LESSON 5-4

Ready to Go On? Problem Solving Intervention

Solving Proportions

You can write and solve proportions to see what will happen if a rate continues.

At 2:10 P.M., your family began a 58-mile car trip to Grandma's. At 2:50 P.M., you have gone 23 miles. At this rate, will you get there by 3:30 P.M.?

Understand the Problem

1. How many miles is the whole trip to Grandma's? How many miles have you driven so far?

   58 miles; 23 miles

2. Do you have to find the exact time of arrival?

   No; only if you will get there by 3:30.

3. If you arrive at 3:30, how long will the whole trip have taken?

   1 hour and 20 minutes, or 80 minutes

Make a Plan

4. Let x be the number of minutes it takes for the whole trip. What must x be less than or equal to for you to arrive in time? 80

5. Complete the proportion to show how you could find x.

   $\frac{23 \text{ miles}}{40 \text{ minutes}} = \frac{58 \text{ miles}}{x \text{ minutes}}$

6. Why can you estimate or use mental math to solve the problem?

   Sample answer: You don't need to find an exact amount, just if $x < 80$.

Solve

7. Is 58 miles greater than or less than 2 times 23 miles?

   greater than

8. Why must x be more than 80?

   Since $58 > 2 \cdot 23$, $x > 2 \cdot 40$.

Check

9. Make sure you answer the question that the problem asks.

   No, at that rate I won't make it by 3:30.

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SECTION 5A

Ready to Go On? Quiz

5-1 Ratios and Proportions

Simplify to tell whether the ratios form a proportion.

1. $\frac{4}{9}$ and $\frac{28}{63}$ yes
2. $\frac{35}{56}$ and $\frac{45}{70}$ no
3. $\frac{21}{96}$ and $\frac{7}{32}$ yes
4. $\frac{5}{6}$ and $\frac{15}{22}$ no

5. Kara found a recipe that called for 0.5 cup of blueberries to make 30 blueberry pancakes. She created the table shown here to make 24 or 36 pancakes. Is she following the recipe?

Blueberries (c)	Number of Pancakes
0.3	24
0.6	36

She is following the recipe for 36 pancakes but not for 24.

The specifications from a cement manufacturer for making concrete call for 1 part cement, 4 parts gravel, and 2.5 parts sand, all by volume.

6. How many cubic yards of cement and sand should be mixed with 18.4 cubic yards of gravel?

   4.6 yd^3 of cement and 11.5 yd^3 of sand

7. How many cubic yards each of cement, gravel, and sand are needed to produce 165 cubic yards of concrete?

   22 yd^3 of cement, 88 yd^3 of gravel, 55 yd^3 of sand

5-2 Ratios, Rates, and Unit Rates

8. The mass of a chunk of titanium is 55 g. The volume is 12.5 cm^3. What is the density of the chunk of titanium? 4.4 g/ cm^3

8. Bixbyite is a rare mineral with a density of 4.95 g/cm^3. What is the volume of a piece of bixbyite with a mass of 101.97 g? 20.6 cm^3

9. Maria's St. Bernard, Arfy, is fed the same amount of food every day. If Arfy gets fed 36.75 cups of dog food per week, how many cups of dog food does he get fed per day? 5.25 cups

Determine the better buy.

10. 40 lb of potatoes for $11.20 or 60 lb of potatoes for $16.20 60 lb

11. $35.7 for 15 gallons of gas or $64.80 for 27 gallons of gas 15 gal

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SECTION 5A

Ready to Go On? Quiz continued

5-3 Dimensional Analysis

Find the appropriate factor for each conversion.

12. miles to feet $\frac{5{,}280 \text{ ft}}{1 \text{ mile}}$
13. seconds to minutes $\frac{1 \text{ minute}}{60 \text{ seconds}}$
14. cups to quarts $\frac{1 \text{ quart}}{4 \text{ cups}}$

Use conversion factors to find each unit to the nearest hundredth.

15. 16 yards to feet 48 ft
16. 88 gallons to quarts 352 qt
17. 2,890 meters to kilometers 2.89 km
18. 620 seconds to minutes 10.33 min
19. 4.5 tons to pounds 9,000 lb
20. 200 inches per year to yards per year 5.56 yd/yr
21. Driving at a constant rate, Joanne traveled 225 kilometers in 3.5 hours. Express her driving rate in meters per minute. 10.71 m/min

5-4 Solving Proportions

Solve each proportion to the nearest hundredth.

22. $\frac{12{,}000 \text{ tons}}{8 \text{ weeks}} = \frac{t \text{ tons}}{22 \text{ weeks}}$ 33,000 t
23. $\frac{440 \text{ meters}}{32 \text{ seconds}} = \frac{200 \text{ meters}}{s \text{ seconds}}$ 14.55 sec
24. $\frac{464 \text{ feet}}{8 \text{ days}} = \frac{522 \text{ feet}}{d \text{ days}}$ 9 days
25. $\frac{\$178.50}{17 \text{ hours}} = \frac{\$\ d}{28 \text{ hours}}$ $294
26. Jonathan conducted 24 telephone surveys in 6 hours. At this rate, how long will it take him to conduct 15 more telephone surveys? 3.75 h

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SECTION 5A

Ready to Go On? Enrichment

Acceleration

Velocity is a ratio of distance to time. Acceleration is a ratio of change in velocity to time. If a car accelerates from 50 miles/hour to 60 miles/hour in 5 seconds, the acceleration is 2 miles per hour per second.

These three equations can be used to solve problems involving acceleration:

(a) $d = v_o t + \frac{1}{2}at^2$

(b) $v_f = v_o + at$

(c) $v_f^2 - v_o^2 = 2ad$

d	Distance
v_o	Original velocity, the velocity at the beginning of acceleration
v_f	Final velocity, the velocity at the end of acceleration
a	Acceleration that is constant
t	Time, the time during which acceleration occurs

Suppose a car is traveling at 35 miles per hour and accelerates for 15 seconds at a rate of 1 mile per hour per second. How many feet does the car travel in that 15 seconds?

$d = v_o t + \frac{1}{2}at^2$

$= \left(35 \cdot \frac{5{,}280}{3{,}600}\right)(15) + \frac{1}{2}\left(\frac{5{,}280}{3{,}600}\right)(15)^2$

$= 770 + 165 = 935$ ft

$v_o = 35$ miles/hour $= 35 \cdot \frac{5{,}280}{3{,}600}$ feet/sec

$a = 1$ mile/hour/sec $= 1 \cdot \frac{5{,}280}{3{,}600}$ feet/sec^2 $= \frac{5{,}280}{3{,}600}$ feet/sec^2

$t = 15$ seconds

The car travels 935 feet.

1. A car is traveling at 45 miles per hour and accelerates for 10 seconds at a rate of 2 miles per hour per second. About how many feet does the car travel in that 10 seconds? 806.6 feet
2. A motorcycle accelerates from 0 to 40 miles/hour in 8 seconds.
   a) What it its approximate rate of acceleration in feet per seconds? *Hint:* Use equation (b). 7.3 feet/sec^2
   b) How many feet does it travel in that period of time? 234.6
3. A truck accelerates from 0 to 60 miles/hour with a constant acceleration of 1.5 miles/hour/sec. How many feet does it travel in the time it takes to reach 60 miles/hour. *Hint:* Use equation (c). 1,760 feet
4. Form three different formulas for acceleration, each one based on one of the equations given above. $a = 2\left(\frac{d - v_0 t}{t^2}\right)$; $a = \frac{v_f - v_0}{t}$, $\frac{v_f^2 - v_o^2}{2d}$

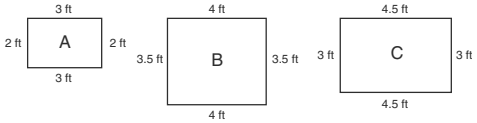
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SECTION 5B Ready to Go On? Quiz

5-5 Similar Figures

1. Which rectangles are similar? A and C



2. Jaime found a picture that he wanted to fit into a collage he was making. The picture was 5 inches wide and 4 inches tall. He enlarged the picture to a width of 12.5 inches. How tall was the enlarged picture? 10 inches

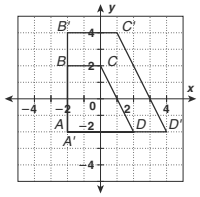
3. Laura had a photo of her dog that she wanted to enlarge to fill a frame. The original photo was 5 inches wide and 8 inches tall. The enlargement was 9.6 inches tall. How wide was the enlargement? 6 inches

4. A computer screen contained the picture of an office building. The measurement of the building on the screen was 14 cm tall by 2.6 cm tall. The image was projected onto a wall where the height of the building measured 91 cm. What was the width of the building as measured on the wall? 16.9 cm

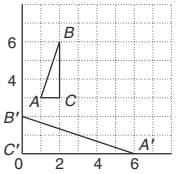
5-6 Dilations

Tell whether the transformation is a dilation.

5. yes



6. yes



7. A triangle has vertices with coordinates (0,0), (−3, 4), and (5, −1). If the triangle is dilated by a scale factor of 2 with the origin as the center of dilation, what are the coordinates of the vertices of the image?

(0, 0), (−3, 4), (5, −1)

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SECTION 5B Ready to Go On? Quiz continued

5-7 Indirect Measurement

8. Maureen is walking past a tree. Maureen's height is 5 ft and her shadow at that moment is 5.5 ft. The tree's shadow is 44 ft. How tall is the tree? 40 ft

9. A blimp is positioned over a field. The shadow of the blimp strikes the ground 1,200 feet from a point directly under the blimp. A meter stick stuck in the ground directly under the blimp casts a shadow of 120 cm. What is the height of the blimp? 1,000 ft

10. A street lamp is 20 feet tall and casts a shadow 14 feet long. Attached part way up the street lamp is a parking sign. The shadow of the upper edge of the parking sign is 5.6 feet from the base of the street lamp. How high off the ground is the upper edge of the parking sign? 8 feet

11. A professional basketball player is talking on the sidewalk with her coach. The player is 6.4 feet tall and casts a shadow 3.5 feet long. The shadow cast by the coach is 3.1 feet long. Approximately how tall is the coach? 5.7 feet

5-8 Scale Drawings and Scale Models

12. The model of rocket was built using a scale of 2 inches:5 feet. If the length of the model was 22 inches, what was the length of the actual rocket? 55 feet

13. Eric was examining a dust particle under a microscope using the 400:1 setting. The dust particle appeared to have a length of 80 mm. What was the actual length of the dust particle? 0.2 mm

14. The length of an object on a scale drawing is 6 cm. The actual length of the object is 54 cm. What is the scale of the drawing? 1:9

15. Sam is going to build a scale model of sailboat with a length of 75 ft. He has decided upon the scale 3 inches:10 feet. How long will Sam's model be? 22.5 inches

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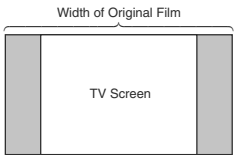
SECTION 5B Ready to Go On? Enrichment

Aspect Ratios

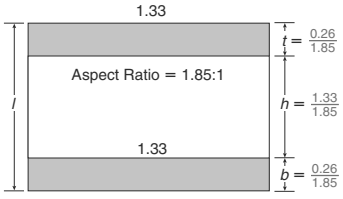
Aspect ratio is the ratio of the width of a picture to the height of a picture. The screens of traditional television sets have an aspect ratio of 4:3, or 1.33:1. One common aspect ratio used for films today is the widescreen format of 1.85:1.

1. The diagram on the right shows what happens when the full height of a movie with an aspect ratio of 1.85:1 is shown on a standard TV screen. About what percent of the original image appears to get cut off?

About 25%



The situation gets a little more interesting when the full width of a movie with an aspect ratio of 1.85:1 is shown centered on a standard TV screen.



2. In the diagram, the width of the 1.85:1 film is shown conforming to the width of the 1.33:1 TV screen. Write and solve a proportion to find the relative height *h* of the displayed film. Fill in that dimension on the diagram, leaving it as a fraction. $\frac{1.85}{1} = \frac{1.33}{h}$ $h = \frac{1.33}{1.85}$

3. The unused areas of the TV screen, shown in gray, are equal in size. Use the dimension you found for *h* to determine relative dimensions for *t* and *b*. Fill in those dimensions on the diagram leaving them as fractions.

4. About what percent of the TV screen is used by the film image? How does that compare with your answer to question 1?

72%; The percent of original film lost when the height of the film is preserved is the same as the percent of the TV screen lost when the width of the screen is preserved.

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LESSON 6-1 Ready to Go On? Skills Intervention

Relating Decimals, Fractions, and Percents

Percents are ratios that compare a number to 100.

Vocabulary
percent

Finding Equivalent Ratios and Percents

Find the missing ratio or percent equivalent for each letter *A* – *C* on the number line.



A. 5%

$\frac{5}{100}$ Write the percent as a fraction. What number is the denominator?

$\frac{1}{20}$ Divide both the numerator and denominator by the GCF: 5.

B. $\frac{3}{8}$

3 ÷ 8 = 0.375 Divide the numerator by the denominator.

0.375 • 100 = 37.5 Multiply the quotient by 100.

Insert a percent sign. What is the percent equivalent of $\frac{3}{8}$? 37.5%

C. 40%

$\frac{40}{100}$ Write as a fraction. What is the denominator? 100

$\frac{2}{5}$ Divide both the numerator and denominator by the GCF: 20

Comparing and Ordering Fractions, Decimals, and Percents

Write $\frac{1}{4}$, 0.26, and 15% in order from least to greatest.

Write each number as a percent.

$\frac{1}{4}$ = 0.25 Convert the fraction to a decimal.

0.26 = 26 % Convert the decimals to percents by moving the decimal point and inserting a percent symbol.

0.25 = 25 %

15% < 25 % < 26 % Order the percents.

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