MATHEMATICS ITEMS

Guide to the Content and Layout of This Book

The *Mathematics Items* book contains, in a ready-to-use form, the released TIMSS 1999 and TIMSS 2003 mathematics assessment items that appeared in Book 3, *Mathematics Concepts and Mathematics Items*. Each item is presented on a separate page to facilitate printing.

The two books are designed to be used in tandem. The *Mathematics Items* book is designed to facilitate the construction of sets of items tailored to the purpose of the user—most likely a classroom teacher. Users can select items for their own purpose based on their reading of the *Mathematics Concepts and Mathematics Items* book, print these and administer them to students. Student responses can be scored using the scoring instructions presented in the *Mathematics Concepts and Mathematics Items* book, and may be compared to the international benchmarks presented there.
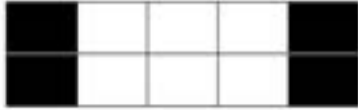
If there are 300 calories in 100 g of a certain food, how many calories are there in a 30 g portion of this food?

A. 90

B. 100

C. 900

D. 1000

E. 9000

Which picture shows that $\dfrac{2}{5}$ is equivalent to $\dfrac{4}{10}$?

A.

B.

C.

D.

Item Number: B09

Which of these is the smallest number?

A. 0.625

B. 0.25

C. 0.375

D. 0.5

E. 0.125

Item Number: B10

Which of these fractions is smallest?

A. $\dfrac{1}{6}$

B. $\dfrac{2}{3}$

C. $\dfrac{1}{3}$

D. $\dfrac{1}{2}$

Item Number: D09

What is the best estimate of the number corresponding to P?

A.   1.1

B.   1.2

C.   1.4

D.   1.5

Item Number: D12

A runner ran 3000 m in exactly 8 minutes. What was his average speed in meters per second?

A. 3.75

B. 6.25

C. 16.0

D. 37.5

E. 62.5

Which of these numbers is between 0.07 and 0.08?

A. 0.00075
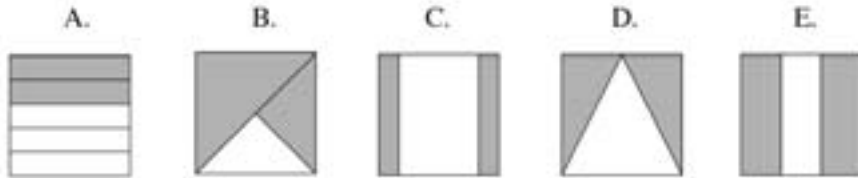
B. 0.0075

C. 0.075

D. 0.75

Item Number: F09

What fraction of the circle is shaded?

A.   Between 0 and $\frac{1}{4}$

B.   Between $\frac{1}{4}$ and $\frac{1}{2}$

C.   Between $\frac{1}{2}$ and $\frac{3}{4}$

D.   Between $\frac{3}{4}$ and 1

Item Number: F12

Which shows $\frac{2}{3}$ of the square shaded?

A.   B.   C.   D.   E.

Item Number: H08

The sum 691 + 208 is closest to the sum

A. 600 + 200

B. 700 + 200

C. 700 + 300

D. 900 + 200

Divide: $\dfrac{6}{55}$ ÷ $\dfrac{3}{25}$ =

Answer: _____

Divide $0.003)\overline{15.45}$

A. 0.515

B. 5.15
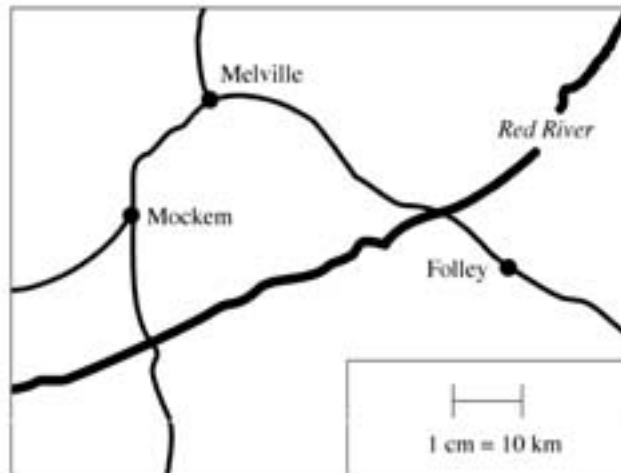
C. 51.5

D. 515

E. 5150

On the map, 1 cm represents 10 km on the land.

On the land, about how far apart are the towns Melville and Folley?

A.   5 km

B.   30 km

C.   40 km

D.   50 km

Item Number: J18

The car is 3.5 m long. About how long is the building?

A.   18 m

B.   14 m

C.   10 m

D.   4 m

Item Number: L09

Which number is two hundred six and nine-tenths?

A. 206.09

B. 206.9

C. 206.910

D. 2006.9

What is the value of $\dfrac{4}{5} - \dfrac{1}{3} - \dfrac{1}{15}$?

A. $\dfrac{1}{5}$

B. $\dfrac{2}{5}$

C. $\dfrac{7}{15}$

D. $\dfrac{3}{4}$

E. $\dfrac{4}{5}$

Item Number: L18

A company produced 17,175 cars in 1996. For a report, this number was rounded to the nearest hundred. Which was the number of cars given in the report?

A. 17,000

B. 17,100

C. 17,200

D. 17,270

In which list of fractions are all of the fractions equivalent?

A. $\dfrac{1}{2}$, $\dfrac{2}{4}$, $\dfrac{4}{6}$

B. $\dfrac{2}{3}$, $\dfrac{4}{6}$, $\dfrac{8}{12}$

C. $\dfrac{2}{5}$, $\dfrac{4}{10}$, $\dfrac{8}{50}$

D. $\dfrac{3}{4}$, $\dfrac{4}{6}$, $\dfrac{6}{8}$

Item Number: N14

Penny had a bag of marbles. She gave one-third of them to Rebecca, and then one-fourth of the remaining marbles to John. Penny then had 24 marbles left in the bag. How many marbles were in the bag to start with?

A. 36

B. 48

C. 60

D. 96

Item Number: N16

A painter had 25 L of paint. He used 2.5 L of paint every hour. He finished the job in 5.5 hours. How much paint did he have left?
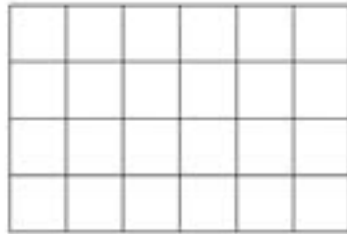
A. 10.25 L

B. 11.25 L

C. 12.75 L

D. 13.75 L

Item Number: N17

Shade in $\frac{3}{8}$ of the unit squares in the grid.

Item Number: N19

There are 68 rows of cars in a parking lot. Each row has 92 cars. Which of these would give the closest estimate of the total number of cars in the parking lot?

A. 60 x 90 = 5400

B. 60 x 100 = 6000

C. 70 x 90 = 6300

D. 70 x 100 = 7000

Item Number: P13

Sound travels at approximately 330 meters per second. The sound of an explosion took 28 seconds to reach a person. Which of these is the closest estimate of how far away the person was from the explosion?

A. 12,000 m

B. 9,000 m

C. 8,000 m

D. 6,000 m

Item Number: P14

Robin and Jim took cherries from a basket. Robin took $\frac{1}{3}$ of the cherries and Jim took $\frac{1}{6}$ of the cherries. What fraction of the cherries remained in the basket?

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{6}$

D. $\frac{1}{18}$

Item Number: P15

Write 0.48 as a fraction reduced to its lowest terms.

Answer: _____

Item Number: P17

Subtract: $4.722 - 1.935 =$

A. 2.787

B. 2.797

C. 2.887

D. 2.897

Item Number: R07

The total weight of a pile of 500 salt crystals is 6.5 g. What is the average weight of a salt crystal?

A. 0.0078 g

B. 0.013 g

C. 0.0325 g

D. 0.078 g

Item Number: R08

Subtract: $\begin{array}{r} 7003 \\ - \ 4078 \\ \hline \end{array}$

A. 2035

B. 2925

C. 3005

D. 3925

Laura had \$240. She spent $\frac{5}{8}$ of it. How much money did she have left?

Answer: _____

John sold 60 magazines and Mark sold 80 magazines. The magazines were all sold for the same price. The total amount of money received for the magazines was $700. How much money did Mark receive?

Answer: _____

Item Number: R15

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02A

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02B

A sheet of paper is 0.012 cm thick. Of the following, which would be the height of a stack of 400 sheets of this paper?

A. 0.048 cm

B. 0.48 cm

C. 4.8 cm

D. 48 cm

The height of a boy was reported as 140 cm. The height had been rounded to the nearest 10 cm. What are two possibilities for the boy's actual height?

Answer: _____ cm   and   _____ cm

In making a garden fertilizer, a gardener mixes 2 kg of a nitrate, 3 kg of a phosphate, and 6 kg of potash. What is the ratio of nitrate to the total amount of fertilizer?

A. $\dfrac{11}{9}$

B. $\dfrac{2}{3}$

C. $\dfrac{2}{9}$

D. $\dfrac{2}{11}$

Item Number: V03

n is a number. When n is multiplied by 7, and 6 is then added, the result is 41. Which of these equations represents this relation?

A. $7n + 6 = 41$

B. $7n \pm 6 = 41$

C. $7n \times 6 = 41$

D. $7(n + 6) = 41$

Item Number: B12

If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x?

A. 7

B. 13

C. 28

D. 364

The cost, C, of printing greeting cards consists of a fixed charge of 100 cents and a charge of 6 cents for each card printed. Which of these equations can be used to determine the cost of printing n cards?

A. $C = (100 + 6n)$ cents

B. $C = (106 + n)$ cents

C. $C = (6 + 100n)$ cents

D. $C = (106n)$ cents

E. $C = (600n)$ cents

Item Number: D10

If 4 times a number is 48, what is $\dfrac{1}{3}$ of the number?

A. 4

B. 8

C. 12

D. 16

Item Number: F11

The table shows a relation between x and y.

x	2	3	4	5
y	7	10	13	16

Which of these equations expresses this relation?

A. $y = x + 5$

B. $y = x \pm 5$

C. $y = \dfrac{1}{3}(x \pm 1)$

D. $y = 3x + 1$

Item Number: H10

☐ represents the number of magazines that Lina reads each week. Which of these represents the total number of magazines that Lina reads in 6 weeks?

A. $6 + \square$

B. $6 \times \square$

C. $\square + 6$

D. $(\square + \square) \times 6$

Item Number: H12

The table represents a relation between x and y.

What is the missing number in the table?

A.   9

B.   10

C.   11

D.   12

E.   13

x	y
2	5
3	7
4	?
7	15

Item Number: J17

In a sequence of starts and stops, an elevator travels from the first floor to the fifth floor and then to the second floor. From there, the elevator travels to the fourth floor and then to the third floor. If the floors are 3 m apart, how far has the elevator traveled?

A. 18 m

B. 27 m

C. 30 m

D. 45 m

Item Number: L12

The table represents a relation between x and y.

Which of the following equations could represent the same relation?

A. $y = 2x + 2$

B. $y = 2x - 1$

C. $y = 3x + 2$

D. $y = 3x + 1$

E. $y = 3x - 2$

x	y
1	1
2	4
3	7
4	10

Item Number: L14

The table shows some values of x and y, where x is proportional to y.

x	4	8	Q
y	9	P	45

What are the values of P and Q?

A. $P = 40$ and $Q = 13$

B. $P = 18$ and $Q = 17$

C. $P = 20$ and $Q = 18$

D. $P = 40$ and $Q = 18$

E. $P = 18$ and $Q = 20$

Item Number: L15

Find the value of x if $12x - 10 = 6x + 32$

Answer: _____

If $x = 3$, what is the value of $\dfrac{5x + 3}{4x - 3}$?

Answer: _____

Which of these expressions is equivalent to n x n x n for all values of n?

A. $\dfrac{n}{3}$

B. $n + 3$

C. $3n$

D. n^3

Item Number: P09

For all numbers k,
$k + k + k + k + k$ can be written as

A. $k + 5$

B. $5k$

C. k^5

D. $5(k + 1)$

Which of the following is true when a, b, and c are different real numbers?

A. $a - b = b - a$

B. $a(b - c) = b(c - a)$

C. $b - c = c - b$

D. $ab = ba$

E. $ab - c = ab - b$

Item Number: R10

If k represents a negative number, which of these is a positive number?

A. k^2

B. k^3

C. $2k$

D. $\dfrac{k}{2}$

Item Number: R12

A club has 86 members, and there are 14 more girls than boys. How many boys and how many girls are members of the club?

Show your work.

The figures show four sets consisting of circles.

Figure 1   Figure 2   Figure 3   Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04A

The figures show four sets consisting of circles.

Figure 1 Figure 2 Figure 3 Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04B

The figures show four sets consisting of circles.

Figure 1   Figure 2   Figure 3   Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04C

What units would be best to use to measure the weight (mass) of an egg?

A. centimeters

B. milliliters

C. grams

D. kilograms
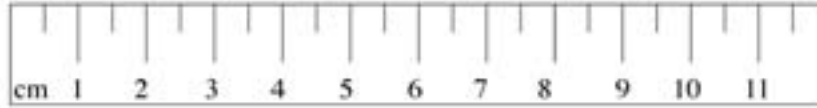
Using a centimeter ruler like this one, you can measure accurately to the nearest

A.   millimeter

B.   half-millimeter

C.   centimeter

D.   half-centimeter

Item Number: F10

A rectangular garden that is next to a building has a path around the other three sides, as shown.
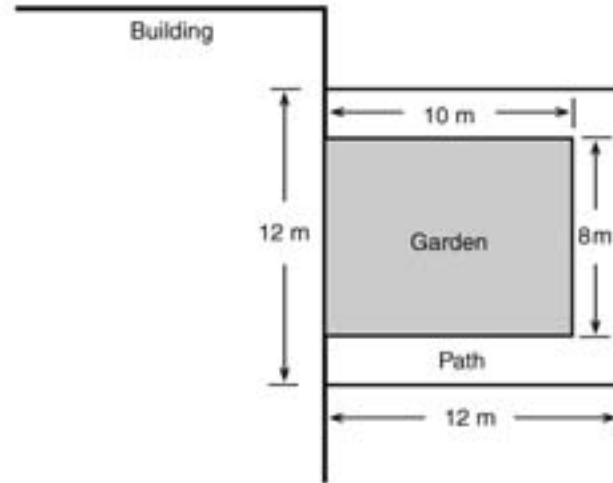
What is the area of the path?

A.   144 m^2

B.   64 m^2

C.   44 m^2

D.   16 m^2

Item Number: J10

Four girls measured the length of their paces. The chart shows their measurements.

Name	Length of Pace
Polly	80 cm
Maria	65 cm
Helen	75 cm
Susan	60 cm

Who would take the most paces in walking from one end of a hallway to the other?

A.   Polly

B.   Maria

C.   Helen

D.   Susan

Item Number: L13

Which angle in the figure has a measure closest to 45°?

A. *p*

B. *q*

C. *r*

D. *s*
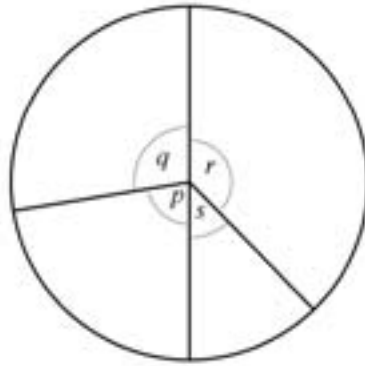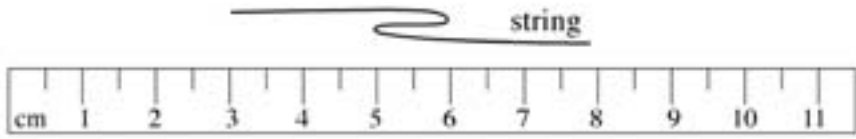
The rectangle below is twice as long as it is wide.

What is the ratio of the width of the rectangle to its perimeter?

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{6}$

Item Number: P08

string

cm 1 2 3 4 5 6 7 8 9 10 11

If the string in the diagram is pulled straight, which of these is closest to its length?

A.   5 cm

B.   6 cm

C.   7 cm

D.   8 cm

Item Number: P12

The figure shows a shaded rectangle inside a parallelogram.
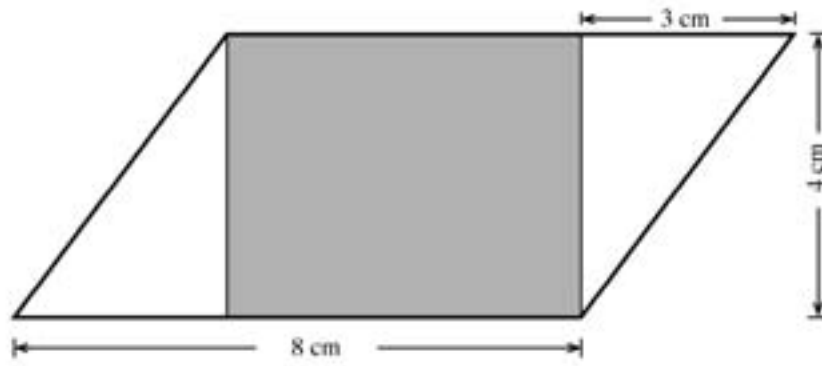
What is the area of the shaded rectangle?

Answer: _____
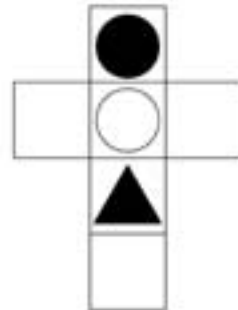
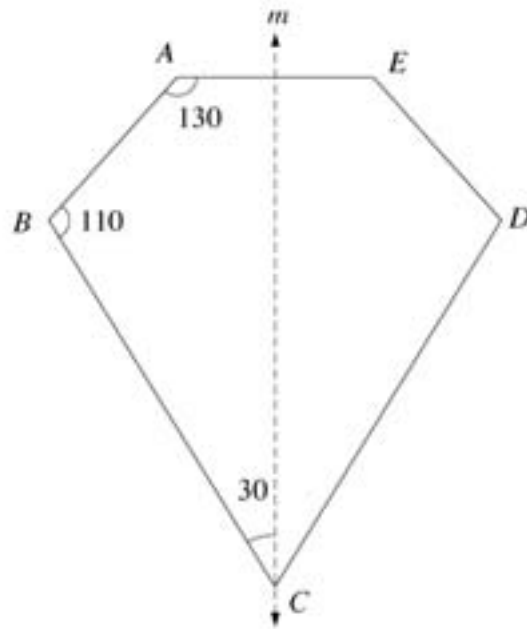Which of these cubes could be made by folding the figure above?
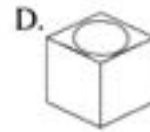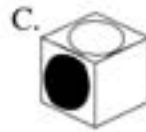
A.   B.   C.   D.

Item Number: B11

The line *m* is a line of symmetry for figure *ABCDE*.

The measure of angle *BCD* is

A. 30°

B. 50°

C. 60°

D. 70°

E. 110°
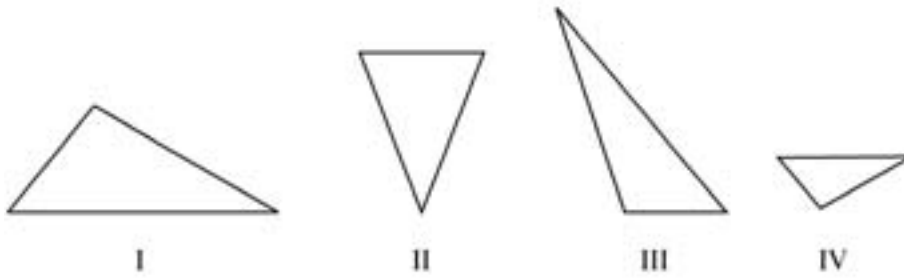
Item Number: D07

Of the following, which is NOT true for all rectangles?

A. The opposite sides are parallel.

B. The opposite sides are equal.

C. All angles are right angles.

D. The diagonals are equal.

E. The diagonals are perpendicular.

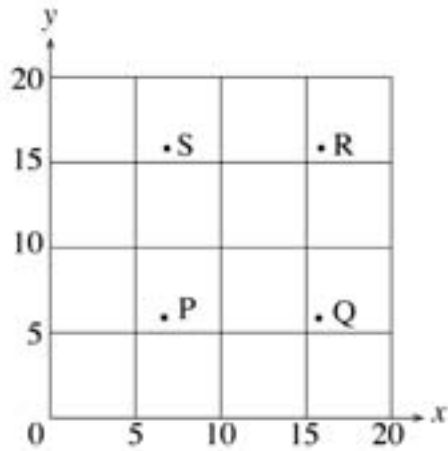*Item Number: J11*

Two of the triangles below are similar.

I II III IV

Which two triangles are similar?

A.   I and II

B.   I and III

C.   I and IV

D.   II and IV

E.   III and IV

Item Number: J15

Which point on the graph could have coordinates (7,16)?

A.   Point P

B.   Point Q

C.   Point R

D.   Point S

Item Number: J16

In a quadrilateral, each of two angles has a measure of 115°. If the measure of a third angle is 70°, what is the measure of the remaining angle?

A. 60°

B. 70°

C. 130°

D. 140°

E. None of the above

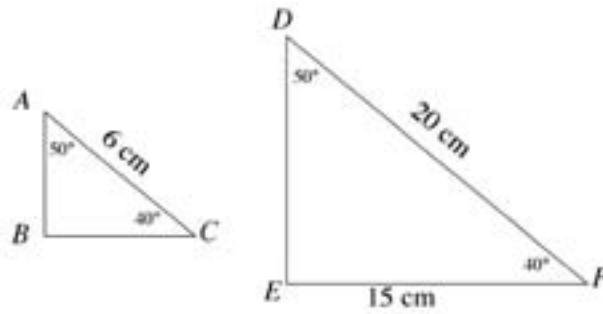Point P (not shown) on the number line is 5 units from point N and 2 units from point M.

Where is point P located?

A. Between O and L

B. Between L and M

C. Between M and N

D. To the right of N

Item Number: N12

The figure represents two similar triangles. The triangles are not drawn to scale.

In the actual triangle *ABC*, what is the length of side *BC*?

A. 3.5 cm

B. 4.5 cm

C. 5 cm

D. 5.5 cm

E. 8 cm

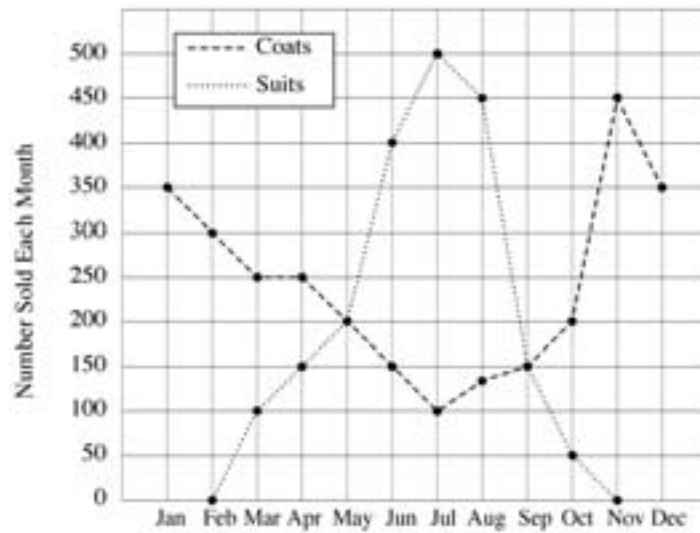*Item Number: P10*

2 cm

3 cm

4 cm

6 cm

How many of the shaded right triangles shown above are needed to exactly cover the surface of the rectangle?

A.   Four

B.   Six

C.   Eight

D.   Ten

Item Number: R11

This graph shows the number of suits and coats sold each month.

According to the information in the graph, during which two-month period does the greatest increase in coat sales occur?

A.   December - January

B.   May - June

C.   June - July

D.   October - November

Item Number: B07

If a fair coin is tossed, the probability that it will land heads up is $\frac{1}{2}$. In four successive tosses, a fair coin lands heads up each time. What is likely to happen when the coin is tossed a fifth time?

A. It is more likely to land tails up than heads up.

B. It is more likely to land heads up than tails up.

C. It is equally likely to land heads up or tails up.

D. More information is needed to answer the question.

Item Number: F08

The graph shows the time of travel by pupils from home to school.
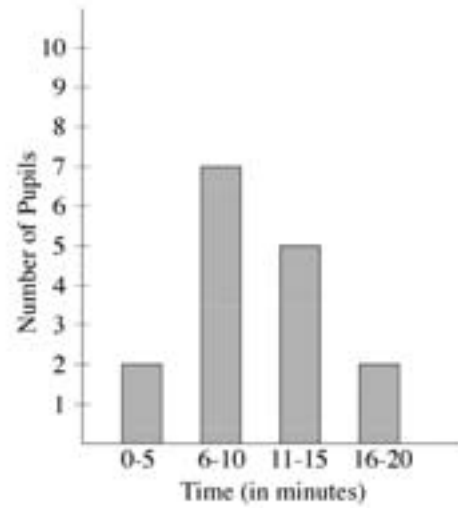
How many pupils must travel for MORE than 10 minutes?

A.   2

B.   5

C.   7

D.   8

E.   15

Item Number: H07

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, about how many defective light bulbs would be expected in the entire batch?

A. 15

B. 60

C. 150

D. 300

E. 600

Item Number: H11

The table shows the number of houses on two streets of a town, Konini Street and Rimu Street.

Street	Number of Houses
Konini	30
Rimu	21

The pictograph below represents the number of houses in each street.

Konini St.	⌂ ⌂ ⌂ ⌂ ⌂
Rimu St.	⌂ ⌂ ⌂ ⌂

How many houses does one ⌂ represent?

Answer: _____

Item Number: J13

The graph below shows the humidity in a room as recorded on a certain morning.

Humidity in Room

Time (a.m.) in hours

On the morning shown in the graph, how many times between 6 a.m. and 12 noon was the humidity exactly 20 percent?

A.   One

B.   Two

C.   Three

D.   Four

Item Number: L11

The eleven chips shown below are placed in a bag and mixed.

Chelsea draws one chip from the bag without looking. What is the probability that Chelsea draws a chip with a number that is a multiple of three?
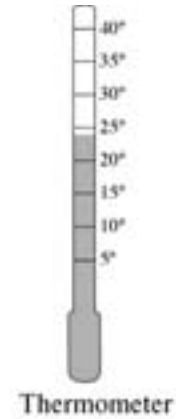
A. $\dfrac{1}{11}$

B. $\dfrac{1}{3}$

C. $\dfrac{4}{11}$

D. $\dfrac{4}{7}$

Item Number: N18

This table shows temperatures at various times on four days.

| TEMPERATURE					
	6 a.m.	9 a.m.	Noon	3 p.m.	6 p.m.
Monday	15°	17°	24°	21°	16°
Tuesday	20°	16°	15°	10°	9°
Wednesday	8°	14°	16°	19°	15°
Thursday	8°	11°	19°	26°	20°

Thermometer

On which day and at what time was the temperature shown in the table the same as that shown on the thermometer?

A. Monday, Noon

B. Tuesday, 6 a.m.

C. Wednesday, 3 p.m.

D. Thursday, 3 p.m.

Item Number: P16

The graph shows the time taken for a pendulum to swing backwards and forwards 20 times for different lengths of the string.
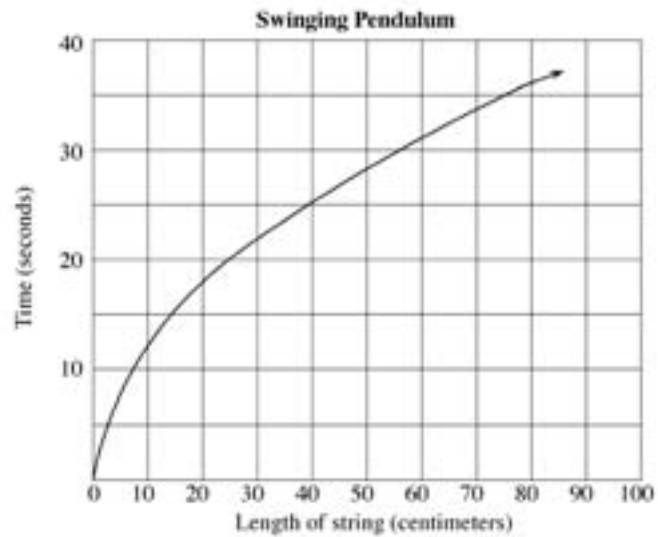
Swinging Pendulum

The length of a string is 90 cm. About how long would it take for the pendulum to swing backwards and forwards 20 times?

A.   35 seconds

B.   38 seconds

C.   42 seconds

D.   45 seconds

Item Number: R09

Chris plans to order 24 issues of a magazine. He reads the following advertisements for two magazines. *Ceds* are the units of currency in Chris' country.

Teen Life Magazine

24 issues
First four issues FREE
The rest
3 *ceds* each.

Teen News Magazine

24 issues
First six issues FREE
The rest
3.5 *ceds* each.

Which magazine is the least expensive for 24 issues? How much less expensive? Show your work.

Item Number: V02