

# Ten Mile Day

By Mary Ann Fraser / ISBN: 0-8050-4703-4

---

## Lesson by

Todd Zartman, Federal Reserve Bank of Philadelphia

---

## Lesson Description

In this multidisciplinary lesson, using the book *Ten Mile Day* by Mary Ann Fraser, students work in small groups ("work crews") while participating in a production activity. Students learn about competition, division of labor, and incentives. They also demonstrate how division of labor and incentives help lead to greater productivity.

---

## Age Level

10-12 years old

---

## Content Standards

### National Standards in Economics

- **Standard 1:** Students will understand that productive resources are limited. Therefore, people cannot have all the goods and services they want; as a result, they must choose some things and give up others.
  - Benchmark 12, Grade 4: Capital goods are goods produced and used to make other goods and services.
  - Benchmark 13, Grade 4: Human capital refers to the quality of labor resources, which can be improved through investments in education, training, and health.
- **Standard 4:** Students will understand that people respond predictably to positive and negative incentives.
  - Benchmark 1, Grade 4: Rewards are positive incentives that make people better off.
- **Standard 6:** Students will understand that when individuals, regions, and nations specialize in what they can produce at the lowest cost and then trade with others, both production and consumption increase.
  - Benchmark 2, Grade 4: Division of labor occurs when production of a good is broken down into numerous separate tasks, with different workers performing each task.

# Ten Mile Day

---

- Benchmark 3, Grade 4: Specialization and division of labor usually increase the productivity of workers.
- **Standard 15:** Students will understand that investment in factories, machinery, new technology, and the health, education, and training of people can raise future standards of living.
- Benchmark 1, Grade 4: When workers learn and practice new skills they are improving their human capital.
- Benchmark 2, Grade 4: Workers can improve their productivity by improving their human capital.
- Benchmark 3, Grade 4: Workers can improve their productivity by using physical capital such as tools and machinery.

---

## Concepts

Capital goods  
Division of labor  
Human capital  
Incentives  
Productivity

---

## Objectives

Students will:

1. Analyze the impact that improvements in human capital, the use of capital goods, incentives, and division of labor can have on productivity.
2. Define and give examples of capital goods and human capital.
3. Explain and give examples of division of labor.

---

## Time Required

60-90 minutes

## Materials

- *Ten Mile Day* (ISBN: 0-8050-4703-4) by Mary Ann Fraser—prior to reading the story, number the pages of the book or use sticky notes to number the pages.
- A copy of Handout 1 for each student
- Two copies of Handout 2A for each student and one for the teacher
- Two copies of Handout 2B for each student and one for the teacher
- Two copies of Handout 2A, for each work crew for Round 2
- Two copies of Handout 2B, for each work crew for Round 2
- A copy of Handout 2C, for each work crew
- A copy of Handout 3 for each student
- A brown and a black crayon or marker for each student
- A pair of scissors for each student
- A stapler or glue stick for each student
- Overhead markers
- Visuals 1, 2, and 3

---

## Procedures

1. Ask students if they have ever experienced a situation in which it was easier to accomplish a task by working as a group than it would have been to have worked on the task alone? (*Answers will vary but may include playing sports, shoveling snow, or moving personal possessions.*)
2. Tell students that you will be reading a story about the building of the transcontinental railroad, a railroad that connected the East Coast of the United States with the West Coast of the United States, and how the railroad work crews were able to successfully complete the transcontinental railroad in record time. Share the following information:
  - Emphasize to students that the completion of the transcontinental railroad was a great accomplishment. The railroad brought goods, services, and people from the East to the West and vice versa.
  - Completion of the railroad took highly motivated, hard-working, resourceful, and very productive work crews. Tell the students that productive means producing or making goods and services. In the story, the workers produce the service of laying railroad track. Students are productive, too. They produce projects, complete school work and so on.

## Ten Mile Day

---

- In the 1860s, no railroad ran across all of North America, connecting the Atlantic to the Pacific. It was quite a feat to complete this railroad because the terrain that the rails (or tracks) covered seemed impassable. Work crew members died laying the rails through the treacherous terrain.
  - What does it mean to be productive? (*Productive means that you produce goods and services.*)
3. Read pages 8–18 to the students. Discuss the following:
- What were some of the marvelous names that the work crews gave their work groups? (*“Fishplate Men,” “Gandy Dancers,” and “Track Liners.”*)
  - Why would the foreman of the work crew sing out simple tunes with strong beats during the construction of the railroad? (*The foreman would sing out simple tunes with strong beats to coordinate the movements and efforts of the crew. The songs would help the crew members synchronize their efforts and work together to accomplish the crew’s goal more efficiently. Teamwork among the crew members was imperative for the crew to lay 10 miles of track successfully in a day.*)
  - What is teamwork? (*Teamwork is a cooperative effort by the members of a group or team to achieve a common goal.*)
  - Give examples of times that teamwork helped you to accomplish a goal. (*Answers will vary but may include a school project or sports team victory.*)
  - What is a competition? (*A contest for some prize, honor, or advantage.*)
  - Give examples of times when you competed for a prize, honor, or advantage. (*Answers will vary but may include working on a school project or participating in sports.*)
  - What were some of the prizes, honors, or advantages you competed for? (*Answers will vary but may include medals, money, and recognition.*)
4. Explain that these prizes, honors, and advantages could be looked upon as incentives. Explain that **incentives** are actions, awards, and rewards that determine the choices people make. Discuss the following:
- Have you ever been motivated or persuaded by an incentive? (*Answers will vary. For example, an allowance is an incentive to do chores. Students might not want to do chores each day, but they do them because they want their allowance.*)

## Ten Mile Day

---

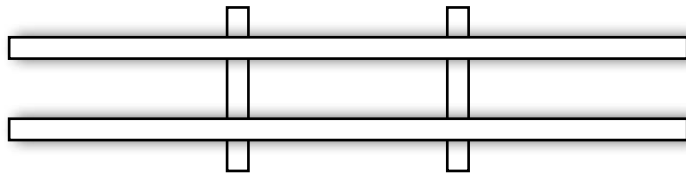
- In what way did competition and incentives inspire the work crews to complete 10 miles of track in one day and to be more productive? (*Answers will vary, but in this story, both competition and incentives such as four times the normal wages promised to the crews if they met the goal served to motivate the crews.*)
  - Why did the two sides decide to have a competition? (*The competition brought out the workers competitive nature and motivated them to complete the tasks more quickly.*)
  - What was the incentive for the crews to participate in the competition? (*The incentive was the bonus that would be paid to them if the project was completed on time or earlier.*)
5. Explain that the tools the work crews used and the skills and knowledge possessed by the work crews were very important in helping them meet their goal of a 10 mile day. Tools can help workers be more productive (complete more work than working with their hands alone) and meet goals. Tools are an example of capital goods. **Capital goods** are items made by people and used again and again to produce other goods and services. The skills, abilities, and knowledge an individual possesses are known as **human capital**.
  6. Ask students what capital goods and human capital the teacher uses to meet goals, complete work, and be more productive. (*Answers will vary but may include marking pen, computer, his or her education and continuing education, and the ability to read, write, and speak well.*)
  7. Distribute *Handout 1: Ten Mile Day Capital Goods* to the students. Display Visual 1. Write the definition of capital goods on the visual and tell students to write it on their copies of Handout 1. Give the following examples of capital goods: machines, tools, office buildings, and factories.
  8. Tell the students to write examples of four capital goods they have used in school on the lines provided on Handout 1. Check their handouts to see that they have written four possible answers. Ask four students to share one of their answers with the class. Write these answers on Visual 1 in the appropriate spaces.
  9. Instruct students to list four examples of capital goods from the story on the lines provided on Handout 1. Check their handouts to see that they have written four possible answers. Then ask eight students to share one of their answers. Ensure that each student gives a unique answer. Write these answers on Visual 1 in the appropriate spaces, and instruct students to add these responses to their copy of Handout 1.

# Ten Mile Day

---

10. Show students the illustrations on pages 9-18 of the book if students have problems remembering examples. The illustration on pages 9 and 10 shows an overview of the railroad being constructed with two trains pulling railway supplies. The other pages show illustrations of men using mauls, crowbars, tamping bars, shovels, and rail gauges, and trains pulling the supplies, water buckets, and iron cars to construct the railroad.
11. Tell students they will participate in an exercise that requires them to assemble as many completed sections of railroad track as possible in four minutes.
12. Divide the class into groups of four or five students. Each group is a work crew similar to the work crews mentioned in the story. Ask students to choose a name for their work crew. If time permits, have students share their group names with the class and explain why they chose that name. Explain that team names can be important. For example, in the book work crew names reflected the task that those members performed. Often, group names can lead to greater teamwork and a sense of belonging to a group.
13. Have students in each group arrange their desks to make a common work area or have them move so they have a common work area.
14. Tell students they are going to create assembled sections of railroad track. Show an assembled section of railroad track to the students. Explain that an assembled section of railroad track consists of two brown railroad ties (Handout 2A) and the two black railroad rails (Handout 2B) affixed to each other with four staples or four spots of glue. Demonstrate how to assemble a track as follows:

- Cut out two railroad ties from *Handout 2A: Railroad Ties* and color them brown. Cut out two railroad rails from *Handout 2B: Railroad Rails* and color each rail black. Explain to the students that they may color the activity sheets before cutting out the railroad ties and rails.



- Using the stapler or glue stick, connect each rail to two railroad ties to create a track section as shown in the figure above.
15. Tell students that they will have four minutes to produce as many complete track sections as they can. Only completed railroad track that meets production standards will count in this activity.

## Ten Mile Day

---

16. Explain that it is important for completed track sections to meet production standards because, in real life, if the track sections did not meet production standards, they might have broken and caused a train to derail—come off the track. In a derailment, the train's cargo would have been damaged or destroyed and passengers and train crew members could have been injured or killed.
17. Serve as the quality control inspector or assign that role to a student. The quality control inspector will determine whether the track sections assembled by each crew are complete and meet production standards. Those sections that are complete and meet the standards should be included in each crew's total. All incomplete sections of track and those that do not meet the quality control standards should be discarded.
18. Distribute two copies of Handout 2A, two copies of Handout 2B, scissors, one brown crayon, one black crayon, and a stapler or glue stick to each student. Check to make sure all the students understand what a correctly assembled track section looks like.

### Round 1

19. Tell students that during Round 1 each student is a track section producer. Each student will make his or her own track sections, even though they are arranged in work crews and sitting in their work areas.
20. Give the students four minutes to produce track sections.
21. Tell the students to stop and put down the scissors, crayons, and staplers or glue sticks. Have the quality control inspector quickly check the completed railroad sections. Discard all incomplete and defective sections. Tell each crew to count the total number of remaining track sections produced by the students in the crew.
22. Distribute a copy of Handout 2C to each student. Display Visual 2 and explain that the numbers in the first column are examples. Explain that **productivity** is defined as the amount of output produced per unit of input during some period of time—day, week, month, and so on. Using the sample numbers, demonstrate how to calculate productivity. (Completed track sections produced in four minutes (12) divided by the number of workers (4) equals the output per worker—productivity.)

## Ten Mile Day

---

23. Review the following:
- Number of workers in crew = the number of students grouped together by desks or work area.
  - Number of completed track sections = the number of completed track sections that were declared to meet quality standards by the quality control inspector.
  - Productivity = output per worker in 4 minutes. Completed track sections (line 2) divided by (÷) the number of workers (line 1) = Productivity (line 3).
24. Have the students in each work crew record the number of completed track sections and the number of workers and then calculate and record output per worker for their crew.
25. Display Visual 3 and record each work crew's production totals for round one.
26. Ask the students how they, as work crews, could change their production process for making track sections, so that they could produce more track sections in the same amount of time. (*Answers will vary but will likely include dividing the labor among work crew members and specializing—having individual work crew members perform just one task of the track section production process.*)
27. Explain that **division of labor** is an approach to completing a complex task that involves breaking down the task into a number of smaller, simpler tasks and assigning these tasks to individuals who generally perform only their assigned task.

### Round 2

28. Explain that each individual member of the work crew probably has certain skills and knowledge, human capital, that makes that member good at performing certain tasks necessary to produce completed rail sections. For example, one member might be able to cut out the track sections better than another.
29. Give the work crews time to decide what task each student in their crew will perform.



# Ten Mile Day

---

30. Distribute two copies of Handout 2A and two copies of Handout 2B to each work crew. Repeat steps 20 and 21 from Round 1. Students should record their results on Handout 2C in the Round 2 column. Use Visual 2, again, to help the students calculate productivity. Discuss the following:
- What happened to productivity (output per worker) in Round 2? *(It increased.)*
  - Why did productivity increase? *(Each student was able to perform his or her assigned task more quickly.)*
  - How was this similar to what happened in the book *Ten Mile Day*? *(In the book, division of labor and teamwork led to increased productivity, which enabled the work crews to meet their goals. As a result, members of the work crews collected their incentives. That is, they earned higher wages.)*
  - How did your method of division of labor differ from the one used by the crews in the book? If so, in what way did it differ? *(The workers moved along the track doing different jobs. Each student passed the track among them to assemble the parts.)*
  - What do you predict would happen if we did another round? *(There would be an increase in output.)* Explain. *(Workers had practice, an investment in human capital.)*
  - How did railroads increase productivity in the United States? *(Answers will vary but may include division of labor, better tools and equipment, and use of incentives.)*

Note: If some work crews did not experience an increase in productivity between Rounds 1 and 2, ask students why this might have occurred. *(Explain that this may have occurred because the work crew members needed practice in their chosen task [an investment in their human capital] or the work crew's teamwork needed improvement.)* If possible, allow the crews to discuss any problems and correct them. Then conduct a third round of production.

---

## Closure

31. Review the key points of the lesson with the following questions:
- What is an incentive? *(Incentives are actions, awards, and rewards that determine the choices people make.)*
  - Give examples of incentives your family gives to encourage you to do your school work well or to do chores at home. *(Answers may vary but may include providing an allowance, being treated to pizza, or being given special prizes.)*

## Ten Mile Day

---

- Did competition play a part in the number of rail sections your crew completed? *(Answers will vary, but students will likely mention that it motivated them to succeed.)* How did competition play a part in the story? *(Competition between the two railroad companies motivated the companies to complete more track than they had before.)*
- What is division of labor? *(An arrangement in which workers perform only one step or a few steps in a larger production process.)* Division of labor often leads to higher productivity. Give examples of division of labor from the story. For example, "ironmen" only laid the iron train rails; a "pioneer" aligned the railroad ties; the "track-gauge" team only measured the rails to ensure they were the correct distance apart; and "fishplate men" tightened the nuts on the plates that held the rails in place.)
- What is productivity? *(Productivity is a measure relating a quantity or quality of output to the inputs required to produce that output during a specified amount of time—per minute, per hour, per day, per year.)*
- Why does division of labor tend to lead to greater productivity? *(Because workers perform only one task or a few steps in production, these workers are able to produce quickly, master their tasks, and efficiently carry out their tasks in the production process.)*
- What is human capital? *(The knowledge and skills people obtain through education, experience, and training.)*
- How did you improve your human capital from one round of production to another? *(Through practice—as each task is completed over and over, the skills necessary to complete the task successfully improve.)*
- Give examples of human capital that workers in the story possessed. *(Answers will vary, but may include ability to make mathematical calculations and read measuring instruments [surveyors], ability to read plans/blueprints, and the ability to skillfully operate machinery and hand tools.)*
- What are some examples of human capital that you possess? *(Answers will vary but should include the abilities to read, write, compute, and work in groups.)*
- How do you invest in your human capital? *(Answers will vary, but may include by attending school, through practice, by watching others.)*
- What is teamwork? *(Teamwork is a cooperative effort by the members of a group or team to achieve a common goal.)*
- How did the completion of railroads lead to increased productivity in the United States? *(Completion of the railroads allowed for the transportation of more resources, more workers, and more goods all over the U.S. in less time.)*

## Assessment

32. Distribute Handout 3 to the students. Read and explain the directions.

## Handout 1: Ten Mile Day Capital Goods

**Capital Goods** are:

Four capital goods used in school:

- 
- 
- 
- 

Four capital goods used in the story:

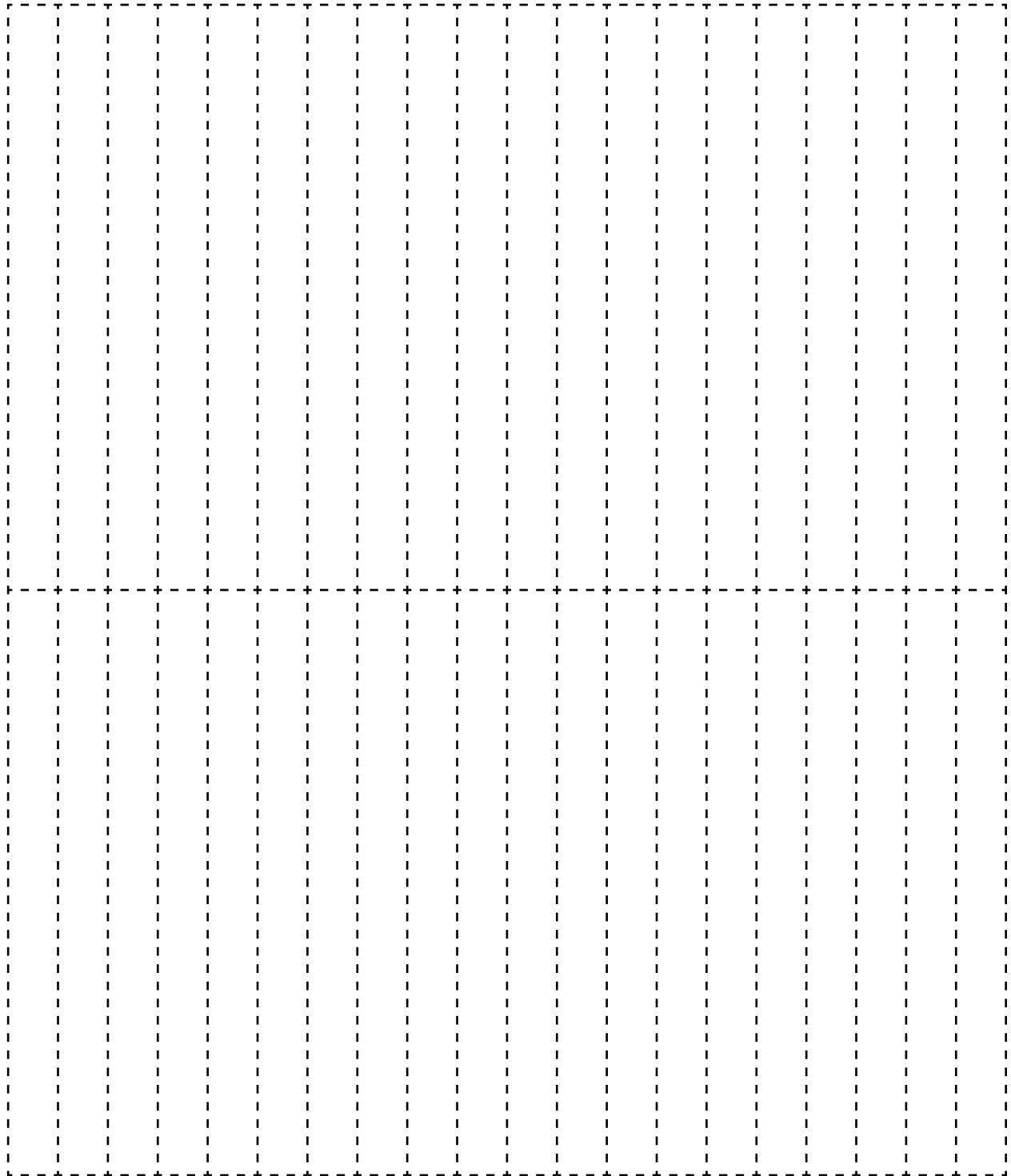
- 
- 
- 
- 

More examples of capital goods used in the story:

- 
- 
- 
-

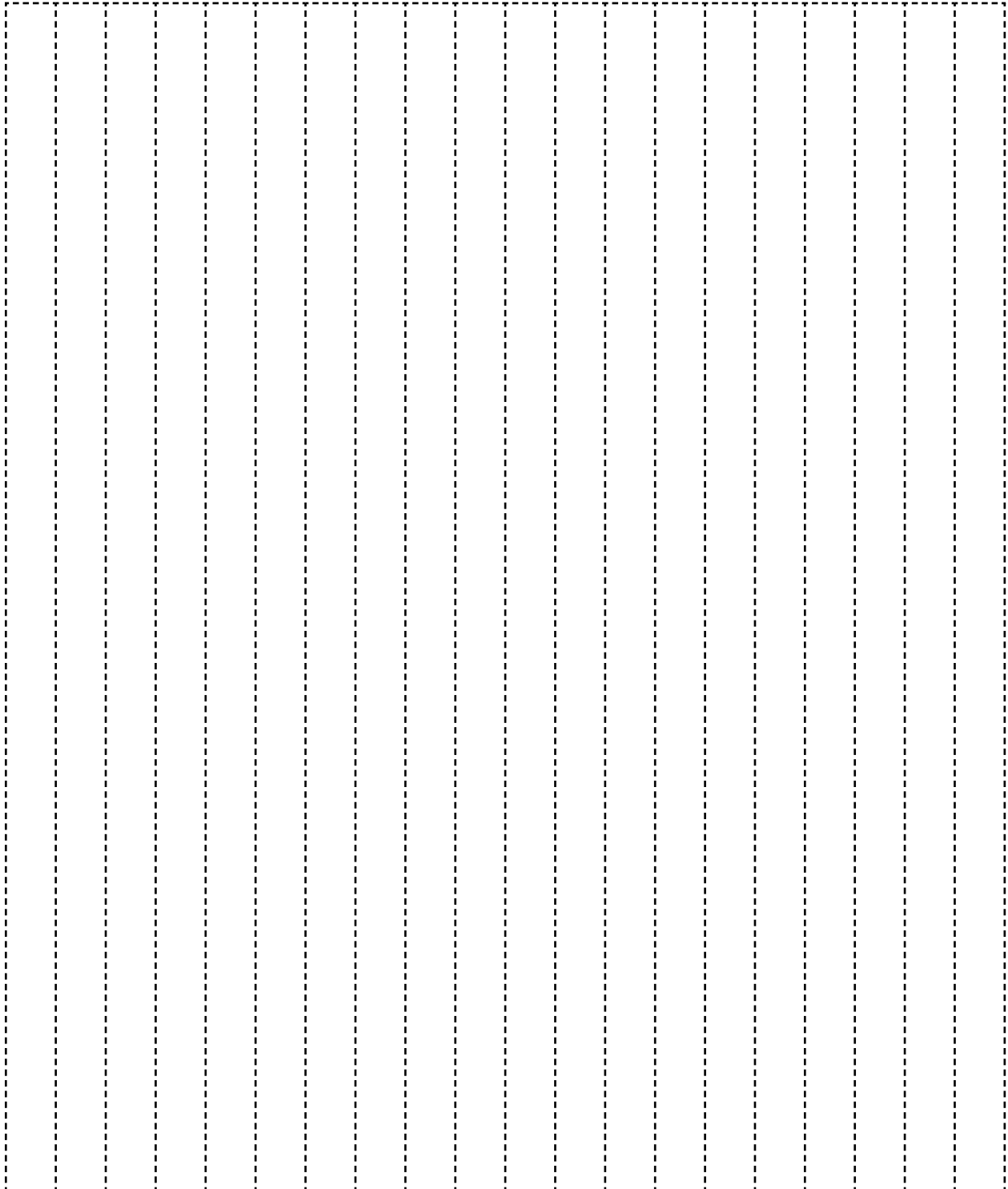
## Handout 2A: Train Track Parts—Railroad Ties

Color each tie brown. Two ties will be attached underneath two black rails.



## Handout 2B: Train Track Parts—Railroad Rails

Color each rail black. Two rails will be attached on top of two brown ties.



## Handout 2C: Crew Productivity Data

Name of work crew: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

	<b>Example</b>	<b>Round 1</b>	<b>Round 2</b>
Number of workers in crew	4		
Number of completed track sections	12		
Productivity: output per worker in 4 minutes Completed track sections (line 2) ÷ number of workers (line 1) = Productivity (line 3)	3		

## Handout 3: Ten Mile Day Assessment

**WORD BANK: (Each letter is used only once.)**

- |                      |                  |
|----------------------|------------------|
| A. Capital goods     | F. Competition   |
| B. Division of labor | G. Human capital |
| C. Incentives        | H. Productivity  |
| D. "Golden Spike"    | I. Teamwork      |
| E. Ten miles         |                  |

DIRECTIONS: Match the letter of the term with the sentence below that best describes that term.

1. \_\_\_\_\_ Actions, awards, or rewards that determine the choices people make.
2. \_\_\_\_\_ Cooperative effort by the members of a group or team to achieve a common goal.
3. \_\_\_\_\_ Last item used to bring the two sets of completed tracks together and complete the transcontinental railroad.
4. \_\_\_\_\_ A contest for some prize, honor, or advantage.
5. \_\_\_\_\_ Skills, abilities, and knowledge an individual possesses.
6. \_\_\_\_\_ An arrangement in which workers perform only one step or a few steps in a larger production process (as when working on an assembly line).
7. \_\_\_\_\_ The record distance that work crews successfully laid rails in one day.
8. \_\_\_\_\_ The amount of output produced per unit of input, per unit of time.
9. \_\_\_\_\_ Items made by people and used again and again to produce other goods and services.



### Handout 3: Ten Mile Day Assessment (Continued)

Read the paragraph below and answer the questions that follow.

You and three friends are producing decorated cookies for a bake sale. You have 12 dozen (144) cookies to decorate. In one hour, you have decorated 12 cookies. At this rate it will take you 11 more hours to finish. You won't meet the deadline. You ask your grandmother for help, and she comes to observe you. She sees that each of you is decorating one cookie at a time. She notices that the cookies are iced with white icing, a trim of yellow icing is piped along the edge, a school logo template is placed on top, then green sprinkles are sprinkled on the template, and the cookie is placed in a bag.

- A. What is the productivity of your group (you and your three friends)? Show your work.
  
- B. What suggestions do you think your grandmother might make to help you increase your productivity, especially if she had read about the work crews mentioned in the book and had experienced a lesson about productivity? Why would your grandmother's suggestions help you meet the deadline?

## Handout 3: Ten Mile Day Assessment—Answer Key

**WORD BANK: (Each letter is used only once.)**

- |                      |                  |
|----------------------|------------------|
| A. Capital goods     | F. Competition   |
| B. Division of labor | G. Human capital |
| C. Incentives        | H. Productivity  |
| D. "Golden Spike"    | I. Teamwork      |
| E. Ten miles         |                  |

DIRECTIONS: Match the letter of the term with the sentence below that best describes that term.

1. C Actions, awards, or rewards that determine the choices people make.
2. I Cooperative effort by the members of a group or team to achieve a common goal.
3. D Last item used to bring the two sets of completed tracks together and complete the transcontinental railroad.
4. F A contest for some prize, honor, or advantage.
5. G Skills, abilities, and knowledge an individual possesses.
6. B An arrangement in which workers perform only one step or a few steps in a larger production process (as when working on an assembly line).
7. E The record distance that work crews successfully laid rails in one day.
8. H The amount of output produced per unit of input, per unit of time.
9. A Items made by people and used again and again to produce other goods and services.

### Handout 3: Ten Mile Day Assessment—Answer Key (Continued)

Read the paragraph below and answer the questions that follow.

You and three friends are producing decorated cookies for a bake sale. You have 12 dozen (144) cookies to decorate. In one hour, you have decorated 12 cookies. At this rate it will take you 11 more hours to finish. You won't meet the deadline. You ask your grandmother for help, and she comes to observe you. She sees that each of you is decorating one cookie at a time. She notices that the cookies are iced with white icing, a trim of yellow icing is piped along the edge, a school logo template is placed on top, then green sprinkles are sprinkled on the template, and the cookie is placed in a bag.

- A. What is the productivity of your group (you and your three friends)?

Show your work.

$$12 \text{ cookies} \div 4 \text{ workers} = 3 \text{ cookies per hour.}$$

- B. What suggestions do you think your grandmother might make to help you increase your productivity, especially if she had read about the work crews mentioned in the book and had experienced a lesson about productivity? Why would your grandmother's suggestions help you meet the deadline?

*She might suggest that your group use division of labor. Each group member would carry out one of the four tasks involved in decorating the cookie. These include icing the cookies with white icing, piping the yellow icing around the edge, placing the template on top and shaking on the green sprinkles, and placing the cookie in a plastic bag.*

*Grandmother's suggestions would help the group meet the deadline because division of labor would increase productivity; that is, it would allow more cookies to be decorated in the same amount of time.*

## Visual 1: Ten Mile Day Capital Goods

**Capital Goods** are:

Four capital goods used in school:

- 
- 
- 
- 

Capital goods used in the story:

- 
- 
- 
- 
- 
- 
- 
- 
-

### Visual 1: Ten Mile Day Capital Goods—Answer Key

#### **Capital Goods** are:

*Items made by people and used again and again to produce other goods and services. Machines, tools, and factories are examples of capital resources.*

#### Four capital goods used in school:

*(Possible answers could include the following.)*

- *Chairs*
- *Computers*
- *Desks or tables*
- *Overhead projector*

#### Capital goods used in the story:

*(Possible answers could include the following.)*

- *Crowbars*
- *Iron cars*
- *Mauls or sledgehammers*
- *Shovels*
- *Rail gauges*
- *Tamping bars*
- *Trains (those pulling the supplies)*
- *Water carriers (two buckets [one bucket on each end] attached to a pole)*

## Visual 2: Work Crew Productivity Data

Name of work crew: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

Name of crew member: \_\_\_\_\_

	<b>Example</b>	<b>Round 1</b>	<b>Round 2</b>
Number of workers in crew	4		
Number of completed track sections	12		
Productivity: output per worker in 4 minutes Completed track sections (line 2) ÷ number of workers (line 1) = Productivity (line 3)	3		

**Visual 3: Class Work Crew Productivity Data**

<b>Crew Name</b>	<b>Round 1</b>	<b>Round 2</b>