST / UCLA has an existing contract from the National Center for Education Statistics (NCES) to conduct validity studies on NAEP. CRESST / UCLA areas of interest include both assessment and policy issues. The purpose of this report (the Final Report on our USC subcontract) is to document a series of collaborative studies on the experimental effects of motivation on a low-stakes (to the student) standardized test.

The Research Question

One of the major validity questions that has been raised in relation to the National Assessment of Educational Progress (NAEP) concerns the possible impact of motivational factors on the NAEP results. If students are not motivated to perform well on NAEP tests, and if the lack of motivation results in poor performance, then NAEP findings are underestimates of student achievement.

The possibility that NAEP underestimates what students could do if they gave the assessment their best effort has been a concern for some time. Shanker (1990), for example, noted that "one of the most frequently offered theories about the low NAEP scores is that kids know the tests don't count" and therefore "may decide it's not worth their while to put forth any effort." He went on to argue that because of the importance of NAEP as a source of information about student achievement, "we ought to clear up this question about its validity." Responses to the NAEP mathematics field test questions (Educational Testing Service, 1991) also indicate the need to investigate effort in the context of low-stakes NAEP testing. When asked, "How hard did you try on this test?" 28% of 8th graders responded "Somewhat hard" or "Not at all hard," whereas 51% of 12th graders answered in this manner. Similarly, when asked, "How important was it for you to do well on this test?" 36% of 8th graders responded "Somewhat important" or "Not very important," whereas 62% of 12th graders gave this response.

The Studies

To test the theory that increased motivation to perform well on a NAEP test would be reflected in increased effort and improved performance on the test, a series of studies was conducted in 1992 by UCLA's Center for the Study of Evaluation and its National Center for Research on Evaluation, Standards, and Student Testing (CRESST). The studies investigated the effects of various motivational conditions on the performance of 8th- and 12th-grade students on a subset of released items from the 1990 NAEP mathematics test.

Mathematics was selected because it is a content area that many students not only find difficult but also dislike, want to avoid, or feel anxious about. In addition, mathematics is an area that has been singled out for special attention by its choice as the first content domain in the NAEP Trial State Assessment and for the assessment of the President's and Governors' National Education Goals.

The studies were conducted at two grade levels, 8 and 12. Grade 12 was selected because it is the grade where concerns about motivation are most serious. We did not want to limit the study to that grade, however, because negative effects of low motivation observed at Grade 12, if any, might not generalize to other grades. Therefore, we thought it important to replicate the studies at a second grade level. At Grade 8, it would be possible to implement some sort of remediation, if desired.

In order to link any observed performance differences to differential investment of effort or to differences in metacognition, anxiety, and perceived ability, these variables were measured via a modified self-assessment questionnaire (O'Neil, Baker, Jacoby, Ni, & Wittrock, 1990) The history of the development and validation of this instrument is described in detail later in this report.

It was reasoned that the motivational treatments might have different effects on subgroups of students whose performance on NAEP mathematics tests currently differs. Therefore, the studies investigated possible differential effects of the motivational conditions on the performance, and perceived effort, metacognition, mathematics ability, and anxiety of male and female students with different ethnic backgrounds (White, African American, Latino, Asian).

A number of pilot studies were conducted to select the motivational conditions that might influence test performance. (Each of these is described in detail later in the report.) An initial "focus-group study" revealed that both 8th- and 12th-grade students would be motivated by financial rewards to try harder on tests. A second pilot study compared the performance of 8th- and 12th-grade students who received three different financial rewards (or no reward). The study yielded no differences among test scores of 8th- or 12th-grade students who received any of three financial incentives and students who received standard NAEP test instructions. Based on previous research and on our feeling that 50 cents per item might not be enough to motivate Los Angeles teenagers, a financial incentive condition offering a larger reward of $1 per correct item was included in the main study.

A third pilot study investigated the differential effects of various goal orientation conditions. One group of students was told that the goal of the test was to provide a personal challenge and accomplishment (task-oriented goal); a second group was told that the goal was to compare their mathematical ability with that of other students (competitive or ego-oriented goal); a third group was told that the goal of the test was to evaluate the effectiveness of their teachers (teacher-oriented goal); a fourth group in this pilot study got the standard NAEP test instructions. Eighth-grade students (in classes tested first) who were told that the goal was to compare their mathematics ability with that of others obtained higher scores than 8th-grade students who received standard NAEP instructions. However, because this finding was inconsistent with previous research on the relationship of goal orientation and performance (see our literature review), both the personal accomplishment goal and the competitive goal were retained as motivational conditions in the main study.

The main study compared the effects of three experimental motivational conditions (financial reward, competition, personal accomplishment) and standard NAEP test instructions on the mathematics performance of 8th- and 12th-grade students. In addition, for 12th-grade students, a fifth condition was added: Students were offered a certificate of accomplishment if they scored in the top 10% of their class. The results indicated that the offer of a financial reward can improve the performance of 8th-grade students. The 8th-grade students who were offered a financial reward also reported investing more effort during the test than did 8th-grade students who received the standard NAEP test instructions. Goal orientation manipulations did not result in significant differences on any outcome variable. In 12th grade, no differences were observed in test performance among students who were exposed to the different motivational conditions. However, 12th-grade students who were offered the financial reward reported more metacognitive activity during the test. Treatment did not interact with ethnicity or gender in its effect on any outcome variable in either 8th or 12th grade.

The Implications

The 8th-grade findings indicate that, indeed, we may be underestimating the achievement of students when we use scores on “low-stakes” tests as the indicators of achievement. While offering all students a financial reward for performance on such tests is not practical, there may be other ways of rewarding students for high achievement on such tests that would lead them to invest their maximum effort.

Appendix B

Focus Group Consent Forms

University of California, Los Angeles

ASSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study
(Focus Group)

You are asked to participate in a focus group that is part of a research study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in the focus group because you are a high school senior who has taken or is currently enrolled in advanced mathematics or physics courses.

- **PURPOSE OF THE STUDY**

The purpose of this study is to investigate the effect motivation with an incentive may have on 12th grade student performance in standardized tests of mathematics. The purpose of the focus group is to gain an understanding of incentives (rewards), amount of incentive, and any issues and concerns that may have an impact on receiving these incentives from a student perspective.

- **PROCEDURES**

If you volunteer to participate in the focus group, the following procedures would take place:

- You will be informed of the nature of the focus group purpose and intent.
- You will be asked to sign a participation assent form.
- You will be asked to participate in a discussion not to exceed one hour.
- Your responses will be audiotaped and transcribed. Your name and any other identifying information will not be included in the transcription.
- For your participation in the focus group, you will receive a small honorarium.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will be asked to be part of a discussion on receiving incentives for correct responses on math test items. You will not be coerced or asked to give responses. All responses obtained during the focus group meeting are voluntary.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If you participate in the focus group, you will receive a small honorarium.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this focus group and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in the focus group or not. If you volunteer to be in the focus group, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the focus group. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research or participation in the focus group, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your assent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this focus group. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this focus group. I have been given a copy of this form.

______________________________ ______________________
Name of Subject Date

____
Signature for Adolescent Assent

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed assent and possesses the legal capacity to give informed assent to participate in this research study.

______________________________ ______________________
Signature of Investigator Date

University of California, Los Angeles

CONSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study
(Focus Group)

You are asked to participate in a focus group that is part of a research study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in the focus group because you are either a parent/guardian of a high school senior or a high school senior (18 years old or over) who has taken or is currently enrolled in advanced mathematics or physics courses.

- **PURPOSE OF THE STUDY**

The purpose of this study is to investigate the effect motivation with an incentive may have on 12th grade student performance in standardized tests of mathematics. The purpose of the focus group is to gain an understanding of incentives (rewards), amount of incentive, and any issues and concerns that may have an impact on receiving these incentives from a student or parent perspective.

- **PROCEDURES**

If you volunteer to participate in the focus group, the following procedures would take place:

- You will be informed of the nature of the focus group purpose and intent.
- You will be asked to sign a participation consent form.
- You will be asked to participate in a discussion not to exceed one hour.
- Your responses will be audiotaped and transcribed. Your name and any other identifying information will not be included in the transcription.
- For your participation in the focus group, you will receive a small honorarium.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will be asked to be part of a discussion on receiving incentives for correct responses on math test items. You will not be coerced or asked to give responses. All responses obtained during the focus group meeting are voluntary.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If you participate in the focus group, you will receive a small honorarium.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this focus group and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in the focus group or not. If you volunteer to be in the focus group, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the focus group. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research or participation in the focus group, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your consent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this focus group. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this focus group. I have been given a copy of this form.

Name of Subject Date

Signature of Adolescent Consent / Parent / Guardian

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

Signature of Investigator Date

University of California, Los Angeles

PARENTAL PERMISSION FOR MINOR TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study (Focus Group)

Your child / ward has been asked to participate in a focus group that is part of a research study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. Your child / ward was selected as a possible participant in this study because s / he is a high school senior who has taken or is currently enrolled advanced mathematics or physics courses.

- **PURPOSE OF THE STUDY**

The purpose of this study is to investigate the effect motivation with an incentive may have on 12th grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If your child / ward volunteers to participate in the focus group, the following procedures would take place. Your child / ward will:

- be informed of the nature of the focus group purpose and intent.
- be asked to sign a participation assent form.
- be asked to participate in a discussion not to exceed one hour.
- have responses audiotaped and transcribed. Your child's / ward's name and any other identifying information will not be included in the transcription.
- receive a small honorarium for participation in the focus group.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. Your child / ward will be asked to be part of a discussion on receiving incentives for correct responses on math test items. Your child / ward will not be coerced or asked to give responses. All responses obtained during the focus group meeting are voluntary.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If your child / ward participates in the focus group, s / he will receive a small honorarium.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this focus group and is identified with your child / ward will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

Your child / ward can choose whether to be in the focus group or not. If s / he volunteers to be in the focus group, s / he may withdraw at any time without consequences of any kind. Your child / ward may also refuse to answer any questions s / he doesn't want to answer and still remain in the study. The investigator may withdraw your child / ward from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the focus group or the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

Your child / ward may withdraw her / his assent at any time and discontinue participation without penalty. Your child / ward is not waving any legal claims, rights or remedies because of his / her participation in this research study. If your child / ward has questions regarding his / her rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I GIVE PERMISSION** for my child / ward to participate in this focus group. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT GIVE PERMISSION** for my child / ward to participate in this focus group. I have been given a copy of this form.

____

Name of Child / Ward

____

Name of Parent / Guardian

____ __________________________

Signature of Parent / Guardian Date

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

____ __________________________

Signature of Investigator Date

Appendix C

Description of the Pilot Study

Description of the Pilot Study

Although the major purpose of the pilot study was to test the training of assessment administrators and the design of our procedures and forms, we also explored whether or not the treatment (monetary incentive) would increase–students' performance in math.

For testing this hypothesis, students' total or overall math score was the main dependent variable and treatment group membership (incentive, control) was the main independent variable. A simple comparison between students' performance in the two groups would provide evidence for rejecting/not rejecting the null hypothesis. However, there are at least two other independent variables that may impact students' performance. These variables are sex and test form or booklet. To test the main effects of these three independent variables and their interactions on the dependent variable (math score), a three-factor completely crossed analysis of variance model ($2 \times 2 \times 2$; i.e., 2 levels of treatment by 2 levels of sex by 2 levels of form) was needed. However, there were not enough subjects in the pilot study to permit such analysis. Since there was not a significant difference between students' performance across the two forms this variable was dropped.

It was expected that the mean math score of the subjects in the incentive group would be higher than the mean for the control group and that males would perform higher on the math test than females. We consistently find effects by sex on math with our local L.A. samples. We did not expect an interaction between treatment and sex.

A total of 144 students from five different schools in the greater Los Angeles area participated in the pilot study. For the entire pilot sample, students were relatively evenly distributed across sex and booklet. However, because treatment coordination was assigned before the test administrators arrived at each school, the distribution of students within treatment varied slightly due to unforeseen circumstances such as absenteeism, student decision on the test day to not participate, as well as student decision on test day to participate. For those students who chose to participate on the test day and who brought a signed assent and parental permission form or a consent form were assigned to a group.

Background information for the pilot sample is provided in Table B1. In the test booklet, two versions of the background questions were used to elicit information about students. Sites 1–3 received version 1 (Questions 1 and 2), and sites 4 and 5 received version 2 (Questions 3, 4, 5, 6 and 7 as well as Questions 1 and 2). Figure C1 displays the background questions for version 1. Figure C2 displays the background questions for version 2.

Figure C1. — Background questions, version 1

VERSION 1

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year
   (B) Regular classes in mathematics
   (C) AP classes in mathematics
   (D) Regular classes in physics
   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

   (A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world…In brief, how well you do will tell us how good you are at this kind of test."
   (B) "There are a total of 20 questions. We will give you $10 for each correct answer, just like the easier test you completed. For example, if you get 10 items correct, we will give you $100. If you answer all of the items correctly, you will get $200. We are giving money to you to encourage you to try harder and do well on this test. If you finish early, you can go back to those questions you could not answer."
   (C) "Some of the questions will be followed by four or five possible answers indicated with a letter next to it. For these questions, circle the letter next to the answer you consider to be correct, as shown in Example 1."
   (D) "I can't remember."

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Figure C2. — Background questions, version 2

VERSION 2

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year
   (B) Regular classes in mathematics
   (C) AP classes in mathematics
   (D) Regular classes in physics
   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

   (A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world."
   (B) "There are a total of 20 questions…we will give you $10 for each correct answer, just like the easier test you completed."
   (C) "There are a total of 20 questions…if you finish early, you can go back to those questions you could not answer in this section only."
   (D) "I can't remember."

3. What was your total SAT 9 score last year? ________________________

4. Mark the statement that best describes your math grades since ninth grade.

   (A) Mostly A's
   (B) Mostly B's
   (C) Mostly C's
   (D) Mostly D's
   (E) Mostly below D

5. How often do the people in your home speak a language other than English?

   (A) Never
   (B) Sometimes
   (C) Always

6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes
   (B) No

7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

For Question 1, type of math and physics classes, 8 students in the incentive group and 8 students in the control group indicated that they took either AP math and/or AP physics classes. These students should not have been in the sample, as our design required non-AP students. We dropped the 16 students who had indicated that they took these AP classes from the pilot study sample. Likewise, for Question 2, 52 out of 72 students in the incentive group correctly identified that they were to receive money. In the control group, 10 out of 72 (14%) of the students inappropriately thought they were to receive money. Sixty-two (86%) of the control group students did not respond to this question. However, there were 8 students in the control group who also responded that they did not remember any instructions. Subsequent analysis also dropped these participants. There were two students with missing data.

We added more questions to the background questionnaire as the pilot study progressed. Thus, the questions about the student's language proficiency (language spoken at home) and math grades were added after data collection was completed at schools 1, 2, and 3. For Question 4, 14 students in the incentive group and 23 students in the control group reported that they always use a language other than English at home. For Question 5, most participants' math grades were C and below (25 students in the incentive group and 25 students in the control group, or 68%). Finally, for Question 6, 58 of the students responded they had been taught the concepts. The reader should note that question 3 was dropped for analyses as the student responses indicated that they confused the SAT 9 with the SAT.

Table C1. — Descriptive statistics for background questions for schools 1, 2, 3, 4 and 5

Question	Incentive		Control	
	Number	Percent	Number	Percent
1. Type of math and physics classes				
Total response	72	100.0	72	100.0
Not taking math	23	31.9	28	38.9
Regular math	39	54.2	35	48.6
AP math and / or AP physics	8	11.1	8	11.1
Regular physics	12	16.7	16	22.2
2. Remember directions				
Total response	72	100.0	72	100.0
Compare your math skills with others	(*)	(*)	16	22.2
$10 for each correct answer	52	72.2	10	13.9
Questions are followed by four or five answers	22	30.6	39	54.2
Can't remember the instruction	3	4.2	8	11.1

* Less than three students gave this answer.

NOTE: Detail may not sum to totals due to multiple responses and rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C2. — Descriptive statistics for the background questions for schools 4 and 5

Question	Incentive group		Control group	
	Number	Percent	Number	Percent
4. Language other than English spoken in the home				
Total response	33	100.0	40	100.0
Never	9	27.3	8	20.0
Sometimes	10	30.3	9	22.5
Always	14	42.4	23	57.5
5. Math grade				
Total response	33	100.0	40	100.0
Mostly As	(*)	(*)	6	15.0
Mostly Bs	8	24.2	9	22.5
Mostly Cs	20	60.6	20	50.0
Mostly Ds and below	5	15	5	12.5
6. Concepts in math been taught				
Total response	33	100.0	39	100.0
Yes	24	72.7	34	87.2
No	9	27.3	5	12.8

* Less than three students gave this answer.

NOTE: Detail may not sum to totals due to multiple responses and rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Pilot Study Results

Math Scores

Table C3 shows means, standard deviations, and number of subjects for each cell of the 2×2 Analysis of Variance (ANOVA) model. For example, the overall mean of the math scores for 128 regular students was 9.28 ($\underline{SD}$ = 3.93). The trends of the data in Table C3 indicate that females had significantly lower mean math scores than males. However, there was not a significant difference between students in the incentive group and students in the control group. Moreover, there was no significant interaction between treatment and sex.

Table C3. — Descriptive statistics for the math test score by treatment and sex for the pilot study, AP students excluded

Treatment	Sex		Total
	Female	Male	
Incentive			
M	7.60	10.28	8.69
SD	2.91	4.36	3.78
n	38	26	64
Control			
M	9.44	10.40	9.86
SD	3.81	4.29	4.02
n	36	28	64
Total			
M	8.50	10.35	9.28
SD	3.48	4.28	3.93
n	74	54	128

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Motivation. The motivation questionnaire consisted of three scales of six items each to measure students' level of effort, self-efficacy, and worry. We first discuss the results of internal consistency of the three scales and then report the relationship between the motivation scales and the math scores.

Table C4 presents the results of internal consistency analyses for the pilot sample when AP students are excluded. Internal consistency coefficients in Table C4 range from .69 to .82, indicating acceptable reliability coefficients for these scales.

Table C4. — Internal consistency statistics for the pilot group excluding the AP students

Items	Effort		Self-efficacy		Worry	
	Item / total correlation	Alpha if item deleted	Item / total correlation	Alpha if item deleted	Item / total correlation	Alpha if item deleted
1	.61	.73	.64	.78	.38	.66
2	.70	.71	.39	.83	.42	.65
3	.34	.80	.62	.79	.42	.65
4	.68	.72	.71	.77	.40	.66
5	.60	.74	.58	.79	.47	.63
6	.37	.80	.60	.79	.45	.64
Alpha	.78		.82		.69	

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C5 reports the means and standard deviations for the effort scale by treatment and sex. As indicated earlier, each scale has six questions using a Likert-type 4-point scale. The maximum score is 24 (6×4). In the pilot study, the incentive group had a mean effort score of 19.17 (SD = 3.40) from a maximum of 24, and the control group had a mean of 18.68 (SD = 3.45). These differences were not significant. Although males had a slightly higher mean effort (M = 19.25, SD = 3.33) than the females (M = 18.67, SD = 3.50), these differences were not statistically significant. There was no significant treatment by gender interaction.

Table C5. — Descriptive statistics for the effort Scale by treatment and sex for the pilot study, excluding AP students

Sex	Treatment		Total
	Incentive	Control	
Male			
M	19.43	19.11	19.25
SD	3.09	3.56	3.33
n	23	28	51
Female			
M	19.00	18.32	18.67
SD	3.63	3.37	3.50
n	36	34	70
Total			
M	19.17	18.68	18.92
SD	3.40	3.45	3.42
n	59	62	121

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C6 presents the means and standard deviations for the self-efficacy scale. The overall mean for self-efficacy was 14.84 (SD = 3.74) from a maximum of 24. Incentive and control groups showed approximately the same level of self-efficacy. The mean score for the incentive group was 14.36 (SD = 3.61), and for the control group it was 15.31 (SD = 3.83). The differences were not statistically different. The mean self-efficacy for males (M = 16.39, SD = 3.77) was higher than the mean for the females (M = 13.71, SD = 3.30). This gender difference was statistically significant. There was no significant treatment by gender interaction.

Table C6. — Descriptive statistics for the self-efficacy scale by treatment and sex for the pilot study, excluding AP students

Sex	Treatment		Total
	Incentive	Control	
Male			
M	15.70	16.96	16.39
SD	3.64	3.85	3.77
n	23	28	51
Female			
M	13.50	13.94	13.71
SD	3.37	3.27	3.30
n	36	34	70
Total			
M	14.36	15.31	14.84
SD	3.61	3.83	3.74
n	59	62	121

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C7 shows the means and standard deviations for the worry scale. The overall mean worry was 11.96 (SD = 3.54) from a maximum of 24 points indicating that students who participated in this pilot study were not very worried. The mean worry score for the incentive group (M = 12.12, SD = 3.71) was slightly higher than the control group score (M = 11.80, SD = 3.40). These differences were not statistically different. However, there were significant gender differences. Males were less worried (M = 11.00, SD = 3.63) than females (M = 12.66, SD = 3.33). Again, there was no significant treatment by gender interaction.

Table C7. — Descriptive statistics for the worry scale by treatment and sex for the pilot study sample, excluding AP students

Sex	Treatment		Total
	Incentive	Control	
Male			
M	10.57	11.36	11.00
SD	3.44	3.81	3.63
n	23	28	51
Female			
M	13.11	12.18	12.66
SD	3.58	3.02	3.33
n	36	34	70
Total			
M	12.12	11.81	11.96
SD	3.71	3.40	3.54
n	59	62	121

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Correlation between math performance and motivation. Correlation coefficients were computed between math score and motivation scale scores in the pilot study to examine the degree of relationship between students' math performance and their effort, self-efficacy, and worry. Table C8 reports these correlations for the participants in the pilot study. As expected, there was a significant negative correlation between worry and students' math score (r = -.43). There was also a significant correlation between total math score and self-efficacy (r = .42). Unexpectedly, the correlation between math score and mean effort was not significant (r = .05). The correlation analyses for the incentive group and control group are found in Table C9 and Table C10. Table C11 provides a summary table in which the correlational relationships are very similar for both the incentive and control groups.

Table C8. — PM correlation coefficients between test scores and motivation subscale scores for the pilot group, excluding AP students

		Total math	Effort	Self-efficacy	Worry
Total math	R	1.00			
	N	128			
Effort	R	.05	1.00		
	N	123	123		
Self-efficacy	R	.42**	.35**	1.00	
	N	124	123	124	
Worry	R	-.43**	-.01	-.32**	1.00
	N	121	121	121	121

NOTE: r represents the correlation coefficient and n the sample size.

* Significant at $p < .05$, two-tailed.

** Significant at $p < .01$, two-tailed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C9. — PM correlation coefficients between math and motivation scale scores for the pilot sample incentive group, excluding AP students

		Total math	Effort	Self-efficacy	Worry
Total math	R	1.00			
	N	64			
Effort	R	.26*	1.00		
	N	61	61		
Self-efficacy	R	.47**	.41**	1.00	
	N	62	61	62	
Worry	R	-.43**	-.17*	-.27*	1.00
	N	59	59	59	59

NOTE: r represents the correlation coefficient and n the sample size.

* Significant at $p < .05$, two-tailed.

** Significant at $p < .01$, two-tailed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C10. — PM correlation coefficients between math scores and motivation scale scores for the pilot sample control group, excluding AP students

		Total math	Effort	Self-efficacy	Worry
Total math	R	1.00			
	N	64			
Effort	R	-.11	1.00		
	N	62	62		
Self-efficacy	R	.36**	.32*	1.00	
	N	62	62	62	
Worry	R	-.43**	.15	-.36**	1.00
	N	62	62	62	62

NOTE: r represents the correlation coefficient and n the sample size.

* Significant at p < .05, two-tailed.

** Significant at p < .01, two-tailed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table C11. — Comparison of correlations between motivation and math performance for the pilot student sample, excluding AP students

	Incentive	Control
Effort / Math performance	.26*	-.11
Self-efficacy / Math performance	.47**	.36**
Worry / Math performance	-.43**	-.43**

NOTE: r represents the correlation coefficient and n the sample size.

* Significant at p < .05, two-tailed.

** Significant at p < .01, two-tailed.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

We computed a correlation coefficient between the response to the OTL questions (yes / no) with the three motivational subscales and the total math scores. Correlation coefficients were -.203 between the self-efficacy and OTL, .102 between the worry and OTL, -.103 between effort and OTL and -.109 between total math score and

OTL. These correlation coefficients are relatively low and in some cases were not statistically significant. The low relationship between the OTL variable and other variables in this study may be due to a reliability problem with the OTL measure since a one-item test may not be reliable enough to provide a reasonable measure.

Pilot Study
(AP students included)

Table C12 reports means, standard deviations, and number of pilot subjects for the entire study including AP students. Although the overall mean for the incentive group ($\underline{M}$ = 9.81, $\underline{SD}$ = 4.91) was lower than the overall mean for the control group ($\underline{M}$ = 10.81, $\underline{SD}$ = 4.69), this difference was not significant. However, there was a significant gender difference. Females in general performed lower ($\underline{M}$ = 9.24, $\underline{SD}$ = 4.18) than the males ($\underline{M}$ = 11.69, $\underline{SD}$ = 5.23).

Table C12. — Descriptive statistics for the math score by treatment and sex for the pilot study

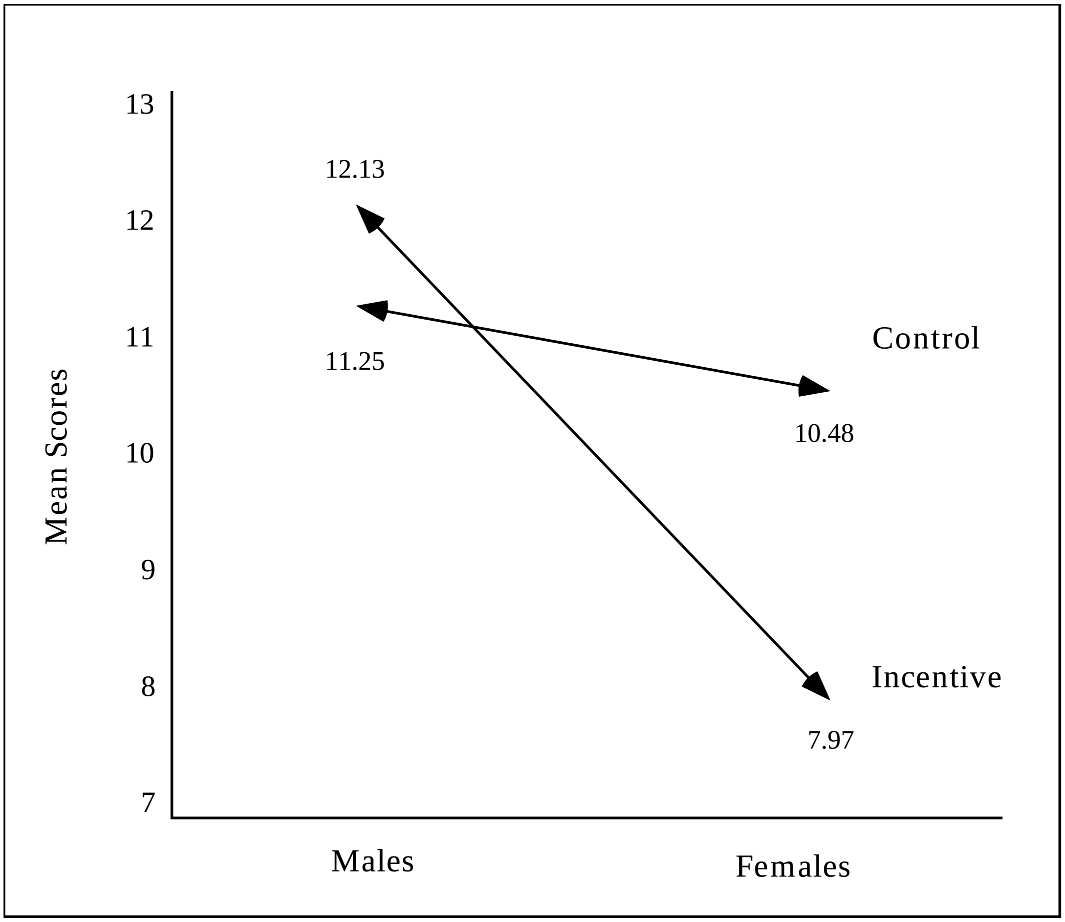
Treatment	Sex		Total
	Female	Male	
Incentive			
M	7.97	12.13	9.81
SD	3.32	5.60	4.91
N	40	32	72
Control			
M	10.48	11.25	10.81
SD	4.58	4.86	4.69
N	41	31	72
Total			
M	9.24	11.69	10.31
SD	4.18	5.23	4.81
N	81	63	144

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Moreover, the results of our analyses also suggest a significant interaction effect between treatment and sex. As may be seen in Figure C3, females performed substantially lower in the incentive group (M = 7.99, SD = 3.32) than the control group (M = 10.48, SD = 4.58), while male performed higher in the incentive group (M = 12.13, SD = 5.60) than the control group (M = 11.25, SD = 4.86). The post hoc-comparison test for the interaction, a t test (using the pool variance estimate), indicated that the means were different for the females but not the males.

Figure C3 — Pilot Study



SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Appendix D

Original Consent Forms

University of California, Los Angeles

ASSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

You are asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in this XXX study because you are a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE XXX STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12th grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If you volunteer to participate in this XXX study, the following procedures would take place:

We will begin in your regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. Your class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which you will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which you will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will engage in common test taking practices with which you are very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If you participate in this XXX study, you will be randomly assigned into one of two conditions: 1) a no-incentive condition in which you will receive a small monetary sum for your participation; or 2) an incentive condition in which you will receive a monetary sum determined by your performance on the math literacy test.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this XXX study or not. If you volunteer to be in this XXX study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the XXX study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your assent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research XXX study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this XXX study. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this XXX study. I have been given a copy of this form.

______________________________ ______________________

Name of Subject Date

____

Signature for Adolescent Assent

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed assent and possesses the legal capacity to give informed assent to participate in this research XXX study.

______________________________ ______________________

Signature of Investigator Date

University of California, Los Angeles

CONSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

You are asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in this XXX study because you are a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE XXX STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12^{th} grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If you volunteer to participate in this XXX study, the following procedures would take place:

We will begin in your regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. Your class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which you will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which you will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will engage in common test taking practices with which you are very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If you participate in this XXX study, you will be randomly assigned into one of two conditions: 1) a no-incentive condition in which you will receive a small monetary sum for your participation; or 2) an incentive condition in which you will receive a monetary sum determined by your performance on the math literacy test.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this XXX study or not. If you volunteer to be in this XXX study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the XXX study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your consent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research XXX study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this XXX study. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this XXX study. I have been given a copy of this form.

____ ______________________
Name of Subject Date

____
Signature for Adolescent Consent

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research XXX study.

____ ______________________
Signature of Investigator Date

University of California, Los Angeles

PARENTAL PERMISSION FOR MINOR TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

Your child/ward has been asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. Your child/ward was selected as a possible participant in this XXX study because s/he is a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE PILOT STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12th grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If your child/ward volunteers to participate in this XXX study, the following procedures would take place:

We will begin in the regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. The class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which the students will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which the students will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. Your child/ward will engage in common test taking practices with which s/he is very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **PAYMENT FOR PARTICIPATION**

If your child / ward participates in this XXX study, s / he will be randomly assigned into one of two conditions: 1) a no-incentive condition in which s / he will receive a small monetary sum for your participation; or 2) an incentive condition in which s / he will receive a monetary sum determined by your performance on the math literacy test.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with your child / ward will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

Your child / ward can choose whether to be in this XXX study or not. If s / he volunteers to be in this XXX study, s / he may withdraw at any time without consequences of any kind. Your child / ward may also refuse to answer any questions s / he doesn't want to answer and still remain in the XXX study. The investigator may withdraw your child / ward from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

Your child / ward may withdraw her / his assent at any time and discontinue participation without penalty. Your child / ward is not waving any legal claims, rights or remedies because of his / her participation in this research XXX study. If your child / ward has questions regarding his / her rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I GIVE PERMISSION** for my child / ward to participate in this XXX study. I have been given a copy of this form.

r I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT GIVE PERMISSION** for my child / ward to participate in this XXX study. I have been given a copy of this form.

____
Name of Child / Ward

____
Name of Parent / Guardian

____ ______________________
Signature of Parent / Guardian Date

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research XXX study.

____ ______________________
Signature of Investigator Date

Appendix E

Main Study
(AP students included)

Description of the Main Study

(Including AP Students)

A three-factor Analysis of Variance (ANOVA) model was applied to the main study data, which included AP students. The independent variables (factors) were: treatment (incentive/control), sex (male/female), and book (Form A/B). The dependant variable was math total. Table E1 presents mean, standard deviation, and n for the main effects and interactions and Table E2 presents a summary of the three–factor ANOVA model. As indicated earlier, these results are consistent with those reported in Table 6, where AP students were excluded.

Table E1. — Descriptive Statistics for Math Test Score by Treatment, Sex, and Booklet for the Main Study Sample including AP students

	Treatment						Total		
	Incentive			Control					
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Booklet A									
M	9.33	6.41	7.76	7.77	7.08	7.47	8.54	6.76	7.58
SD	4.45	3.63	4.26	3.82	3.32	3.56	4.19	3.47	3.91
n	44	51	95	45	54	99	89	105	194
Booklet B									
M	9.00	8.39	8.71	9.58	7.09	8.50	9.29	7.78	8.61
SD	4.12	3.48	3.83	4.56	3.35	4.25	4.34	3.46	4.03
n	60	53	113	61	47	108	121	100	221
Total									
M	9.14	7.42	8.28	8.81	7.09	7.97	8.97	7.26	8.13
SD	4.24	3.67	4.05	4.34	3.32	3.96	4.29	3.50	4.00
n	104	104	208	106	101	207	210	205	415

NOTE: M represents the mean, SD, the standard deviation, and n the sample size. There were 20 questions with a possible score ranging from 0 to 24.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Table E2. — Between subject effects, including AP students

Source	Type III Sum of Squares	df	Mean Square	F	Significance level
Correct Model	506.298*	7	72.328	4.789	.000
Intercept	26787.078	1	26787.078	1773.498	.000
TREAT	16.488	1	16.488	1.092	.297
GENDER	287.337	1	287.337	19.024	.000
BOOK	77.044	1	77.044	5.101	.024
TREAT / GENDER	.773	1	.773	.051	.821
TREAT / BOOK	.184	1	.184	.012	.912
GENDER / BOOK	1.675	1	1.675	.111	.739
TREAT / GENDER / BOOK	107.550	1	107.550	7.121	.008
Error	6147.366	407	15.104		
Total	34090.111	415			
Correct Total	6653.664	414			

* R Squared = .076 (Adjusted R Square = .060)

SOURCE: U.S. Department of Education, National Center for Education Statistics, Monetary Incentives for Low-Stakes Tests, 2001.

Appendix F

Test Booklet A

Main Study
(Control and Incentive)

UCLA/CRESST STUDY

Name: ______________________________

Gender: Male or Female (circle one)

SECTION 1

GENERAL DIRECTIONS

In this booklet, you will find questions about mathematics. Because there are different booklets, the other students around you may be working on booklets that are different from yours. You will have 25 minutes to answer all of the questions in this section. Please read each question carefully and answer it as well as you can.

You will be told when to begin work on this booklet. If you finish answering the questions before time is called, you may go over your work and review your answers.

If you decide to change an answer to a question, erase or cross out your first choice and then circle the letter next to the answer you consider correct.

For other questions you will be asked to write short answers in the space provided in your booklet. For these questions, you may use words, drawings, numbers, or equations in your answers.

Even if you use a calculator, when the question asks you to show ALL of your work it is very important that you give as complete an answer as you can. Please use the extra space on the page to do your work. You will not be penalized for guessing or providing incorrect responses so you should attempt to answer every question.

STOP

SECTION 2

SAMPLE QUESTIONS

DIRECTIONS: Read each question carefully and answer it as well as you can.

1. Which of the numbers below is the smallest?

   (A) 3
   (B) 1
   (C) 4
   (D) 7

2. Which of the numbers below is an even number?

   (A) 2
   (B) 5
   (C) 3
   (D) 1

STOP

SECTION 3

MATH ASSESSMENT

1. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

   What percentage of all serous bicycle accidents involve fatal head injuries?

   A. 16%

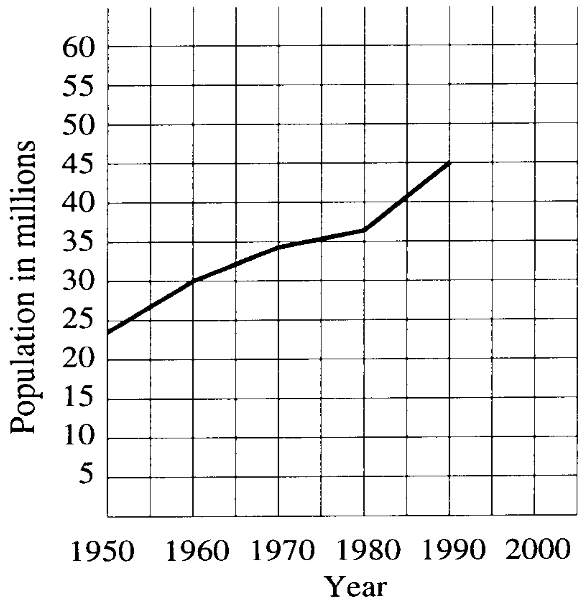
   B. 20%

   C. 55%

   D. 105%

A-3

2. If the population increases by the same rate from the year 1990 to the year 2000 as in the years from 1980 to 1990, approximately what is the expected population by the year 2000?



A. 47 million

B. 50 million

C. 53 million

D. 58 million

A-4

3. A school club is planning a bus trip to the wildlife park. A bus which will hold up to 45 people will cost 600 centros (units of money) and admission tickets cost 30 centros each.

   If the cost of the trip, including bus and admission ticket, is set at 50 centros per person, what is the minimum number of people who must participate to ensure that these costs are covered?

   A. 12

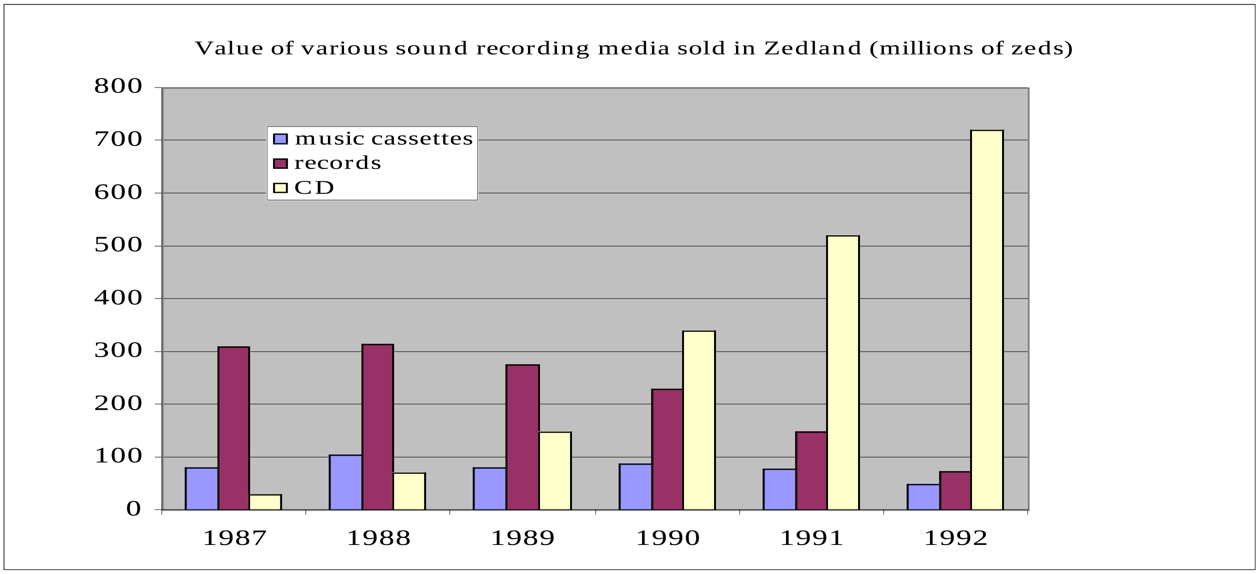
   B. 20

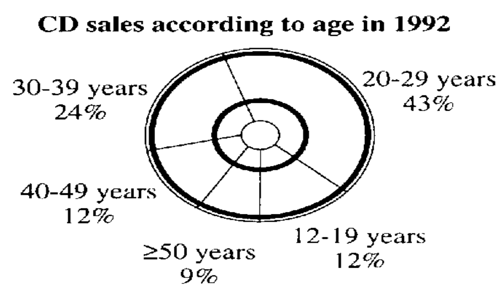
   C. 30

   D. 45

A-5

4. The graphs give information about sales of CDs and other sound recording media in Zedland. Zeds are the monetary units used in Zedland.

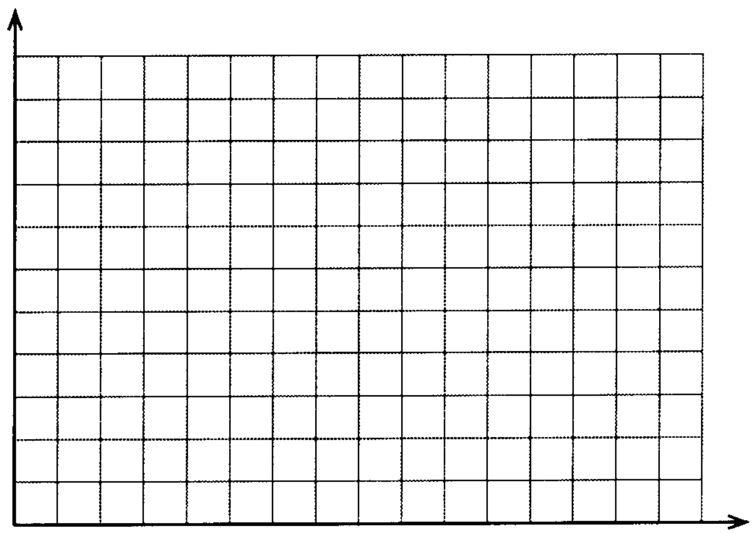




With the aid of both graphs calculate how much money was spent by 12-19 year olds on CDs in 1992. Show your work.

A-8

5. Using the set of axes below, sketch a graph which shows the relationship between the height of a person and his / her age from birth to 30 years. Be sure to label your graph, and include a realistic scale on each axis.



A-10

6. The following two advertisements appeared in a newspaper in a country where the units of currency are *zeds.*

BUILDING A	**BUILDING B**
Office Space Available	Office Space Available
85 - 95 square meters 475 *zeds* per month	35 - 260 square meters 90 *zeds* per square meter per year
100 - 120 square meters 800 *zeds* per month	

If a company is interested in renting an office of 110 square meters in that country for a year, at which office building, A or B, should they rent the office in order to get the lower price? Show your work.

A-12

MS-6to7

7. A 45,000-litre water tank is to be filled at the rate of 220 liters per minute.

   Estimate to the nearest half an hour, how long it will take to fill the tank.

   A. 4 hours

   B. 3 1/2 hours

   C. 3 hours

   D. 2 1/2 hours

D-6

8. If there are 300 calories in 100 grams of a certain food, how many calories are there in a 30-gram portion of that food?

A. 90

B. 100

C. 900

D. 1000

E. 9000

D-7

9. In a vineyard there are 210 rows of vines. Each row is 192 m long and plants are planted 4 m apart. On average, each plant produces 9 kg of grapes each season.

The total amount of grapes produced by the vineyard each season is closest to

A. 10 000 kg

B. 100 000 kg

C. 400 000 kg

D. 1 600 000 kg

D-8

10. A store is having a '20% off' sale. The normal price of a stereo system is $1250.

What is the price of the stereo system after the 20 % discount is applied?

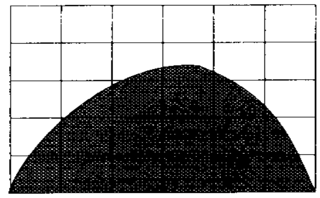
A. $1000

B. $1050

C. $1230

D. $1500

11.



Each of the small squares in the figure is 1 square unit. Which is the best estimate of the area of the shaded region?

A. 10 square units

B. 12 square units

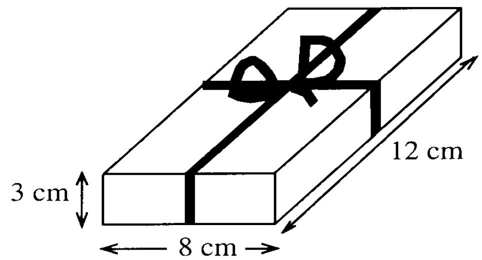
C. 14 square units

D. 16 square units

E. 18 square units

D-10

12. Stu wants to wrap some ribbon around a box as shown and have 25 cm left to tie a bow.



How long a piece of ribbon does he need?

A. 46 cm

B. 52 cm

C. 65 cm

D. 71 cm

E. 77 cm

D-11

13. Brighto soap powder is packed in cube-shaped cartons. A carton measures 10 cm on each side.

    The company decides to increase the length of each edge of the carton by 10 per cent.

    How much does the volume increase?

A. 10 cm^3

B. 21 cm^3

C. 100 cm^3

D. 331 cm^3

D-12

14. In a school election with three candidates, Joe received 120 votes, Mary received 50 votes, and George received 30 votes.

    What percentage of the total number of votes did Joe receive?

    A. 60%

    B. 66 2 / 3%

    C. 80%

    D. 120%

D-13

15. From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, how many defective light bulbs would be expected in the entire batch?

A. 15

B. 60

C. 150

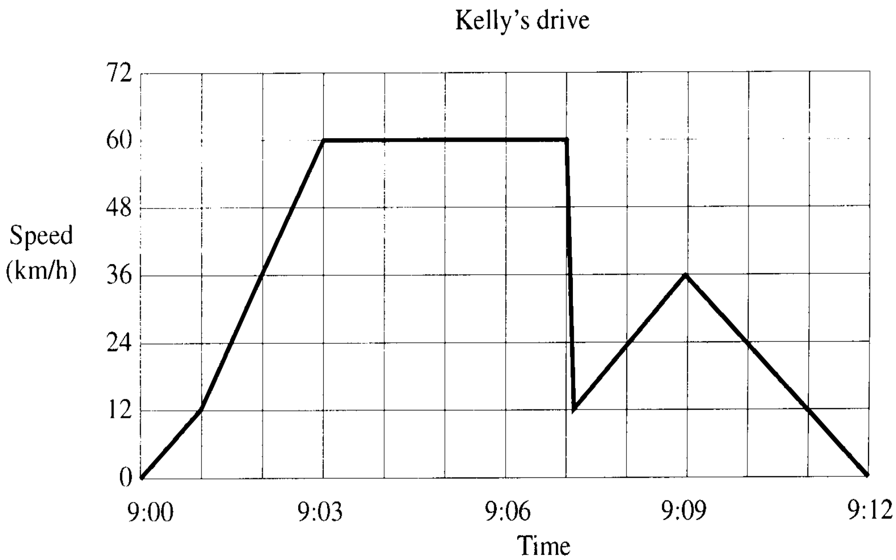
D. 300

E. 600

D-14

16. Kelly went for a drive in her car. During the drive, a cat ran in front of the car. Kelly slammed on the brakes and missed the cat.

    Slightly shaken, Kelly decided to return home by a shorter route. The graph below is a record of the car's speed during the drive.



a) What was the maximum speed of the car during the drive?

____

b) What time was it when Kelly slammed on the brakes to avoid the cat?

____

D-15a

D-15b

17. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	Length of Time
1	2 minutes 41 seconds
2	3 minutes 10 seconds
3	2 minutes 51 seconds
4	3 minutes
5	3 minutes 32 seconds

Estimate to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: ______________________

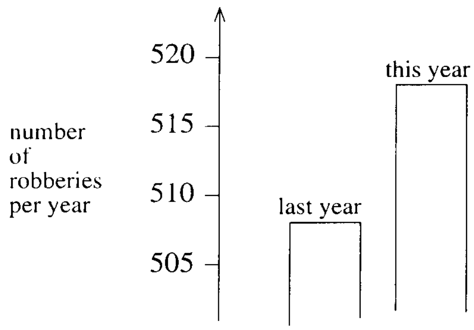
Explain:

D-16a

D-16b

18. A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."



Do you consider the reporter's statement to be a reasonable interpretation of the graph? Briefly explain.

STOP

D-17

SECTION 4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase, which best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. **Remember to give the answer that best describes how you thought or felt during the math test.**

	Not at all	**Somewhat**	**Moderately So**	**Very much so**
1. I concentrated as hard as I could during the math test.	1	2	3	4
2. I expected to do very well on the math test.	1	2	3	4
3. I thought my score would be so bad that everyone, including myself, would be disappointed.	1	2	3	4
4. I worked hard on the math test.	1	2	3	4
5. I had no doubts about my capability to do well on the math test.	1	2	3	4
6. I was afraid I should have studied more for this test.	1	2	3	4
7. I kept working, even on difficult questions.	1	2	3	4
8. I think I will receive a good score on this test.	1	2	3	4
9. I was not happy with my performance.	1	2	3	4

	Not at all	Somewhat	Moderately So	Very much so
10. I put forth my best effort.	1	2	3	4
11. I am sure I did an excellent job on the questions on the math test.	1	2	3	4
12. I felt regretful about my performance on the math test.	1	2	3	4
13. I tried to do my best on the math test.	1	2	3	4
14. I understand math systems quite well.	1	2	3	4
15. I was concerned about what would happen if I did poorly.	1	2	3	4
16. I did not give up, even though the test was hard.	1	2	3	4
17. Even when the questions were difficult, I knew I could succeed.	1	2	3	4
18. I did not feel confident about my performance on the math test.	1	2	3	4

Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year

   (B) Regular classes in mathematics

   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

(A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world…In brief, how well you do will tell us how good you are at this kind of test."

(B) "There are a total of 20 questions. We will give you $10 for each correct answer, just like the easier test you completed. For example, if you get 10 items correct, we will give you $100. If you answer all of the items correctly, you will get $200. We are giving money to you to encourage you to try harder and do well on this test. If you finish early, you can go back to those questions you could not answer."

(C) "Some of the questions will be followed by four or five possible answers indicated with a letter next to it. For these questions, circle the letter next to the answer you consider to be correct, as shown in Example 1."

(D) "I can't remember."

3. Mark the statement that best describes your math grades since ninth grade.

   (A) Mostly A’s

   (B) Mostly B’s

   (C) Mostly C’s

   (D) Mostly D’s

   (E) Mostly below D

4. How often do the people in your home speak a language other than English?

   (A) Never

   (B) Sometimes

   (C) Always

5. What was your total SAT 9 score last year? ___________________________

6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

(A) Yes

(B) No

7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

STOP

UCLA/CRESST STUDY

Name: ______________________________

Gender: Male or Female (circle one)

SECTION 1

GENERAL DIRECTIONS

In this booklet, you will find questions about mathematics. Because there are different booklets, the other students around you may be working on booklets that are different from yours. You will have 25 minutes to answer all of the questions in this section. Read each question carefully and answer it as well as you can.

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1. Which of the numbers below is the smallest?

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1. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

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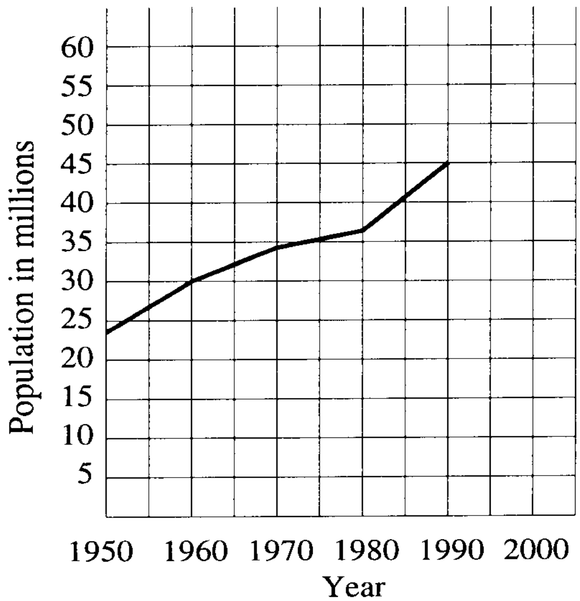

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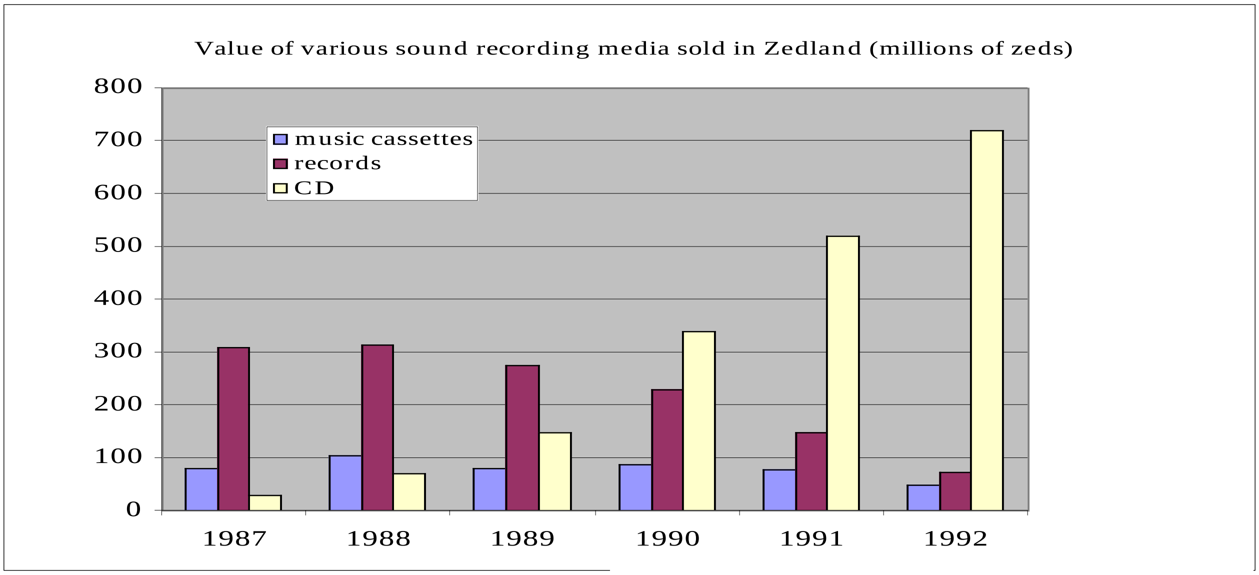

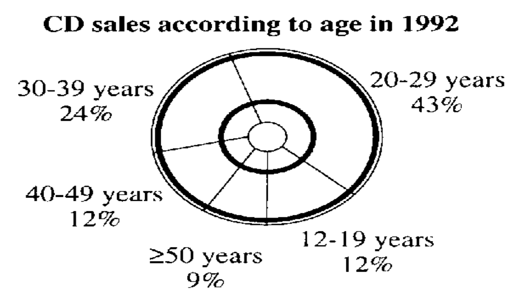

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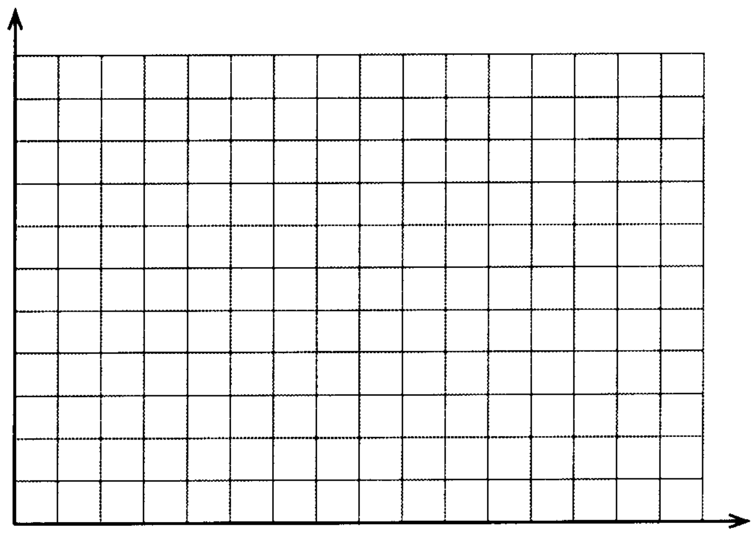

A-10

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D-6

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D-7

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The total amount of grapes produced by the vineyard each season is closest to

A. 10 000 kg

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C. 400 000 kg

D. 1 600 000 kg

D-8

10. A store is having a '20% off' sale. The normal price of a stereo system is $1250.

What is the price of the stereo system after the 20 % discount is applied?

A. $1000

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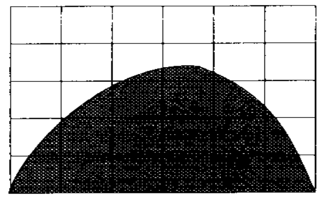
C. $1230

D. $1500

D-9

11.



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D-10

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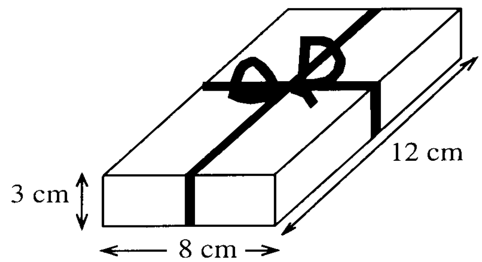

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A. 46 cm

B. 52 cm

C. 65 cm

D. 71 cm

E. 77 cm

D-11

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    The company decides to increase the length of each edge of the carton by 10 percent.

    How much does the volume increase?

    A. 10 cm^3

    B. 21 cm^3

    C. 100 cm^3

    D. 331 cm^3

D-12

14. In a school election with three candidates, Joe received 120 votes, Mary received 50 votes, and George received 30 votes.

What percentage of the total number of votes did Joe receive?

A. 60%

B. 66 2 / 3%

C. 80%

D. 120%

D-13

15. From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, how many defective light bulbs would be expected in the entire batch?

A. 15

B. 60

C. 150

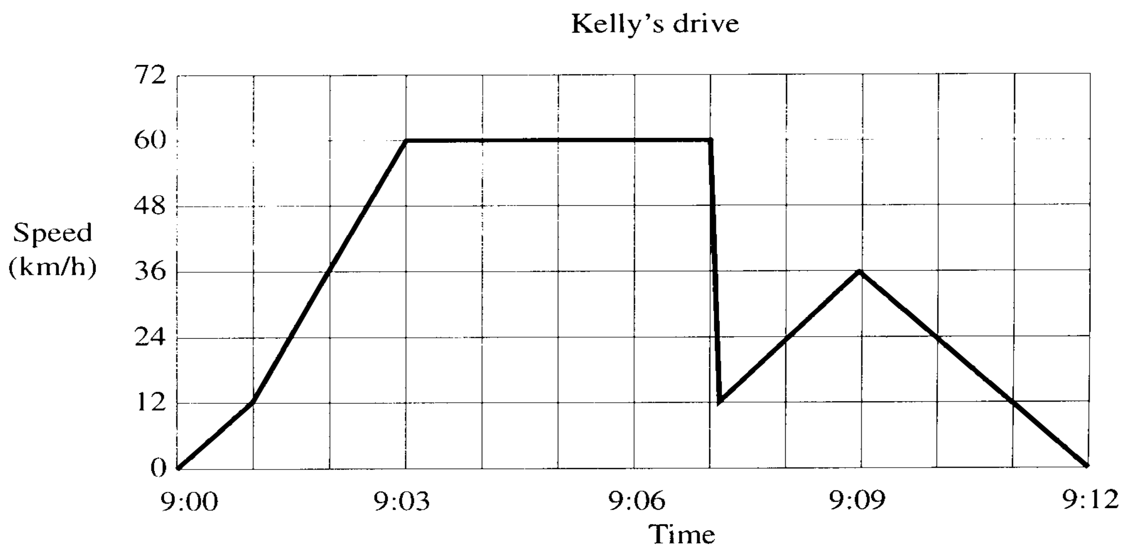
D. 300

E. 600

D-14

16. Kelly went for a drive in her car. During the drive, a cat ran in front of the car. Kelly slammed on the brakes and missed the cat.

    Slightly shaken, Kelly decided to return home by a shorter route. The graph below is a record of the car's speed during the drive.



a) What was the maximum speed of the car during the drive?

____

b) What time was it when Kelly slammed on the brakes to avoid the cat?

____

D-15a

D-15b

17. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	Length of Time
1	2 minutes 41 seconds
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Estimate to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: ______________________

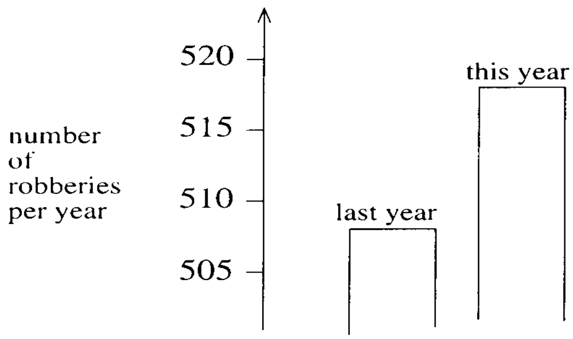
Explain:

D-16a

D-16b

18. A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."



Do you consider the reporter's statement to be a reasonable interpretation of the graph? Briefly explain.

STOP

D-17

SECTION 4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase, which best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. **Remember, give the answer, which seems to describe how you thought or felt during the math test.**

	Not at all	Somewhat	Moderately So	Very much so
1. I concentrated as hard as I could during the math test.	1	2	3	4
2. I expected to do very well on the math test.	1	2	3	4
3. I thought my score would be so bad that everyone, including myself, would be disappointed.	1	2	3	4
4. I worked hard on the math test.	1	2	3	4
5. I had no doubts about my capability to do well on the math test.	1	2	3	4
6. I was afraid I should have studied more for this test.	1	2	3	4
7. I kept working, even on difficult questions.	1	2	3	4
8. I think I will receive a good score on this test.	1	2	3	4
9. I was not happy with my performance.	1	2	3	4

	Not at all	Somewhat	Moderately So	Very much so
10. I put forth my best effort.	1	2	3	4
11. I am sure I did an excellent job on the questions on the math test.	1	2	3	4
12. I felt regretful about my performance on the math test.	1	2	3	4
13. I tried to do my best on the math test.	1	2	3	4
14. I understand math systems quite well.	1	2	3	4
15. I was concerned about what would happen if I did poorly.	1	2	3	4
16. I did not give up, even though the test was hard.	1	2	3	4
17. Even when the questions were difficult, I knew I could succeed.	1	2	3	4
18. I did not feel confident about my performance on the math test.	1	2	3	4

Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year

   (B) Regular classes in mathematics

   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

(A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world…In brief, how well you do will tell us how good you are at this kind of test."

(B) "There are a total of 20 questions. We will give you $10 for each correct answer, just like the easier test you completed. For example, if you get 10 items correct, we will give you $100. If you answer all of the items correctly, you will get $200. We are giving money to you to encourage you to try harder and do well on this test. If you finish early, you can go back to those questions you could not answer."

(C) "Some of the questions will be followed by four or five possible answers indicated with a letter next to it. For these questions, circle the letter next to the answer you consider to be correct, as shown in Example 1."

(D) "I can't remember."

3. Mark the statement that best describes your math grades since ninth grade.

(A) Mostly A's

(B) Mostly B's

(C) Mostly C's

(D) Mostly D's

(E) Mostly below D

4. How often do the people in your home speak a language other than English?

(A) Never

(B) Sometimes

(C) Always

5. What was your total SAT 9 score last year? _________________________

6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

(A) Yes

(B) No

7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

STOP

NAME: ___________________________________

I received $ _________ for participating in the Incentive Group of the UCLA / CRESST Low-Stakes Motivation Study.

SIGNATURE: ________________________________

Appendix G

Test Booklet B

Main Study
(Control and Incentive)

—AND—

Test Booklet B

Advanced Placement Study
(Control and Incentive)

Test Booklet A was not used for the Advanced Placement Group

Test Booklet B

Main Study
(Control and Incentive)

UCLA/CRESST STUDY

Name: ______________________________

Gender: Male or Female (circle one)

SECTION 1

GENERAL DIRECTIONS

In this booklet, you will find questions about mathematics. Because there are different booklets, the other students around you may be working on booklets that are different from yours. You will have 25 minutes to answer all of the questions in this section. Please read each question carefully and answer it as well as you can.

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SECTION 2

SAMPLE QUESTIONS

DIRECTIONS: Read each question carefully and answer it as well as you can.

1. Which of the numbers below is the smallest?

   (A) 3
   (B) 1
   (C) 4
   (D) 7

2. Which of the numbers below is an even number?

   (A) 2
   (B) 5
   (C) 3
   (D) 1

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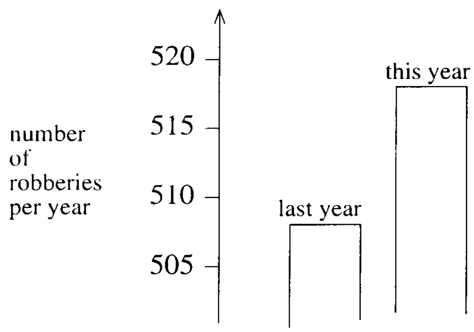
SECTION 3

MATH ASSESSMENT

1. A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."



Do you consider the reporter's statement to be a reasonable interpretation of the graph? Briefly explain.

D-17

2. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	Length of Time
1	2 minutes 41 seconds
2	3 minutes 10 seconds
3	2 minutes 51 seconds
4	3 minutes
5	3 minutes 32 seconds

Estimate to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: ______________________

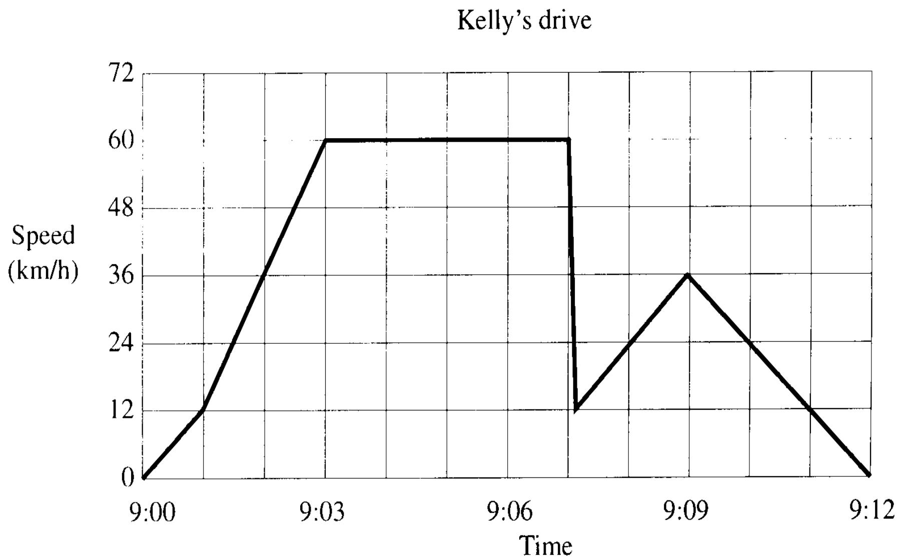
Explain:

D-16a

D-16b

3. Kelly went for a drive in her car. During the drive, a cat ran in front of the car. Kelly slammed on the brakes and missed the cat.

   Slightly shaken, Kelly decided to return home by a shorter route. The graph below is a record of the car's speed during the drive.



a) What was the maximum speed of the car during the drive?

____

b) What time was it when Kelly slammed on the brakes to avoid the cat?

____

D-15a

D-15b

4. From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, how many defective light bulbs would be expected in the entire batch?

A. 15

B. 60

C. 150

D. 300

E. 600

5. In a school election with three candidates, Joe received 120 votes, Mary received 50 votes, and George received 30 votes.

   What percentage of the total number of votes did Joe receive?

   A. 60%

   B. 66 2 / 3%

   C. 80%

   D. 120%

D-13

6. Brighto soap powder is packed in cube-shaped cartons. A carton measures 10 cm on each side.

   The company decides to increase the length of each edge of the carton by 10 percent.

   How much does the volume increase?

   A. $10\ cm^3$

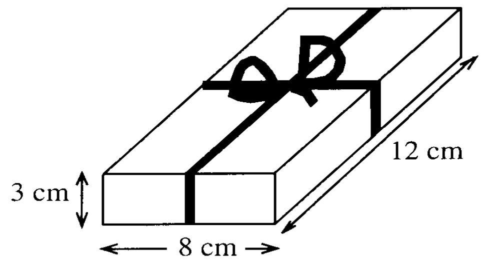
   B. $21\ cm^3$

   C. $100\ cm^3$

   D. $331\ cm^3$

D-12

7. Stu wants to wrap some ribbon around a box as shown and have 25 cm left to tie a bow.



How long a piece of ribbon does he need?

A. 46 cm

B. 52 cm

C. 65 cm

D. 71 cm

E. 77 cm

D-11

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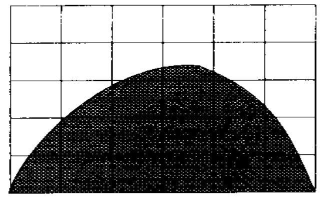

Each of the small squares in the figure is 1 square unit. Which is the best estimate of the area of the shaded region?

A. 10 square units

B. 12 square units

C. 14 square units

D. 16 square units

E. 18 square units

D-10

9. A store is having a '20% off' sale. The normal price of a stereo system is $1250.

   What is the price of the stereo system after the 20 % discount is applied?

   A. $1000

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   C. $1230

   D. $1500

D-9

10. In a vineyard there are 210 rows of vines. Each row is 192 m long and plants are planted 4 m apart. On average, each plant produces 9 kg of grapes each season.

The total amount of grapes produced by the vineyard each season is closest to

A. 10 000 kg

B. 100 000 kg

C. 400 000 kg

D. 1 600 000 kg

D-8

11. If there are 300 calories in 100 grams of a certain food, how many calories are there in a 30-gram portion of that food?

A. 90

B. 100

C. 900

D. 1000

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D-7

12. A 45,000-litre water tank is to be filled at the rate of 220 liters per minute. Estimate to the nearest half an hour, how long it will take to fill the tank.

A. 4 hours

B. 3 1/2 hours

C. 3 hours

D. 2 1/2 hours

D-6

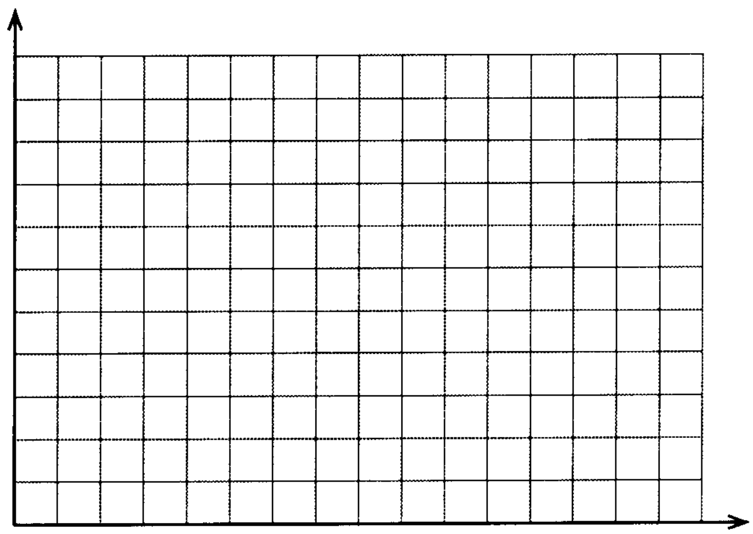
13. The following two advertisements appeared in a newspaper in a country where the units of currency are *zeds*.

BUILDING A	**BUILDING B**
Office Space Available	Office Space Available
85 - 95 square meters 475 *zeds* per month	35 - 260 square meters 90 *zeds* per square meter per year
100 - 120 square meters 800 *zeds* per month	

If a company is interested in renting an office of 110 square meters in that country for a year, at which office building, A or B, should they rent the office in order to get the lower price? Show your work.

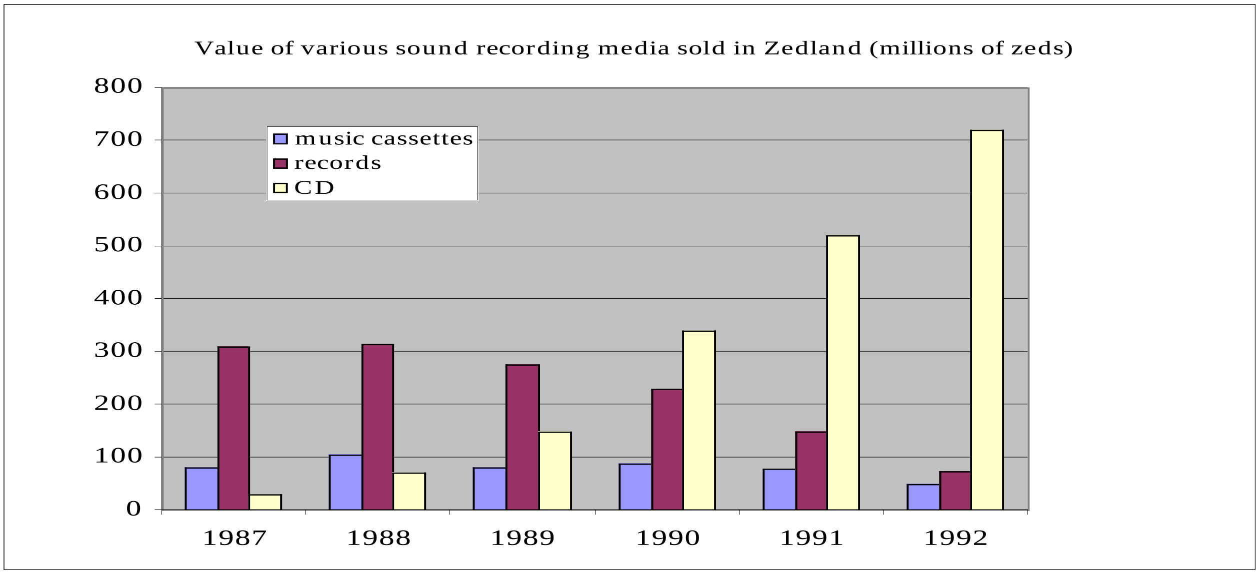
A-12

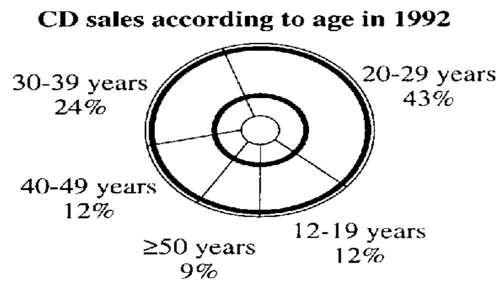
14. Using the set of axes below, sketch a graph which shows the relationship between the height of a person and his / her age from birth to 30 years. Be sure to label your graph, and include a realistic scale on each axis.



A-10

15. The graphs give information about sales of CDs and other sound recording media in Zedland. Zeds are the monetary units used in Zedland.





With the aid of both graphs calculate how much money was spent by 12-19 year olds on CDs in 1992. Show your work.

A-8

16. A school club is planning a bus trip to the wildlife park. A bus which will hold up to 45 people will cost 600 centros (units of money) and admission tickets cost 30 centros each.

    If the cost of the trip, including bus and admission ticket, is set at 50 centros per person, what is the minimum number of people who must participate to ensure that these costs are covered?

    A. 12

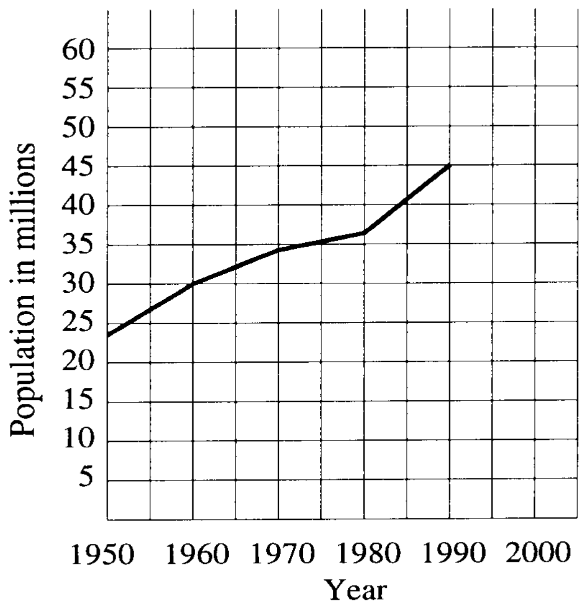
    B. 20

    C. 30

    D. 45

A-5

17. If the population increases by the same rate from the year 1990 to the year 2000 as in the years from 1980 to 1990, approximately what is the expected population by the year 2000?



A. 47 million

B. 50 million

C. 53 million

D. 58 million

A-4

18. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

    What percentage of all serious bicycle accidents involve fatal head injuries?

    A. 16%

    B. 20%

    C. 55%

    D. 105%

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D-17

SECTION 4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase, which best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. **Remember to give the answer that best describes how you thought or felt during the math test.**

	Not at all	Somewhat	Moderately So	Very much so
1. I concentrated as hard as I could during the math test.	1	2	3	4
2. I expected to do very well on the math test.	1	2	3	4
3. I thought my score would be so bad that everyone, including myself, would be disappointed.	1	2	3	4
4. I worked hard on the math test.	1	2	3	4
5. I had no doubts about my capability to do well on the math test.	1	2	3	4
6. I was afraid I should have studied more for this test.	1	2	3	4
7. I kept working, even on difficult questions.	1	2	3	4
8. I think I will receive a good score on this test.	1	2	3	4
9. I was not happy with my performance.	1	2	3	4

	Not at all	Somewhat	Moderately So	Very much so
10. I put forth my best effort.	1	2	3	4
11. I am sure I did an excellent job on the questions on the math test.	1	2	3	4
12. I felt regretful about my performance on the math test.	1	2	3	4
13. I tried to do my best on the math test.	1	2	3	4
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Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year

   (B) Regular classes in mathematics

   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

(A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world…In brief, how well you do will tell us how good you are at this kind of test."

(B) "There are a total of 20 questions. We will give you $10 for each correct answer, just like the easier test you completed. For example, if you get 10 items correct, we will give you $100. If you answer all of the items correctly, you will get $200. We are giving money to you to encourage you to try harder and do well on this test. If you finish early, you can go back to those questions you could not answer."

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4. How often do the people in your home speak a language other than English?

(A) Never

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5. Mark the statement that best describes your math grades since ninth grade.

(A) Mostly A's

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6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes

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7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

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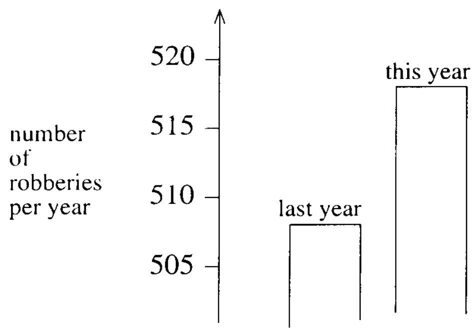

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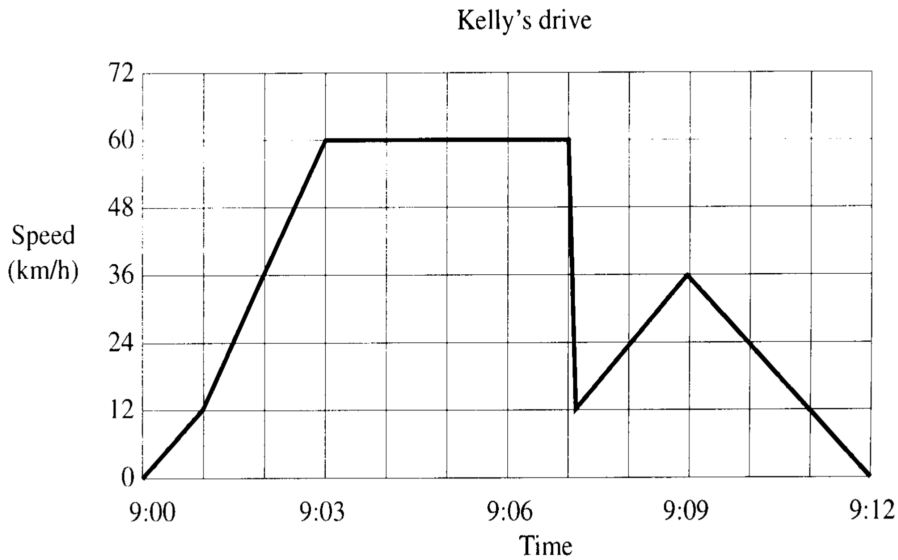

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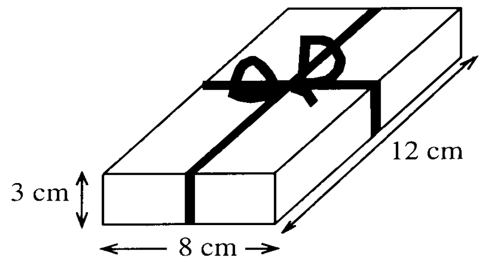

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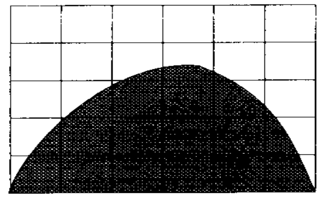

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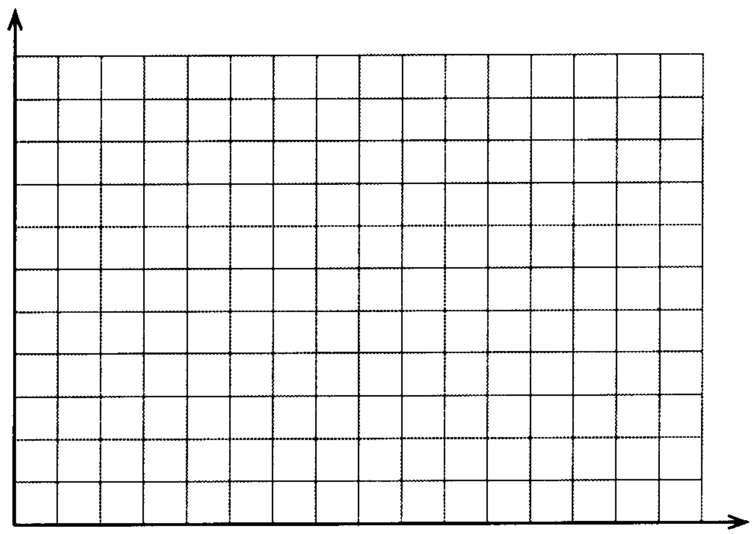

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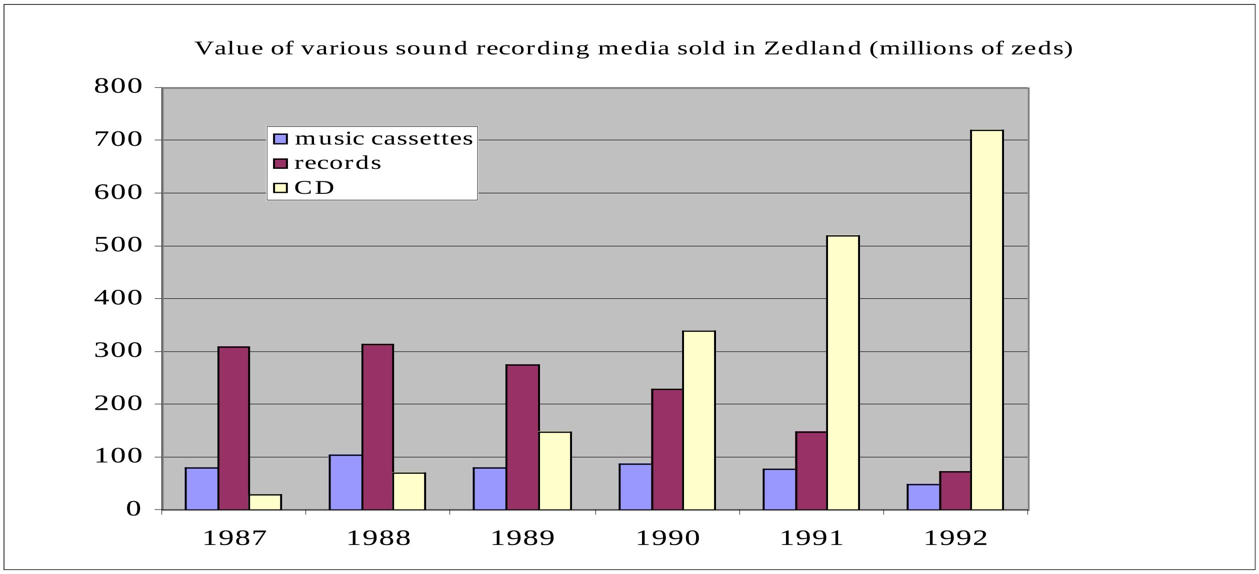

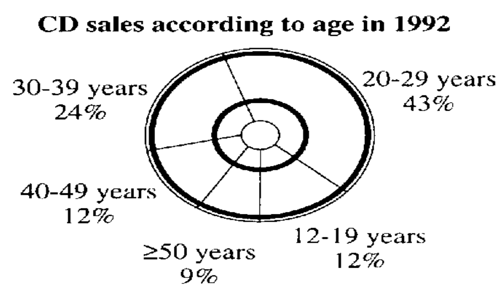

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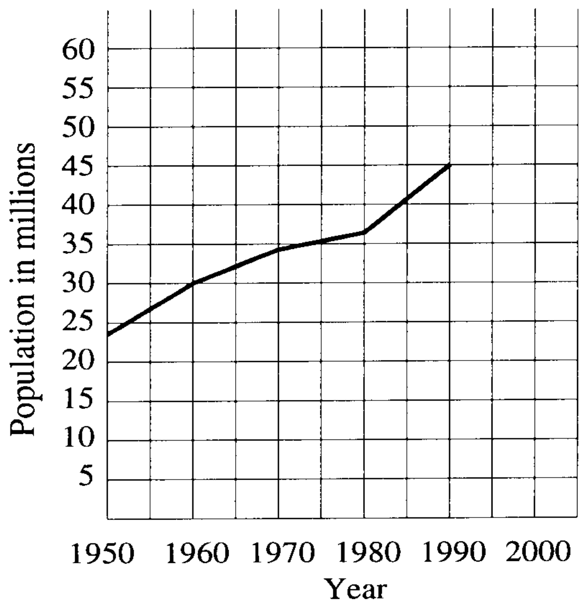

A. 47 million

B. 50 million

C. 53 million

D. 58 million

A-4

18. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

What percentage of all serious bicycle accidents involve fatal head injuries?

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D-17

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Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

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   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. As we mentioned in the directions, we used many booklets each with different questions. We are interested in how well you remember the directions that were given.

   Your directions were (choose as many as apply):

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(C) "Some of the questions will be followed by four or five possible answers indicated with a letter next to it. For these questions, circle the letter next to the answer you consider to be correct, as shown in Example 1."

(D) "I can't remember."

3. What was your total SAT 9 score last year? ________________________

4. How often do the people in your home speak a language other than English?

(A) Never

(B) Sometimes

(C) Always

5. Mark the statement that best describes your math grades since ninth grade.

(A) Mostly A’s

(B) Mostly B’s

(C) Mostly C’s

(D) Mostly D’s

(E) Mostly below D

6. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes

   (B) No

7. If there are some questions whose concepts you feel have not been taught to you, please list them below:

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NAME: ___________________________________

I received $ _________ for participating in the Incentive Group of the UCLA / CRESST Low-Stakes Motivation Study.

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For other questions you will be asked to write short answers in the space provided in your booklet. For these questions, you may use words, drawings, numbers, or equations in your answers.

Even if you use a calculator, when the question asks you to show ALL of your work it is very important that you give as complete an answer as you can. Please use the extra space on the page to do your work. You will not be penalized for guessing or providing incorrect responses so you should attempt to answer every question.

STOP

SECTION 2

SAMPLE QUESTIONS

DIRECTIONS: Read each question carefully and answer it as well as you can.

1. Which of the numbers below is the smallest?

   (A) 3

   (B) 1

   (C) 4

   (D) 7

2. Which of the numbers below is an even number?

   (A) 2

   (B) 5

   (C) 3

   (D) 1

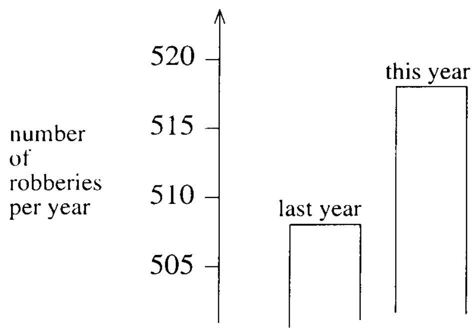
STOP

SECTION 3

MATH ASSESSMENT

1. A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."



Do you consider the reporter's statement to be a reasonable interpretation of the graph? Briefly explain.

D-17

2. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	**Length of Time**
1	2 minutes 41 seconds
2	3 minutes 10 seconds
3	2 minutes 51 seconds
4	3 minutes
5	3 minutes 32 seconds

Estimate to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: ______________________

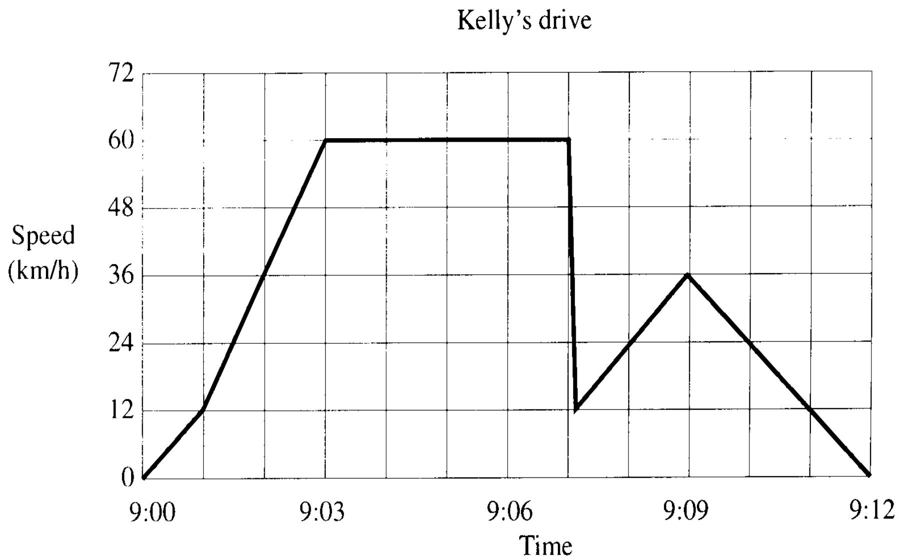
Explain:

D-16a

D-16b

3. Kelly went for a drive in her car. During the drive, a cat ran in front of the car. Kelly slammed on the brakes and missed the cat.

Slightly shaken, Kelly decided to return home by a shorter route. The graph below is a record of the car's speed during the drive.



a) What was the maximum speed of the car during the drive?

____

b) What time was it when Kelly slammed on the brakes to avoid the cat?

____

D-15a

D-15b

AP-17to23

4. From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, how many defective light bulbs would be expected in the entire batch?

   A. 15

   B. 60

   C. 150

   D. 300

   E. 600

D-14

5. In a school election with three candidates, Joe received 120 votes, Mary received 50 votes, and George received 30 votes.

   What percentage of the total number of votes did Joe receive?

A. 60%

B. 66 2 / 3%

C. 80%

D. 120%

D-13

6. Brighto soap powder is packed in cube-shaped cartons. A carton measures 10 cm on each side.

   The company decides to increase the length of each edge of the carton by 10 percent.

   How much does the volume increase?

   A. $10\ \text{cm}^3$

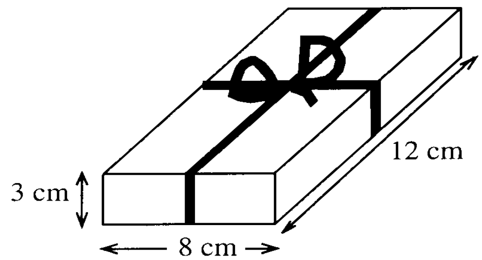
   B. $21\ \text{cm}^3$

   C. $100\ \text{cm}^3$

   D. $331\ \text{cm}^3$

D-12

7. Stu wants to wrap some ribbon around a box as shown and have 25 cm left to tie a bow.



How long a piece of ribbon does he need?

A. 46 cm

B. 52 cm

C. 65 cm

D. 71 cm

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D-11

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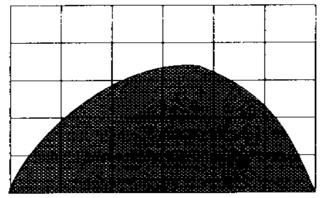


Each of the small squares in the figure is 1 square unit. Which is the best estimate of the area of the shaded region?

A. 10 square units

B. 12 square units

C. 14 square units

D. 16 square units

E. 18 square units

D-10

9. A store is having a '20% off' sale. The normal price of a stereo system is $1250.

   What is the price of the stereo system after the 20 % discount is applied?

A. $1000

B. $1050

C. $1230

D. $1500

D-9

10. In a vineyard there are 210 rows of vines. Each row is 192 m long and plants are planted 4 m apart. On average, each plant produces 9 kg of grapes each season.

The total amount of grapes produced by the vineyard each season is closest to

A. 10 000 kg

B. 100 000 kg

C. 400 000 kg

D. 1 600 000 kg

D-8

11. If there are 300 calories in 100 grams of a certain food, how many calories are there in a 30-gram portion of that food?

A. 90

B. 100

C. 900

D. 1000

E. 9000

D-7

12. A 45,000-litre water tank is to be filled at the rate of 220 liters per minute. Estimate to the nearest half an hour, how long it will take to fill the tank.

A. 4 hours

B. 3 1/2 hours

C. 3 hours

D. 2 1/2 hours

D-6

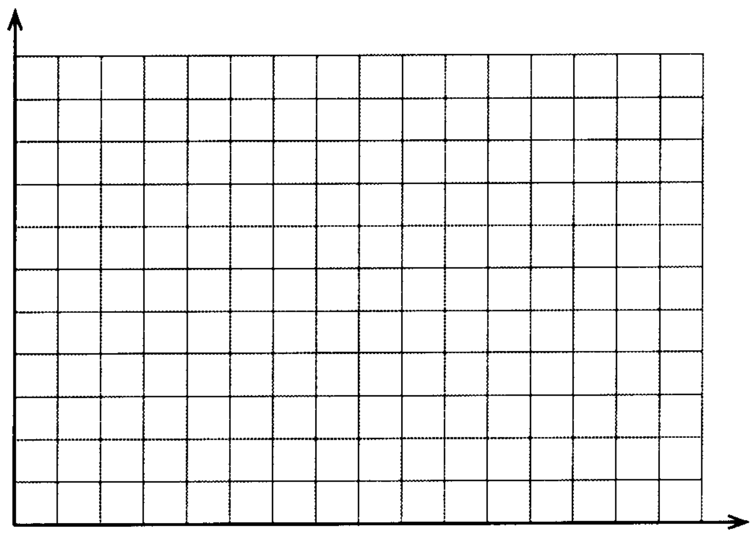
13. The following two advertisements appeared in a newspaper in a country where the units of currency are *zeds.*

BUILDING A	**BUILDING B**
Office Space Available	Office Space Available
85 - 95 square meters 475 *zeds* per month	35 - 260 square meters 90 *zeds* per square meter per year
100 - 120 square meters 800 *zeds* per month	

If a company is interested in renting an office of 110 square meters in that country for a year, at which office building, A or B, should they rent the office in order to get the lower price? Show your work.

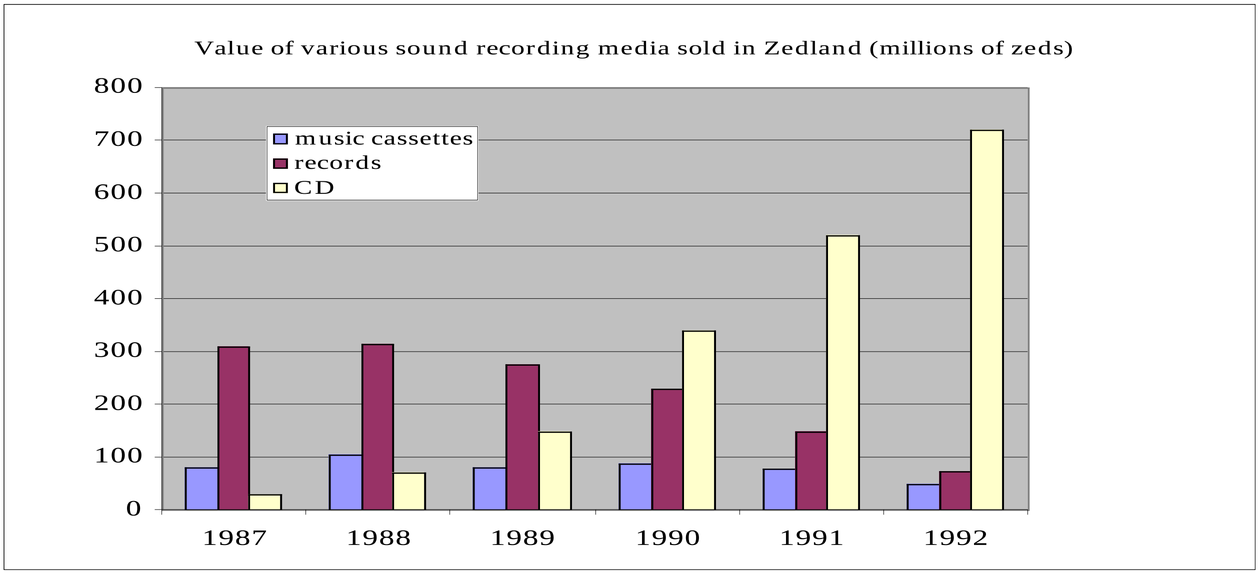
A-12

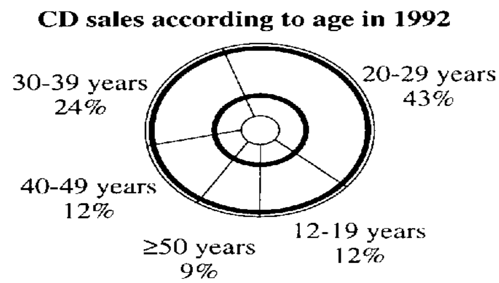
14. Using the set of axes below, sketch a graph which shows the relationship between the height of a person and his / her age from birth to 30 years. Be sure to label your graph, and include a realistic scale on each axis.



A-10

15. The graphs give information about sales of CDs and other sound recording media in Zedland. Zeds are the monetary units used in Zedland.





With the aid of both graphs calculate how much money was spent by 12-19 year olds on CDs in 1992. Show your work.

A-8

AP-17to23

16. A school club is planning a bus trip to the wildlife park. A bus which will hold up to 45 people will cost 600 centros (units of money) and admission tickets cost 30 centros each.

    If the cost of the trip, including bus and admission ticket, is set at 50 centros per person, what is the minimum number of people who must participate to ensure that these costs are covered?

    A. 12

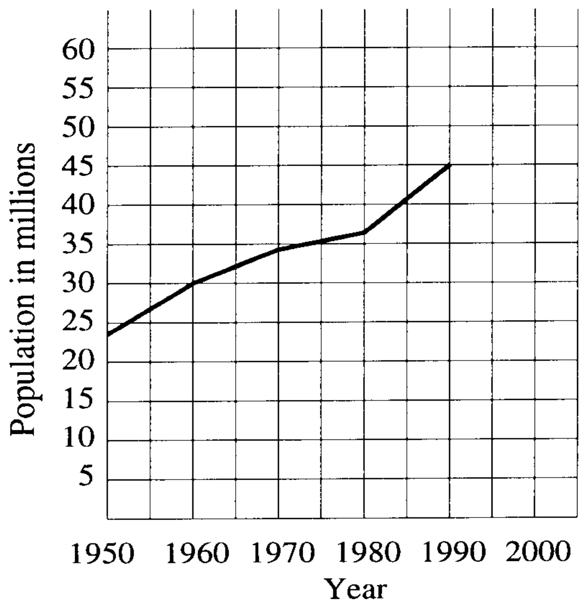
    B. 20

    C. 30

    D. 45

A-5

17. If the population increases by the same rate from the year 1990 to the year 2000 as in the years from 1980 to 1990, approximately what is the expected population by the year 2000?



A. 47 million

B. 50 million

C. 53 million

D. 58 million

A-4

18. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

What percentage of all serious bicycle accidents involve fatal head injuries?

A. 16%

B. 20%

C. 55%

D. 105%

STOP

D-17

SECTION 4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase, which best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. **Remember to give the answer that best describes how you thought or felt during the math test.**

	Not at all	**Somewhat**	**Moderately So**	**Very much so**
1. I concentrated as hard as I could during the math test.	1	2	3	4
2. I expected to do very well on the math test.	1	2	3	4
3. I thought my score would be so bad that everyone, including myself, would be disappointed.	1	2	3	4
4. I worked hard on the math test.	1	2	3	4
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6. I was afraid I should have studied more for this test.	1	2	3	4
7. I kept working, even on difficult questions.	1	2	3	4
8. I think I will receive a good score on this test.	1	2	3	4
9. I was not happy with my performance.	1	2	3	4

	Not at all	Somewhat	Moderately So	Very much so
10. I put forth my best effort.	1	2	3	4
11. I am sure I did an excellent job on the questions on the math test.	1	2	3	4
12. I felt regretful about my performance on the math test.	1	2	3	4
13. I tried to do my best on the math test.	1	2	3	4
14. I understand math systems quite well.	1	2	3	4
15. I was concerned about what would happen if I did poorly.	1	2	3	4
16. I did not give up, even though the test was hard.	1	2	3	4
17. Even when the questions were difficult, I knew I could succeed.	1	2	3	4
18. I did not feel confident about my performance on the math test.	1	2	3	4

Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year

   (B) Regular classes in mathematics

   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. We are interested in how well you remember the directions that were given. Your directions were (choose as many as apply):

   (A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world."

   (B) "There are a total of 20 questions…we will give you $10 for each correct answer, just like the easier test you completed."

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3. What was your total SAT 9 score last year? ________________________

4. How often do the people in your home speak a language other than English?

(A) Never

(B) Sometimes

(C) Always

5. Please answer the following family and generation questions:

	born in the U.S.			raised in the U.S.		
a. I was	Yes	No	Don't Know	Yes	No	Don't Know
b. My mother was	Yes	No	Don't Know	Yes	No	Don't Know
c. Her parents (my grandparents) were	Yes	No	Don't Know	Yes	No	Don't Know
d. My father was	Yes	No	Don't Know	Yes	No	Don't Know
e. His parents (my grandparents) were	Yes	No	Don't Know	Yes	No	Don't Know

6. Mark the statement that best describes your math grades since ninth grade.

(A) Mostly A's

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(C) Mostly C's

(D) Mostly D's

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7. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes

   (B) No

8. If there are some questions whose concepts you feel have not been taught to you, please list them below:

STOP

UCLA/CRESST STUDY

Name: ______________________________

Gender: Male or Female (circle one)

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SAMPLE QUESTIONS

DIRECTIONS: Read each question carefully and answer it as well as you can.

1. Which of the numbers below is the smallest?

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   (D) 7

2. Which of the numbers below is an even number?

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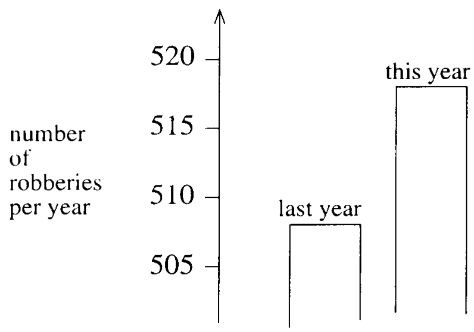
MATH ASSESSMENT

1. A TV reporter showed this graph and said:

"There's been a huge increase in the number of robberies this year."



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D-17

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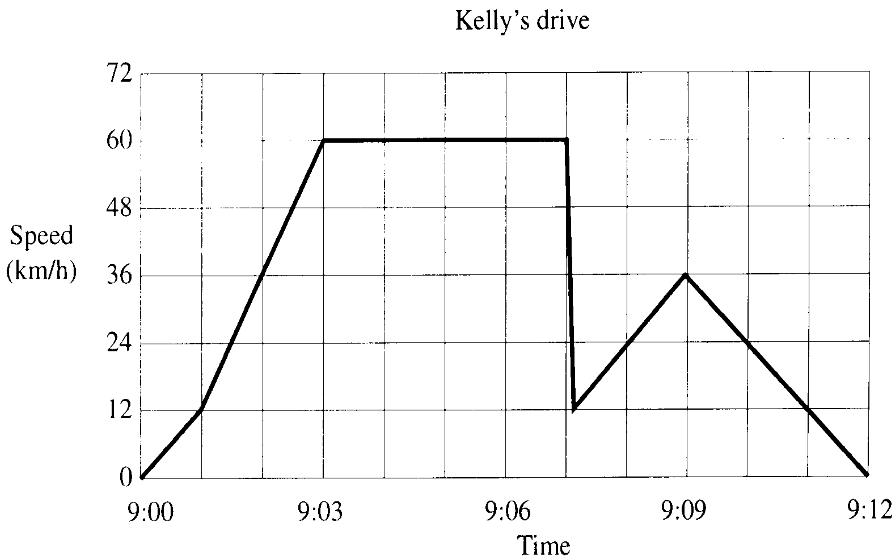

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D-15a

D-15b

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D-12

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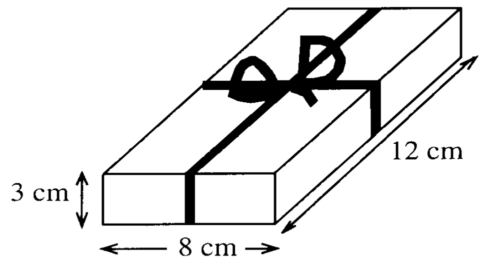

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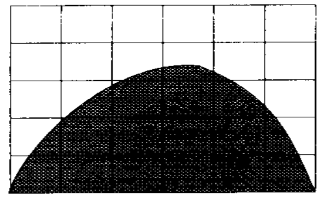

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D-8

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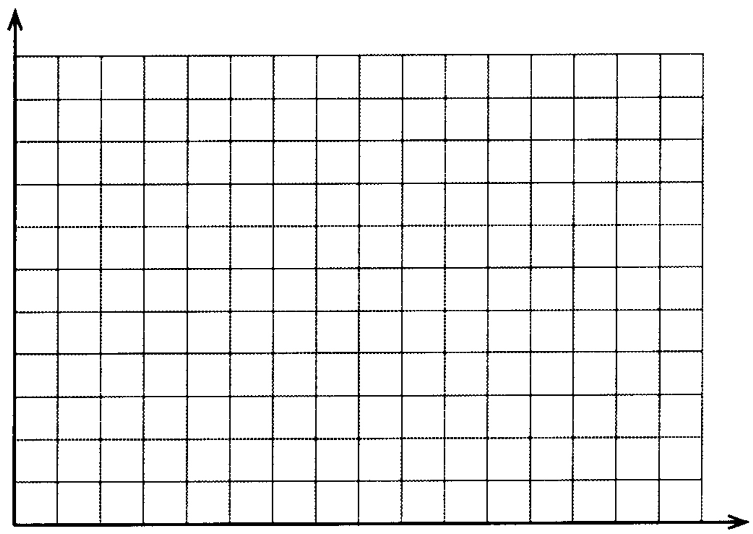

A-10

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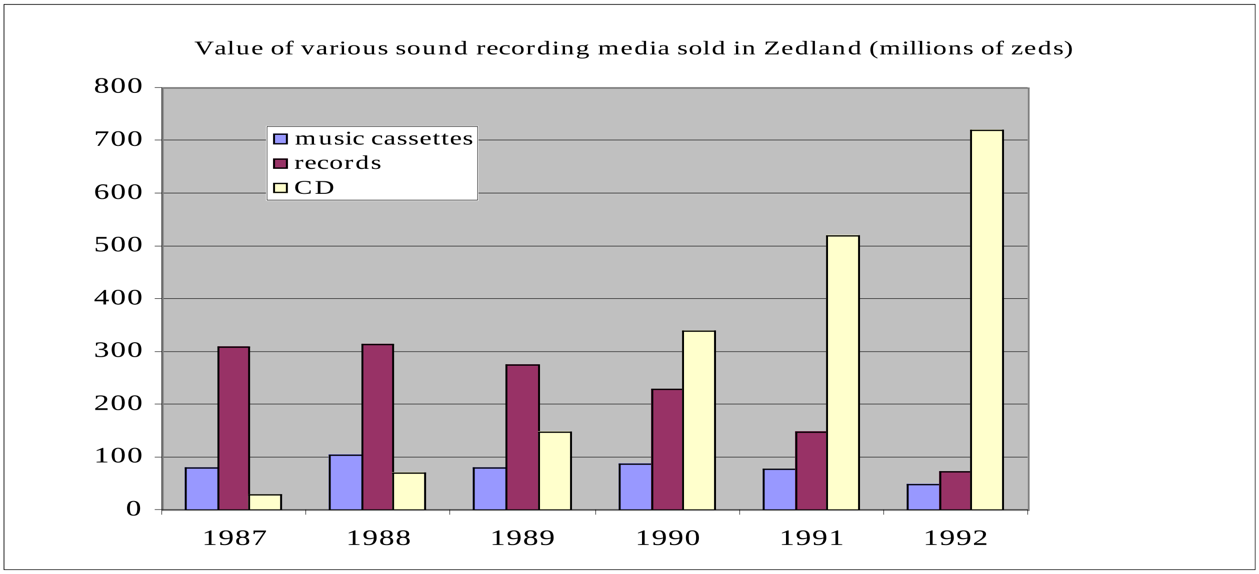

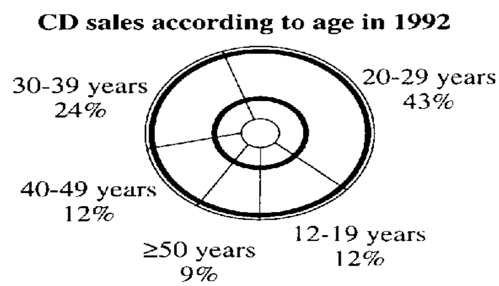

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AP-17to23

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A. 12

B. 20

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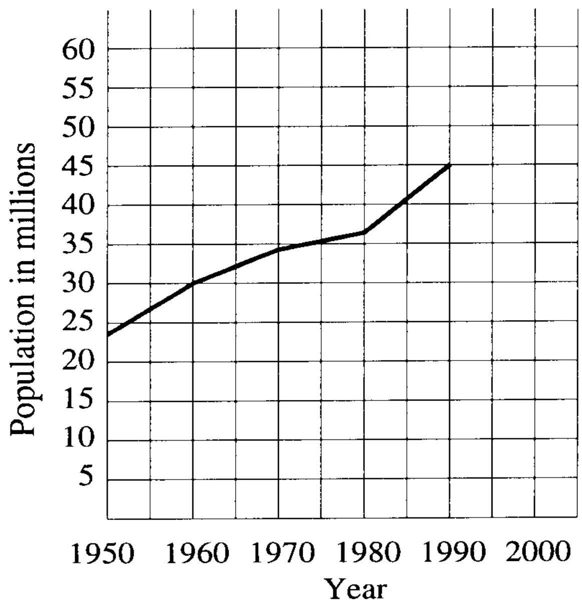

A. 47 million

B. 50 million

C. 53 million

D. 58 million

A-4

18. Experts say that 25% of all serious bicycle accidents involve injuries and that, of all head injuries, 80% are fatal.

What percentage of all serious bicycle accidents involve fatal head injuries?

A. 16%

B. 20%

C. 55%

D. 105%

STOP

D-17

SECTION 4

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and indicate how you thought or felt during the math test. Find the word or phrase, which best describes how you thought or felt and circle the number for your answer. There are no right or wrong answers. Do not spend too much time on any one statement. **Remember to give the answer that best describes how you thought or felt during the math test.**

	Not at all	Somewhat	Moderately So	Very much so
1. I concentrated as hard as I could during the math test.	1	2	3	4
2. I expected to do very well on the math test.	1	2	3	4
3. I thought my score would be so bad that everyone, including myself, would be disappointed.	1	2	3	4
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9. I was not happy with my performance.	1	2	3	4

	Not at all	Somewhat	Moderately So	Very much so
10. I put forth my best effort.	1	2	3	4
11. I am sure I did an excellent job on the questions on the math test.	1	2	3	4
12. I felt regretful about my performance on the math test.	1	2	3	4
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14. I understand math systems quite well.	1	2	3	4
15. I was concerned about what would happen if I did poorly.	1	2	3	4
16. I did not give up, even though the test was hard.	1	2	3	4
17. Even when the questions were difficult, I knew I could succeed.	1	2	3	4
18. I did not feel confident about my performance on the math test.	1	2	3	4

Final Questions:

1. What kind of classes are you taking this year? Mark all that apply.

   (A) I am not taking mathematics this year

   (B) Regular classes in mathematics

   (C) AP classes in mathematics

   (D) Regular classes in physics

   (E) AP classes in physics

2. We are interested in how well you remember the directions that were given. Your directions were (choose as many as apply):

   (A) "These new test items will allow us to compare your mathematical ability with that of other students in your classroom, in your school, in your school district, and around the world.”

   (B) "There are a total of 20 questions…we will give you $10 for each correct answer, just like the easier test you completed.”

   (C) " There are a total of 20 questions…if you finish early, you can go back to those questions you could not answer in this section only."

   (D) "I can't remember."

3. What was your total SAT 9 score last year? __________________________

4. How often do the people in your home speak a language other than English?

   (A) Never

   (B) Sometimes

   (C) Always

5. Please answer the following family and generation questions:

	born in the U.S.			raised in the U.S.		
a. I was	Yes	No	Don't Know	Yes	No	Don't Know
b. My mother was	Yes	No	Don't Know	Yes	No	Don't Know
c. Her parents (my grandparents) were	Yes	No	Don't Know	Yes	No	Don't Know
d. My father was	Yes	No	Don't Know	Yes	No	Don't Know
e. His parents (my grandparents) were	Yes	No	Don't Know	Yes	No	Don't Know

6. Mark the statement that best describes your math grades since ninth grade.

   (A) Mostly A's

   (B) Mostly B's

   (C) Mostly C's

   (D) Mostly D's

   (E) Mostly below D

7. Have all of the concepts presented in these math questions been taught to you in your previous or current math classes?

   (A) Yes

   (B) No

8. If there are some questions whose concepts you feel have not been taught to you, please list them below:

STOP

NAME: ________________________________

I received $ _________ for participating in the Incentive Group of the UCLA / CRESST Low-Stakes Motivation Study.

SIGNATURE: ________________________________

Appendix H

Administration Script

ADMINISTRATION SCRIPT

INCENTIVE GROUP

SESSION ADMINISTRATION SCRIPT

INSTRUCTIONS TO THE ADMINISTRATOR ARE PRINTED IN BOLD CAPITAL LETTERS AND SHOULD NOT BE READ TO THE STUDENTS. ALL WORDS IN PLAIN PRINT ARE TO BE READ TO THE STUDENTS.

INTRODUCTION [TIME: 5 MINUTES]

Please check the two lists for your name, take all of your belongings, and report to your assigned room. Since we only have this class period for the assessment, please proceed as quickly as possible.

If your name does not appear on either list, please wait patiently in your seat and we will assign you to a group.

SECTION 1 [TIME: 15 MINUTES]

ONCE THE GROUPS HAVE BEEN SUCCESSFULLY SEPARATED AND ARE ENTERING THE DESIGNATED ROOMS:

Hello. My name is ____________ and this is my colleague ____________. We are part of a research center at UCLA. Today you will be participating in a study on how motivation affects testing. To make sure that all students receive the same instructions, I will be reading them to you from a script.

The purpose of this study is to provide information on the knowledge and attitudes of young people. As part of the study, you will answer questions about yourself and about mathematics. It will take 50 minutes. You will not be allowed to ask questions during the assessment. Please do the best you can.

You will not need to use any of your personal items—except a calculator if you like—but will use the test booklet and pencil **that is on your desk/that we are distributing**. We will be by to distribute a calculator to you if you need one.

[AS NEEDED: **PLEASE DO NOT OPEN THE TEST BOOKLET.]**

PLEASE TURN YOU TEST BOOKLET OVER TO THE FRONT COVER PAGE. PRINT YOUR NAME AND CIRCLE YOUR GENDER IN THE SPACES PROVIDED ON THE COVER PAGE.

Open the booklet to the first page titled SECTION 1. Read the directions to yourself as I read them aloud:

> In this booklet, you will find questions about mathematics. Because there are many different booklets, the other students around you may be working on booklets that are different from yours. You will have 25 minutes to answer all of the questions in this section. Read each question carefully and answer it as well as you can.
>
> You will be told when to begin work on this booklet. If you finish answering the questions before time is called, you may go over your work and review your answers.

If you decide to change an answer to a question, cross out or completely erase your first choice and then circle the letter next to the answer you consider correct.

For other questions, you will be asked to write short answers in the space provided in your booklet. For these questions, you may use words, drawings, numbers, or equations in your answers.

Even if you use a calculator, when the question asks you to show ALL of your work it is very important that you give as complete an answer as you can. Please use the extra space on the page to do your work. You will not be penalized for guessing or providing incorrect responses so you should attempt to answer every question.

****end of instructions in test booklet—continue reading****

SECTION 2 [TIME: 10 Minutes]

Now turn to the next page titled SECTION 2. We will do the two sample questions together in SECTION 2 and you will complete the other SECTIONS (SECTION 3 and 4) on your own. You will be told when to begin each section. Stop when you see this sign:

DISPLAY PICTURE OF STOP SIGN

If you finish a section early, you may check your work on that section only. Do not begin another section until you are told to continue.

Congratulations. This class has been chosen to receive money for each correct answer on this test. We will be giving you each $10 for each correct answer on the math assessment. To show you how it works, we will give you a two item, very easy test. You will receive $10 in cash for each sample question you get correct today. So, if you get both sample questions correct, you will get $20.

Then we will give you a much harder math test. You will also get $10 per correct item. [WRITE $10/QUESTION on the board.] Since we have to score the math tests, we will get the money to you in 30 days. We will give you the option of receiving a check from UCLA or a post office money order to be sent home once the assessments are corrected.

Now turn to page 3 titled SECTION 2.

Read Sample 1.

READ SAMPLE 1 AND ANSWER CHOICES:

1. Which of the numbers below is the smallest?

A. 3

B. 1

C. 4

D. 7

Circle the letter that corresponds with the best answer.

2. Which of the numbers below is an even number?

A. 2

B. 5

C. 3

D. 1

Again, circle the letter that corresponds with the best answer.

After you are done, please sit quietly as we come around to check your answers and give you $10 for each correct one. We need you to sign your name on **PAGE 28** of your booklet and fill in the amount you received where it says "I received…"

AS YOU CHECK THE STUDENTS' ANSWERS, IF THE ANSWERS ARE CORRECT, GIVE THE STUDENT $10 FOR EACH CORRECTLY ANSWERED QUESTION. YOU CAN PROMPT EACH STUDENT TO BEGIN COMPLETING THE LAST PAGE (CHECK REQUEST FORM) OF THE TEST BOOKLET AS YOU GO AROUND THE CLASSROOM.

Please turn your test booklet over to the back cover. Clearly indicate your preference of payment by marking the box that corresponds to either a check or a money order. Be sure to include your social security number and the address where you would like to have it sent to. These items are essential. If you do not fill them out or don't know your social security number, be sure to write your telephone number so that the UCLA/CRESST staff can contact you, otherwise we will have no way of paying you. After you have completed the form, please wait quietly for others to finish.

AFTER THE STUDENTS HAVE COMPLETED THE FORMS:

The sample questions do not reflect the difficulty of the questions on the math assessment we have for you in SECTION 3 of the test booklet. Remember to read each question carefully. Follow the instructions for each question; you will either circle the letter corresponding to the correct answer for each question or write your answer in the space provided. If you change your answer, erase your first answer completely. If you finish the section early check over your work. Do not proceed on to the other sections until you are told to do so.

SECTION 3 [TIME: 25 MINUTES]

We are ready to begin the math assessment now. Turn to PAGE 4 in your test booklet. We cannot answer any questions during the assessment. If you have a question, save it until the end of the class and we will answer it then. If you need another pencil at any time, raise your hand and we will bring one to you. If you need to do some calculations to get an answer, do them in the space provided in the booklet. If you run out of room on a particular question, continue your work on the back of the page.

Remember we will give you $10 for each correct answer, just like the easier sample test that you completed.

WRITE $10.00 ON THE CHALKBOARD OR OVERHEAD.

There are a total of 20 questions in SECTION 3. Although the questions are numbered 1 through 18, question numbers 2 and 3 have two parts and will be counted as two questions each. You have the opportunity to receive $20 each for questions 2 and 3, if you answer both parts correctly. If you answer all of the items correctly, you will receive $200. We are giving money to you to encourage you to try harder and do well on this test. If you finish early, you can go back to those questions you could not answer in this section only.

Now turn to PAGE 5 which is SECTION 3. You will have 25 minutes to complete this section. Try not to spend too much time on any one question. If you cannot answer a question, proceed to the next one. You may begin now.

RECORD START TIME AND FINISH TIME ON THE CHALKBOARD OR OVERHEAD.

FIVE MINUTES BEFORE TIME IS UP:

You have five minutes left. Remember to answer both parts of questions 2 and 3.

WRITE "5 MINUTES LEFT" ON THE CHALKBOARD OR OVERHEAD PROJECTOR"

ONE MINUTE BEFORE TIME IS UP:

You have one minute to finish this section.

SECTION 4 [TIME: 8 MINUTES]

Okay. That is the end of SECTION 3. Please stop where you are. Now turn to SECTION 4 on page 23. You will be given 8 minutes to complete this section.

IF APPLICABLE: IF the bell rings before we have stopped, please continue to work. We will pass out tardy excuses.

Remember to read the directions before you proceed on to question 1. When you are finished with this section, please turn your booklet over.

We will be by to pick up your calculator while you complete SECTION 4 [Prompt test administrator who is not reading script to pick up calculators.].

You may begin now.

AFTER 8 MINUTES:

Okay please stop. If you are not finished, please stop and turn your booklets over. We will come by to pick up your test booklet. You can keep your pencil. Check if you have your name and gender marked on the front of your test.

PICK UP ANY REMAINING BOOKLETS

We will be sending each of you a letter next month, which will contain your results and a check or money order. We would like to thank you for being part of our study. Before we leave, do you have any questions for us?

AFTER ANSWERING ANY QUESTIONS THE STUDENTS MAY HAVE:

Thank you again for participating in our study. If you have any further questions, please call XXX XXX at CRESST at (310) xxx-xxxxs (PUT NAME AND NUMBER ON BOARD, IF POSSIBLE.]

Please wait until the bell rings and then you are excused to leave.

ADMINISTRATION SCRIPT

CONTROL GROUP

SESSION ADMINISTRATION SCRIPT

INSTRUCTIONS TO THE ADMINISTRATOR ARE PRINTED IN BOLD CAPITAL LETTERS AND SHOULD NOT BE READ TO THE STUDENTS. ALL WORDS IN PLAIN PRINT ARE TO BE READ TO THE STUDENTS.

INTRODUCTION [TIME: 5 MINUTES]

Please check the two lists for your name, take all of your belongings, and report to your assigned room. Since we only have this class period for the assessment, please proceed as quickly as possible.

If your name does not appear on either list, please wait patiently in your seat and we will assign you to a group.

SECTION 1 [TIME: 10 MINUTES]

ONCE THE GROUPS HAVE BEEN SUCCESSFULLY SEPARATED AND ARE ENTERING THE DESIGNATED ROOMS:

Hello. My name is ____________ and this is my colleague ____________. We are part of a research center at UCLA. Today you will be participating in a study on how motivation affects testing. To make sure that all students receive the same instructions, I will be reading them to you from a script.

The purpose of this study is to provide information on the knowledge and attitudes of young people. As part of the study, you will answer questions about yourself and about mathematics. It will take 50 minutes. You will not be allowed to ask questions during the assessment. Please do the best you can.

PLESAE DO NOT OPEN THE TEST BOOKLET.

You will not need to use any of your personal items—except a calculator if you like—but will use the test booklet and pencil **that is on your desk/that we are distributing**. We will be by to distribute a calculator to you if you need one.

PLEASE TURN YOU TEST BOOKLET OVER TO THE FRONT COVER PAGE. PRINT YOUR NAME AND CIRCLE YOUR GENDER IN THE SPACES PROVIDED ON THE COVER PAGE.

Open the booklet to the first page titled SECTION 1. Read the directions to yourself as I read them aloud:

> In this booklet, you will find questions about mathematics. Because there are different booklets, the other students around you may be working on booklets that are different from yours. You will have 25 minutes to answer all of the questions in this section. Read each question carefully and answer it as well as you can.

You will be told when to begin work on this booklet. If you finish answering the questions before time is called, you may go over your work and review your answers.

If you decide to change an answer to a question, erase or cross out your first choice and then circle the letter next to the answer you consider correct.

For other questions you will be asked to write short answers in the space provided in your booklet. For these questions, you may use words, drawings, numbers, or equations in your answers.

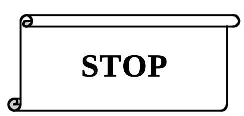
Even if you use a calculator, when the question asks you to show ALL of your work it is very important that you give as complete an answer as you can. Please use the extra space on the page to do your work. You will not be penalized for guessing or providing incorrect responses so you should attempt to answer every question.

****end of instructions in test booklet—continue reading****

SECTION 2 [TIME: 5 MINUTES]

Now turn to the next page titled SECTION 2. Read each question carefully and answer it as well as you can. We will do the two sample questions together in the SECTION 2 and you will complete the other SECTIONS (SECTION 3 and 4) on your own. You will be told when to begin each section. Stop when you see this sign:

DISPLAY PICTURE OF STOP SIGN



If you finish a section early, you may check your work on that section only. Do not begin another section until you are told to continue.

Read Sample 1.

READ SAMPLE 1 AND ANSWER CHOICES:

1. Which of the numbers below is the smallest?

E. 3

F. 1

G. 4

H. 7

Circle the letter that corresponds with the best answer.

2. Which of the numbers below is an even number?

A. 2

B. 5

C. 3

D. 1

Again, circle the letter that corresponds with the best answer.

The answers are: 1. = B and 2. = A.

The sample questions do not reflect the difficulty of the questions on the math assessment we have for you in SECTION 3 of the test booklet. Remember to read each question carefully. Follow the instructions for each question; you will either circle the letter corresponding to the correct answer for each question or write your answer in the space provided. If you change your answer, cross out or erase your first answer completely. If you finish the section early check over your work. Do not proceed on to the other sections until you are told to do so.

SECTION 3 [TIME: 25 MINUTES]

We are ready to begin the math assessment now. Turn to PAGE 4 in your test booklet. We cannot answer any questions during the assessment. If you have a question, save it until the end of the class and we will answer it then. If you need another pencil at any time, raise your hand and we will bring one to you. If you need to do some calculations to get an answer, do them in the space provided in the booklet. If you run out of room on a particular question, continue your work on the back of the page.

There are a total of 20 questions in SECTION 3. Question numbers 2 and 3 have two parts and will be counted as two questions each. If you finish early, you can go back to those questions you could not answer in this section only.

Now turn to PAGE 5 to start the test. You will have 25 minutes to complete this section. Try not to spend too much time on one question. If you cannot answer it, proceed to the next one.

RECORD START TIME AND FINISH TIME ON THE CHALKBOARD OR OVERHEAD.

FIVE MINUTES BEFORE TIME IS UP:

You have five minutes left. Remember to answer both parts of questions 2 and 3.

WRITE "5 MINUTES LEFT" ON THE CHALKBOARD

ONE MINUTE BEFORE TIME IS UP:

You have one minute to finish this section.

SECTION 4 [TIME: 8 MINUTES]

Okay. That is the end of SECTION 3. Please stop where you are. Now turn to SECTION 4 on page 23. You will be given 8 minutes to complete this section.

IF APPLICABLE: IF the bell rings before we have stopped, please continue to work. We will pass out tardy excuses.

Remember to read the directions before you proceed on to question 1. When you are finished with this section, please turn your booklet over.

We will be by to pick up your calculator while you complete SECTION 4 [Prompt test administrator who is not reading script to pick up calculators.].

You may begin now.

AFTER 8 MINUTES:

Okay please stop. If you are not finished, please stop and turn your booklets over. You can keep your pencil. Check if you have your name and gender marked on the front of your test.

Remember, this is a study about motivation. Just so you know, the other students in the class had the opportunity to get money for participating in their part of the study. They had the opportunity of receiving money for each item they answered correctly on the assessment. We are giving each of you $20 to thank you for your participation in this study. You were randomly assigned to the control group. Thus, each student had an equal chance of being in the incentive or control group.

We will be sending each of you a letter next month, which will contain your results. We would like to thank you again for being part of our study. As we come around to each of you, we will need you to sign the last page of your test booklet where it asks for your signature, and fill in $20.00 for the amount received. This will verify to UCLA that you received money for participating in this study. Please be patient and wait for everyone to receive their money. You will be excused once the bell rings.

As we distribute your money, do you have any questions for us?

Thank you again for participating in our study. If you have any further questions, please call XXX XXX at CRESST at (310) xxx-xxxx (PUT NAME AND NUMBER ON BOARD, IF POSSIBLE.]

Please wait until the bell rings and then you are excused to leave.

DISTRIBUTE ONE ENVELOPE TO EACH STUDENT AND MAKE SURE EACH STUDENT SIGNS HIS OR HER NAME ON THE LAST PAGE OF THE BOOKLET.

Appendix I

Original Principal Letter

UNIVERSITY OF CALIFORNIA, LOS ANGELES

UCLA

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SANTA BARBARA • SANTA CRUZ

Center for the Study of Evaluation
National Center for Research on Evaluation, Standards, and Student Testing
UCLA Graduate School of Education & Information Studies
405 Hilgard Avenue, 301 GSEIS Building
Los Angeles, CA 90095-1522
(310) 206-1532
Fax (310) 825-3883

Date

XXX
XXX
XXX
XXX

Dear XXX,

The National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA is currently conducting a study on student motivation on low-stakes tests and investigating whether the use of financial incentives will increase performance on such tests. Our hypothesis is that motivation is a key factor in the lower performance levels exhibited by American high school seniors on such tests as the Third International Mathematics and Science Study (TIMSS). Because students at this level may not be interested in performing well on tests that do not affect them personally during their last months of high school, we are introducing money as an incentive to test whether the students have the content knowledge to perform well on the TIMSS. The results from this study will indicate to us whether motivation is in fact a contributing factor to the low performance levels of American high school seniors on the TIMSS.

We are currently seeking school sites in the Los Angeles area to participate in our study. The study has been approved by the UCLA Human Subjects Protection Committee as well as the XXX school district. These approval forms are attached. Please also note that XXX will be contacting you as well to inform you of our study. Also attached is a simple calendar, which illustrates our testing dates and upcoming tasks asked of the school sites.

We will need the following from each school that chooses to participate:

- Two Grade 12, non AP math or physics classes (preferably two non-homeroom classes that meet during either 2nd, 3rd, or 4th periods)
- Access to the school library or other room so that non-participating students can be separated from those that are participating
- A math teacher designated by the principal that will assist us with the coordination of the testing

The amount of money given per correct item of the math test that students will be taking will be either $0 or $10 per correct item. The two classes will be divided into three groups: the incentive group (each student will receive $10 for each correct item in the form of a check or money order after tests have been corrected); the control group (each student will receive $0 for each correct item, but will receive $20 cash for their participation); and the non-participating group (who will be separated from the incentive and control groups). The students in the incentive group will also receive $20 cash for answering two very easy sample questions correctly (this was implemented into the study so that believability is established among the students receiving money for providing correct answers). We will also be collecting data on state effort, self-efficacy, and worry.

We would like to conduct the Pilot Study during the week of March 8, 1999. The Main Study will be conducted the week of March 22, 1999 - April 9, 1999. Due to time constraints, we are only seeking schools to participate who will be available for testing during these timeframes. We will be paying each teacher $75 for letting us use their valuable class time and for helping us with the coordination of the testing. We will also be paying each school site $100 to be used as designated by the school principal.

If you have any questions or concerns, please contact XXX at XXX or me, XXX, at XXX. We will be contacting your school soon to follow up on your possible interest in participating. Thank you for your consideration.

Sincerely,

XXX
Project Director

Appendix J

Tasks-and-Timeline Form

Tasks-and-Timeline Form

School Site:_________________________________ **Date:**_____________________

Site Coordinator:____

CHECKLIST		
Study Requirements		
	A teacher who will serve as site coordinator for the study.	
r	Two OR Four Grade 12 classes (40 to 100 students) consisting of students who are not currently and have never taken AP Calculus or AP Physics courses.	
r	Insure that ALL (40-100) student participants are available during the SAME class period for testing.	
r	If TWO Grade 12 classes are available, we NEED:	**3 Classrooms: 2 for testing and 1 for non-participants**
r	Principal's approval for school to participate in study.	

TIMELINE	
DATE	**TASK**
	Receive from UCLA via UPS or Special Delivery: Consent, Assent, and Parental Permission Forms for distribution to students/parents.
	Distribute to Students: Consent, Assent, and Parental Permission Forms
	Collect from Students: Consent, Assent, and Parental Permission Forms
	Fax to UCLA: q School site map with parking information and main office location indicated. q Parking permits (if required). q Class room numbers where study will be conducted. q Class Rosters clearly indicating all participants and non-participants, based on signed Consent, Assent and Parental Permission Forms returned so far. q Bell Schedule for class period that study will be conducted.
	Testing Date

<u>IMPORTANT:</u>

COORDINATOR: PLEASE BE SURE TO REMIND TEACHERS AND STUDENTS OFTEN TO RETURN THEIR CONSENT FORMS DAILY.

Appendix K

Principal Verification Form

UNIVERSITY OF CALIFORNIA, LOS ANGELES

UCLA

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SANTA BARBARA • SANTA CRUZ

Center for the Study of Evaluation
National Center for Research on Evaluation, Standards, and Student Testing
UCLA Graduate School of Education & Information Studies
405 Hilgard Avenue, 301 GSEIS Building
Los Angeles, CA 90095-1522
(310) 206-1532
Fax (310) 825-3883

Principal Verification Form

Date

XXX
XXX
XXX

Dear XXX,

On DATE, a letter describing the UCLA Low-Stakes Motivation Study was faxed to you along with human subjects approval notices. Since then, we have arranged with XXX to schedule testing on DATE during period X. Testing will occur during one class period only and involve one-OR-two 12th grade classes. If you have any questions or comments, please feel free to contact XXX at XXX.

Please sign below to confirm that you are aware of the UCLA Low Stakes Motivation Study and approve of its being conducted at your school site.

____
Principal

____
Date

Appendix L

Site Coordinator Script

University of California, Los Angeles

VERBAL SCRIPT TO PARTICIPANTS IN RESEARCH

Motivation and Standardized Test Study

1. UCLA is asking you to take part in a research study because they are trying to learn more about motivation and test performance.
2. If you agree to be in this study you will be asked to take a math literacy test lasting approximately one class period.
3. There are no risks associated with your involvement in this study. Your individual test results will not be released or used for any purpose outside of this research.
4. The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so researchers at UCLA may better interpret both national and international comparisons of achievement regarding high school students.
5. Please talk this over with your parents before you decide whether or not to participate. Your parents will need to give their permission for you to take part in this study. But even if your parents say "yes" you can still decide not to do this.
6. If you don't want to be in this study, you don't have to participate. Remember, being in this study is up to you and no one will be upset if you don't want to participate or even if you change your mind later and want to stop.
7. You can ask any questions that you have about the study. If you have a question later that you didn't think of now, you can call XXX at XXX, who is one of the researchers at UCLA conducting this study.

Appendix M

Revised Consent Forms

University of California, Los Angeles

ASSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

You are asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in this XXX study because you are a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE XXX STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12^{th} grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If you volunteer to participate in this XXX study, the following procedures would take place:

We will begin in your regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. Your class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which you will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which you will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will engage in common test taking practices with which you are very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **COMPENSATION FOR PARTICIPATION**

If your child / ward participates in this study, s / he will be randomly assigned into one of two groups: control or experimental. Every student will receive some form of compensation.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this XXX study or not. If you volunteer to be in this XXX study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the XXX study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your assent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research XXX study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this XXX study. I have been given a copy of this form.

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this XXX study. I have been given a copy of this form.

____ ________________________
Name of Subject Date

____
Signature for Adolescent Assent

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed assent and possesses the legal capacity to give informed assent to participate in this research XXX study.

____ ________________________
Signature of Investigator Date

University of California, Los Angeles

CONSENT TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

You are asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. You were selected as a possible participant in this XXX study because you are a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE XXX STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12^{th} grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If you volunteer to participate in this XXX study, the following procedures would take place:

We will begin in your regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. Your class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which you will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which you will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. You will engage in common test taking practices with which you are very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **COMPENSATION FOR PARTICIPATION**

If your child / ward participates in this study, s / he will be randomly assigned into one of two groups: control or experimental. Every student will receive some form of compensation.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with you will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this XXX study or not. If you volunteer to be in this XXX study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the XXX study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your consent at any time and discontinue participation without penalty. You are not waving any legal claims, rights or remedies because of your participation in this research XXX study. If you have questions regarding your rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I AGREE** to participate in this XXX study. I have been given a copy of this form.

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT AGREE** to participate in this XXX study. I have been given a copy of this form.

____ _______________________

Name of Subject Date

____

Signature for Adolescent Consent

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research XXX study.

____ _______________________

Signature of Investigator Date

University of California, Los Angeles

PARENTAL PERMISSION FOR MINOR TO PARTICIPATE IN RESEARCH

Motivation and Standardized Test Study

Your child / ward has been asked to participate in a research XXX study conducted by Eva Baker, Ed.D., from the Center for the Study of Evaluation at the University of California, Los Angeles. Your child / ward was selected as a possible participant in this XXX study because s / he is a high school senior who has not taken advanced mathematics or physics courses.

- **PURPOSE OF THE PILOT STUDY**

The purpose of this XXX study is to investigate the effect motivation may have on 12th grade student performance in standardized tests of mathematics.

- **PROCEDURES**

If your child / ward volunteers to participate in this XXX study, the following procedures would take place:

We will begin in the regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing the XXX study. The class will be divided into groups. One group will remain in the classroom, while the other two groups will go to alternative classrooms.

The researchers will then administer a brief mathematics test, which the students will have 35 minutes to complete. After this time, the researchers will administer a few survey questionnaires which the students will have 10 minutes to complete. Following completion of the survey instruments, the class will be debriefed and dismissed.

- **POTENTIAL RISKS AND DISCOMFORTS**

There is very minimal risk of harm or discomfort associated with the research procedure. Your child / ward will engage in common test taking practices with which s / he is very familiar.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

The potential benefit of this research to society includes greater knowledge of the role of motivation in test taking situations, so we may better interpret both national and international comparisons of achievement regarding our high school students.

- **COMPENSATION FOR PARTICIPATION**

If your child / ward participates in this study, s / he will be randomly assigned into one of two groups: control or experimental. Every student will receive some form of compensation.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this XXX study and is identified with your child / ward will remain confidential and will be disclosed only with your permission or as required by law.

- **PARTICIPATION AND WITHDRAWAL**

Your child / ward can choose whether to be in this XXX study or not. If s / he volunteers to be in this XXX study, s / he may withdraw at any time without consequences of any kind. Your child / ward may also refuse to answer any questions s / he doesn't want to answer and still remain in the XXX study. The investigator may withdraw your child / ward from this research if circumstances arise which warrant doing so.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Dr. Jamal Abedi at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-4346, or Dr. Eva Baker, also at the Center for the Study of Evaluation on the campus of UCLA, at 310-206-1532.

- **RIGHTS OF RESEARCH SUBJECTS**

Your child / ward may withdraw her / his assent at any time and discontinue participation without penalty. Your child / ward is not waving any legal claims, rights or remedies because of his / her participation in this research XXX study. If your child / ward has questions regarding his / her rights as a research subject, contact the Office for Protection of Research Subjects, 2107 Ueberroth Building, UCLA. Box 951694, Los Angeles, CA 90095-1694, (310) 825-8714.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

PLEASE READ CAREFULLY AND CHECK ONE BOX:

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I GIVE PERMISSION** for my child / ward to participate in this XXX study. I have been given a copy of this form.

q I understand the procedures described above, and that this study is a project of UCLA and that it is not sponsored or funded by XXX. My questions have been answered to my satisfaction, and **I DO NOT GIVE PERMISSION** for my child / ward to participate in this XXX study. I have been given a copy of this form.

____
Name of Child / Ward

____
Name of Parent / Guardian

____ _________________________
Signature of Parent / Guardian Date

SIGNATURE OF INVESTIGATOR (If required by the HSPC.)

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research XXX study.

____ _________________________
Signature of Investigator Date

Appendix N

Revised Principal Letter

UNIVERSITY OF CALIFORNIA, LOS ANGELES UCLA

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO SANTA BARBARA • SANTA CRUZ

Center for the Study of Evaluation
National Center for Research on Evaluation, Standards, and Student Testing
UCLA Graduate School of Education & Information Studies
405 Hilgard Avenue, 301 GSEIS Building
Los Angeles, CA 90095-1522
(310) 206-1532
Fax (310) 825-3883

Date

XXX
XXX
XXX

Dear XXX,

The National Center for Research on Evaluation, Standards, and Student Testing (CRESST) at UCLA is currently conducting a study on student motivation on low-stakes tests and investigating whether the use of financial incentives will increase performance on such tests. Our hypothesis is that motivation is a key factor in the lower performance levels exhibited by American high school seniors on such tests as the Third International Mathematics and Science Study (TIMSS). Because students at this level may not be interested in performing well on tests that do not affect them personally during their last months of high school, we are introducing a form of incentive to test whether the students have the content knowledge to perform well on the TIMSS. The results from this study will indicate to us whether motivation is in fact a contributing factor to the low performance levels of American high school seniors on the TIMSS.

We are currently seeking school sites in the Los Angeles area to participate in our study. The study has been approved by the UCLA Human Subjects Protection Committee as well as the XXX school district. These approval forms are attached. Please also note that XXX will be contacting you as well to inform you of our study.

We will need the following from each school that chooses to participate:

- **2 Grade 12 classes with non-AP Calculus or AP Physics students (preferably two non-homeroom classes that meet during either 2nd, 3rd, or 4th periods - only one class period is necessary if both classes meet during the same period)**

- **Access to the school library or other room so that non-participating students can be separated from those that are participating**

- **A teacher designated by the principal that will assist us with the coordination of the testing**

Each testing period will be conducted in the following format::

Approximately one week before the testing is scheduled, student and parent consent forms as well as a teacher script (which he or she will read when distributing and describing our study) will be sent to each school to be distributed to 12th grade non-AP Calculus or Physics students. A roster of participating students will be compiled and faxed to UCLA by the teacher(s) at each school who have been designated as coordinator(s) for the study. On the testing day, we will begin in the regular classroom during a regularly scheduled class period. Two researchers will begin by briefly describing our study. Each student who chooses to participate in this study, will be randomly assigned into one of two groups: control or experimental. Every student will receive some form of compensation.

The pilot study has already been conducted during the month of March at schools within XXX school district. The main study will be conducted during the month of June. Due to time constraints, we are only seeking schools to participate who will be available for testing during this timeframe The coordinator at each school site will be paid $100.00 for his or her help in coordinating the logistics of our study. We will be paying each teacher $75 for letting us use their valuable class time and for helping us with the coordination of the testing. We will also be paying each school site $100 to be used as designated by the school principal.

If you have any questions or concerns, please contact XXX at XXX or me, XXX, at XXX. We will be contacting your school soon to follow up on your possible interest in participating. Thank you for your consideration.

Sincerely,

XXX
Project Director