

Name _____

Reteaching

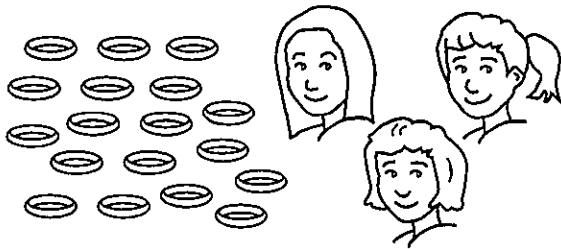
10-1

Understanding Rates

A rate is a ratio in which the two terms are measured in different units.

Example: 18 bracelets for 3 girls.

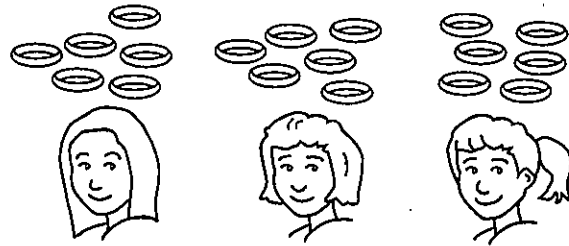
$$\frac{18 \text{ bracelets}}{3 \text{ girls}}$$



In a unit rate, the second number is 1.

Example: 6 bracelets for 1 girl.

$$\frac{6 \text{ bracelets}}{1 \text{ girl}}$$



Remember that the fraction bar shows division. If you know a rate, you can divide to find the unit rate.

Example: 17 goals in 5 games is written as $\frac{17 \text{ goals}}{5 \text{ games}}$.

$$\begin{array}{r} 3.4 \\ 5 \overline{)17.0} \end{array}$$

The unit rate is 3.4 goals per game. (Per means "for each".)

Write the rate and the unit rate.

1. 25 flowers for 5 vases
 $\frac{25 \text{ flowers}}{5 \text{ vases}}$, $\frac{5 \text{ flowers}}{1 \text{ vase}}$

2. 32 games in 8 weeks
 $\frac{32 \text{ games}}{8 \text{ weeks}}$, $\frac{4 \text{ games}}{1 \text{ week}}$

3. 144 pencils in 12 packages
 $\frac{144 \text{ pencils}}{12 \text{ pkgs}}$, $\frac{12 \text{ pencils}}{1 \text{ pkg}}$

4. 252 students in 9 classes
 $\frac{252 \text{ students}}{9 \text{ classes}}$, $\frac{28 \text{ students}}{1 \text{ class}}$

5. \$13.20 for 6 pounds
 $\frac{\$13.20}{6 \text{ lbs}}$, $\frac{\$2.20}{1 \text{ lb}}$

6. 34 minutes for 8 pages
 $\frac{34 \text{ minutes}}{8 \text{ pages}}$, $\frac{4.25 \text{ minutes}}{1 \text{ page}}$

7. **Number Sense** If a car travels 350 miles in 7 hours, what is its rate per hour?

50 miles per hour

8. **Estimation** Bare root plum trees are on sale at 3 for \$40. To the nearest dollar, what is the cost per tree?

\$13 per tree

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Practice

10-1

Understanding Rates

Write the rate and the unit rate.

1. 42 bricks laid in 2 hours
 $\frac{42 \text{ bricks}}{2 \text{ hours}}$ ' $\frac{21 \text{ bricks}}{1 \text{ hour}}$

2. 15 points scored in 4 quarters
 $\frac{15 \text{ points}}{4 \text{ quarters}}$ ' $\frac{3.75 \text{ points}}{1 \text{ quarter}}$

3. 225 chairs in 15 rows
 $\frac{225 \text{ chairs}}{15 \text{ rows}}$ ' $\frac{15 \text{ chairs}}{1 \text{ row}}$

4. 24 trees pruned in 5 days
 $\frac{24 \text{ trees}}{5 \text{ days}}$ ' $\frac{4.8 \text{ trees}}{1 \text{ day}}$

5. 480 miles in 12 hours
 $\frac{480 \text{ miles}}{12 \text{ hours}}$ ' $\frac{40 \text{ miles}}{1 \text{ hour}}$

6. \$6.50 for 10 pounds
 $\frac{\$6.50}{10 \text{ lbs}}$ ' $\frac{\$0.65}{1 \text{ lb}}$

7. 72 plants in 9 square feet
 $\frac{72 \text{ plants}}{9 \text{ sq ft}}$ ' $\frac{8 \text{ plants}}{1 \text{ sq ft}}$

8. 357 miles on 14 gallons
 $\frac{357 \text{ miles}}{14 \text{ gal}}$ ' $\frac{25.5 \text{ miles}}{1 \text{ gal}}$

9. **Estimation** Over 5 days, 8,208 people visited an amusement park. About how many people visited the park per day?

About 1,600 per day

10. **Writing to Explain** Explain how you could convert a rate of 18,000 miles per hour to miles per second.

Divide 18,000 by 60 to get miles per minute, $18,000 \div 60 = 300$ miles per minute. Then divide 300 by 60 to get miles per second, $300 \div 60 = 5$ miles per second.

11. **Critical Thinking** Matt makes 5 bookcases in 8 days. What is his unit rate?

0.625 bookcases per day

12. A space shuttle orbits Earth 1 time in 90 minutes. How many times does it orbit Earth in 6 hours?

4 times

13. Which is the unit rate for 39 people in 3 vans?

A 39 people per van

C 13 people per van

B 13 vans per person

D 3 people per van

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Rates of Rhythm

Franklin wants to begin taking drum lessons after basketball practice. Practice begins tomorrow, November 1, and lasts until 4:30 p.m. every school day. He found information for local music instruction centers.

Decision Making

	The Music School	Melody Maker	New Notes
Start Date	November 24	Anytime	November 15
Lesson Times	Mondays and Wednesdays 4:00–5:30 P.M.	Tuesdays 5:00–6:00 P.M. and Saturdays 10:00–11:00 A.M.	Monday, Wednesday, and Friday 5:00–5:45 P.M.
Number of Lessons	15	20	12
Cost	\$12 per lesson	\$200 for 20 lessons	\$27 per week

1. What is the unit rate for each lesson?
- | | |
|--------------------|-------------|
| A The Music School | <u>\$12</u> |
| B Melody Maker | <u>\$10</u> |
| C New Notes | <u>\$9</u> |

2. How would you answer Exercise 1 if you were to write the unit rate in cost per hour?

	Hours per payment	Cost per hour
A The Music School	<u>1½ hr</u>	<u>\$8</u>
B Melody Maker	<u>20 hr</u>	<u>\$10</u>
C New Notes	<u>2¼ hr</u>	<u>\$12</u>

3. What other factors should Franklin consider before choosing a music instruction center?

Sample answer: The start date, and the time the lessons start

4. Which instruction center do you think Franklin should choose? Explain.

Sample answer: Melody Maker; The start date is anytime and the time is convenient.

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Comparing Rates

Use unit rates to compare two rates that have the same units of measurement.

Daniel painted 9 planks in 6 minutes. Meredith painted 22 planks in 11 minutes. Who painted at a faster rate?

Write each rate as a unit rate.

Daniel's Rate: $\frac{9 \text{ planks}}{6 \text{ min}}$

$$= \frac{9 \text{ planks} \div 6}{6 \text{ min} \div 6} = \frac{1.5 \text{ planks}}{1 \text{ min}}$$

Meredith's Rate: $\frac{22 \text{ planks}}{11 \text{ min}}$

$$= \frac{22 \text{ planks} \div 11}{11 \text{ minutes} \div 11} = \frac{2 \text{ planks}}{1 \text{ min}}$$

Since 2 is greater than 1.5, Meredith is the faster painter. The faster rate is 22 planks in 11 min.

Find each unit rate and determine which rate is greater.

1. 51 hits on Jon's website in 3 h or 96 hits on Shana's website in 6 h
Jon's unit rate: $\frac{17 \text{ hits}}{1 \text{ h}}$; Shana's unit rate: $\frac{16 \text{ hits}}{1 \text{ h}}$;

51 hits in 3 h is greater.

2. 330 mi on 15 gal or 240 mi on 10 gal
 $\frac{22 \text{ mi}}{1 \text{ gal}}$, $\frac{24 \text{ mi}}{1 \text{ gal}}$; 240 mi on 10 gal is greater.

3. 90 breaths in 6 min or 112 breaths in 8 min
 $\frac{15 \text{ breaths}}{1 \text{ min}}$, $\frac{14 \text{ breaths}}{1 \text{ min}}$; 90 breaths in 6 min is greater.

4. 660 miles traveled on 20 gallons of gas or 850 miles traveled on 25 gallons of gas
 $\frac{33 \text{ mi}}{1 \text{ gal}}$, $\frac{34 \text{ mi}}{1 \text{ gal}}$; 850 miles traveled on 25 gallons is greater.

5. **Writing to Explain** Earl and Mia danced in a charity fundraiser. Earl raised \$275 when he danced for 5 hours. Mia raised \$376 when she danced for 8 hours. Which dancer earned more for each hour danced? Explain how you found your answer.

Earl earned more for each hour; Earl's unit rate: $\frac{\$55}{1 \text{ h}}$;
Mia's unit rate: $\frac{\$47}{1 \text{ h}}$. Since $\$55 > \47 , Earl earned more for each hour.

Name _____

Comparing Rates

Find each unit rate and determine which rate is greater.

1. 250 mi per 10 gal or 460 mi per 20 gal

$\frac{25 \text{ mi.}}{1 \text{ gal.}}$, $\frac{23 \text{ mi.}}{1 \text{ gal.}}$; **250 mi per 10 gal is greater.**

2. 1,000 words in 20 min or 2,475 words in 45 min

$\frac{50 \text{ words.}}{1 \text{ min.}}$, $\frac{55 \text{ words.}}{1 \text{ min.}}$; **2,475 words in 45 min is greater.**

3. 6 in. of rain in 4 h or 8 in. of rain in 5 h

$\frac{1.5 \text{ in.}}{1 \text{ h.}}$, $\frac{1.6 \text{ in.}}{1 \text{ h.}}$; **8 in. of rain in 5 h is greater.**

4. 120 tees in 4 boxes or 198 tees in 6 boxes

$\frac{30 \text{ tees.}}{1 \text{ box.}}$, $\frac{33 \text{ tees.}}{1 \text{ box.}}$; **198 tees in 6 boxes is greater.**

5. 108 labels on 9 sheets or 225 labels on 15 sheets

$\frac{12 \text{ labels.}}{1 \text{ sheet.}}$, $\frac{15 \text{ labels.}}{1 \text{ sheet.}}$; **225 labels per 15 sheets is greater.**

6. 5 oz of insect repellent for 7 days or 14 oz of insect repellent for 21 days

$\frac{0.714 \text{ oz.}}{\text{day}}$, $\frac{0.667 \text{ oz.}}{\text{day}}$; **5 oz for 7 days is the greater rate.**

7. Alejandro makes 154 widgets for each 7-hour shift that he works.
Which shift makes more widgets per hour than Alejandro?

- A 120 in a 6-hour shift
B 160 in an 8-hour shift
 C 72 in a 3-hour shift
D 81 in a 4-hour shift

8. **Writing to Explain** Montel and Ellie each need to finish 15 history questions. Montel says that he can finish 10 questions in 2 hours. Ellie says that she can finish all 15 questions in 3 hours. Which friend will finish first? Use unit rates to support your answer.

The friends will both finish at the same time. Montel
= $\frac{5 \text{ questions.}}{1 \text{ hour}}$; Ellie = $\frac{5 \text{ questions.}}{1 \text{ hour}}$; their rates are equivalent.

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People Everywhere!

1. The population in China in 2050 is expected to be 1,408,846,000 people. This is about 10 times as large as Japan's estimated 2050 population. What is Japan's estimated 2050 population?

Data

Sample answer: About 140,000,000

In 2050, Egypt is expected to have a population of 121,219,000 people. Morocco's expected population is 42,583,000 people.

2. Round each of these numbers to the closest ten million.

120,000,000; 40,000,000

3. About how many more people will there be in Egypt than in Morocco in 2050?

About 80,000,000 more people

4.

Country	Estimated 2050 Population
United States	402,415,000
Canada	42,754,000
Mexico	132,278,000

What is the total estimated future population for all three countries?

Sample answer: About 570 million people

In 2050, the population in Ireland is expected to be 6,179,000; in Latvia 1,768,000; in Lithuania 2,654,000; and in Norway 5,732,000.

5. Order the estimated populations of these four countries from greatest to least.

6,179,000; 5,732,000; 2,654,000; 1,768,000

6. List the country names in order from greatest to least estimated populations.

Ireland, Norway, Lithuania, Latvia

Name _____

Unit Rates

A unit rate is a special ratio that compares one quantity to one unit of another quantity. You can use unit rates to solve proportions.

Geraldo makes 100 watches in 4 hours. If he works 7 hours at the same rate, how many watches will he make?

Write a proportion.

Use d for watches made.

$$\frac{100 \text{ watches}}{4 \text{ h}} = \frac{d \text{ watches}}{7 \text{ h}}$$

Find the unit rate.

Divide the first term by the second term.

$$100 \div 4 = 25 \text{ watches}$$

The unit rate is $\frac{25 \text{ watches}}{1 \text{ h}}$.

Think: Find an equal ratio with 1 as the second term.

$$\frac{100 \div 4}{4 \div 4} = \frac{25}{1}$$

Multiply by the unit rate.

$$\frac{25 \text{ watches}}{1 \text{ h}} \times 7 \text{ h} = 175 \text{ watches}$$

So, $\frac{100 \text{ watches}}{4 \text{ h}} = \frac{75 \text{ watches}}{7 \text{ h}}$. Geraldo will make 175 watches when he works 7 hours.

Use unit rates to solve each proportion. Estimate to check reasonableness.

1. $\frac{4 \text{ g}}{2 \text{ kg}} = \frac{30 \text{ g}}{15 \text{ kg}}$

Unit Rate: $\frac{2 \text{ g}}{\text{kg}}$

Multiply: $2 \times 2 = 4$

2. $\frac{120 \text{ mi}}{3 \text{ gal}} = \frac{200 \text{ mi}}{5 \text{ gal}}$

Unit Rate: $\frac{40 \text{ mi}}{\text{gal}}$

Multiply: $40 \times 5 = 200$

3. $\frac{8 \text{ in.}}{2 \text{ wk}} = \frac{20 \text{ in.}}{5 \text{ wk}}$

Unit Rate: $\frac{4 \text{ in.}}{\text{wk}}$

Multiply: $4 \times 5 = 20$

4. $\frac{24 \text{ books}}{3 \text{ wk}} = \frac{80 \text{ books}}{10 \text{ wk}}$

5. $\frac{56 \text{ oz}}{7 \text{ packs}} = \frac{64 \text{ oz}}{8 \text{ packs}}$

6. $\frac{200 \text{ stamps}}{2 \text{ rows}} = \frac{900 \text{ stamps}}{9 \text{ rows}}$

7. Wes used 49 quarts of oil when he changed the oil in 7 cars. Complete and solve the proportion to find how many quarts of oil he would use to change the oil in 20 cars, assuming that all cars need the same quantity of oil.

$$\frac{49 \text{ quarts}}{7 \text{ cars}} = \frac{7 \text{ quarts}}{1 \text{ car}} = \frac{x \text{ quarts}}{20 \text{ cars}} = \frac{140 \text{ quarts}}{20 \text{ cars}}; 140 \text{ quarts}$$

8. **Writing to Explain** A café served 180 pickles with 60 sandwiches. If the ratio of sandwiches to pickles is always constant, explain how you can use unit rates and proportions to find how many pickles are needed to serve 32 sandwiches.

96 pickles; Sample answer: Write and solve the proportion

$$\frac{180 \text{ pickles}}{60 \text{ sandwiches}} = \frac{x \text{ pickles}}{32 \text{ sandwiches}}$$

Name _____

Unit Rates

Use unit rates to solve each proportion. Estimate to check for reasonableness.

1. $\frac{a \text{ ft}}{6 \text{ h}} = \frac{20 \text{ ft}}{4 \text{ h}}$ **30** 2. $\frac{36 \text{ oz}}{6 \text{ lb}} = \frac{b \text{ oz}}{4 \text{ lb}}$ **24** 3. $\frac{c \text{ players}}{10 \text{ teams}} = \frac{27 \text{ players}}{3 \text{ teams}}$ **90**
 4. $\frac{d \text{ c}}{20 \text{ tsp}} = \frac{60 \text{ c}}{12 \text{ tsp}}$ **100** 5. $\frac{e \text{ m}}{12 \text{ cm}} = \frac{63 \text{ m}}{9 \text{ cm}}$ **84** 6. $\frac{16 \text{ adults}}{2 \text{ children}} = \frac{f \text{ adults}}{5 \text{ children}}$ **40**
 7. $\frac{g \text{ m}}{30 \text{ seconds}} = \frac{20 \text{ m}}{8 \text{ seconds}}$ **75** 8. $\frac{12 \text{ mL}}{6 \text{ pt}} = \frac{h \text{ mL}}{40 \text{ pt}}$ **80** 9. $\frac{33 \text{ meals}}{11 \text{ days}} = \frac{k \text{ meals}}{365 \text{ days}}$ **1,095**

10. It takes DeShawn 30 min to paint 90 feet of fence. If he paints at the same rate, how many feet of fence can he paint in 45 min? **135 ft**

11. Inez types 280 words in 7 minutes. If she types at the same rate, how many words will she type in 1 hour? **2,400 words**

12. **Algebra** Explain how you can tell that $\frac{20 \text{ pens}}{2 \text{ packages}} = \frac{30 \text{ pens}}{3 \text{ packages}}$ using mental math?

Sample answer: The unit rate for each ratio is $\frac{10}{1}$, so they are equal ratios and form a proportion.

13. Darryl was looking at the speeds of different airplanes. When he wrote a proportion to compare the speeds, he forgot to write one term. If the proportion is correct, which is the term he forgot?

$$\frac{45 \text{ mi}}{\square} = \frac{135 \text{ mi}}{12 \text{ min}}$$

- A 4 mi C 36 mi
 (B) 4 min D 36 min

14. **Writing to Explain** Jeanette estimates that she mails 2 letters for every 50 e-mails that she sends. She has mailed 9 letters this week. To find how many e-mails she has sent, Jeanette wrote the proportion $\frac{2 \text{ letters}}{50 \text{ e-mails}} = \frac{9 \text{ letters}}{e \text{ e-mails}}$. Tell how she can use unit rates to solve the proportion. Tell how many e-mails she received.

225 e-mails; Sample answer: Rewrite the proportion so that the number of e-mails is the first term in each ratio: $\frac{50 \text{ e-mails}}{2 \text{ letters}} = \frac{e \text{ e-mails}}{9 \text{ letters}}$. The unit rate is $\frac{25 \text{ e-mails}}{1 \text{ letter}}$. Multiply 9 times 25 to solve the proportion.

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Set the Table

1. Complete the table by evaluating each expression. Use the values given for n . The first row has been completed for you.

Algebra

	$n = \frac{1}{2}$	$n = 2\frac{1}{4}$	$n = 3\frac{2}{5}$
$2n$	1	$4\frac{1}{2}$	$6\frac{4}{5}$
$1\frac{3}{4}n$	$\frac{7}{8}$	$3\frac{15}{16}$	$5\frac{19}{20}$
$1\frac{5}{16}n$	$\frac{21}{32}$	$2\frac{61}{64}$	$4\frac{37}{80}$
$\frac{7}{8}n$	$\frac{7}{16}$	$1\frac{31}{32}$	$2\frac{39}{40}$

2. Create your own table. Use 4 expressions and 3 values for n . The expressions and values should all be fractions.

Sample answer:

	$n = 1\frac{1}{4}$	$n = 2\frac{3}{4}$	$n = 4\frac{1}{4}$
$n + \frac{1}{2}$	$1\frac{3}{4}$	$3\frac{1}{4}$	$4\frac{3}{4}$
$n - \frac{3}{4}$	$\frac{1}{2}$	2	$3\frac{1}{2}$
$\frac{5}{6}n$	$1\frac{1}{24}$	$2\frac{7}{24}$	$3\frac{13}{24}$
$n \div \frac{2}{3}$	$1\frac{7}{8}$	$4\frac{1}{8}$	$6\frac{3}{8}$

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Reteaching

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Unit Price

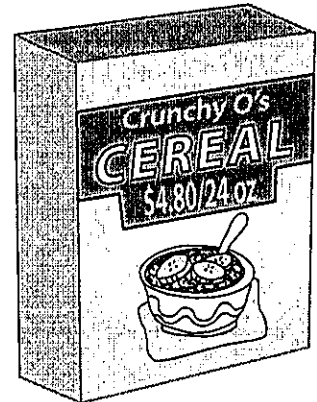
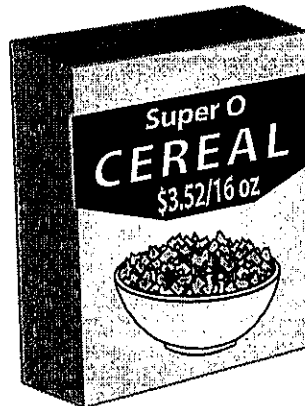
A unit price is a unit rate that gives the price of one item. You can use unit prices to find the best buy.

Write each price as a unit rate to find the best buy.

$$\text{Super O Cereal} = \frac{\$3.52}{16 \text{ oz}} = \frac{\$3.52 \div 16}{16 \text{ oz} \div 16} = \frac{\$0.22}{1 \text{ oz}}$$

$$\text{Crunchy O's Cereal} = \frac{\$4.80}{24 \text{ oz}} = \frac{\$4.80 \div 24}{24 \text{ oz} \div 24} = \frac{\$0.20}{1 \text{ oz}}$$

Since \$0.20 is less than \$0.22, Crunchy O's Cereal is the better buy.



Find each unit price and determine which is a better buy.

- 20 gallons of gas for \$66.00 or 25 gallons of gas for \$81.25
 $\frac{\$3.30}{1 \text{ gal}}$; $\frac{\$3.25}{1 \text{ gal}}$; **25 gallons for \$81.25 is the better buy**
- 24 slices of cheese for \$7.44 or 90 slices of cheese for \$28.80
 $\frac{\$0.31}{1 \text{ slice}}$; $\frac{\$0.32}{1 \text{ slice}}$; **24 slices of cheese for \$7.44 is the better buy**
- 32 oz of orange juice for \$7.04 or 20 oz of orange juice for \$4.80
 $\frac{\$0.22}{1 \text{ oz}}$; $\frac{\$0.24}{1 \text{ oz}}$; **32 oz of orange juice for \$7.04 is the better buy**
- Writing to Explain** A bowling alley rents lanes for \$24.00 for 3 hours on weekends and \$45.00 for the whole day on weekdays. If Ryan would like to rent a lane for 6 hours, and he can come any day of the week, should he come on a weekend or a weekday? Explain how you found your answer.

Ryan should come on a weekday. On a weekday, he will pay \$45 for 6 hours, so the unit rate is $\frac{\$7.50}{1 \text{ hour}}$. On a weekend, he will pay \$24 for 3 hours, so the unit rate is $\frac{\$8.00}{1 \text{ hour}}$. Since $\$7.50 < \8.00 , Ryan should come on a weekday.

Name _____

Unit Price

Find the unit price.

1. 8 jawbreakers for \$4.00

$$\frac{\$0.50}{1 \text{ jawbreaker}}$$

2. 5 used books for \$9.45

$$\frac{\$1.89}{1 \text{ used book}}$$

3. 6 goldfish for \$7.38

$$\frac{\$1.23}{1 \text{ goldfish}}$$

Find each unit price and determine which is a better buy.

4. 1 lb of apples for \$2.15 or 3 lb of apples for \$5.76

$$\frac{\$2.15}{1 \text{ lb}}, \frac{\$1.92}{1 \text{ lb}}, \text{ 3 lb for } \$5.76 \text{ is the better buy.}$$

5. 8 bungee cords for \$10.00 or 20 bungee cords for \$22.00

$$\frac{\$1.25}{1 \text{ cord}}, \frac{\$1.10}{1 \text{ cord}}, \text{ 20 cords for } \$22.00 \text{ is the better buy.}$$

6. 5 oz of insect repellent for \$6.95 or 14 oz of insect repellent for \$19.60

$$\frac{\$1.39}{1 \text{ oz}}, \frac{\$1.40}{1 \text{ oz}}, \text{ 5 oz for } \$6.95 \text{ is the better buy.}$$

7. Fritz earns \$75.60 for each 7-hour shift that he works. Which shift pays a higher hourly wage than the wage Fritz earns?

- A \$60.30 for a 6-hour shift
- B \$80.00 for an 8-hour shift
- C \$36.30 for a 3-hour shift
- D \$40.40 for a 4-hour shift

8. **Writing to Explain** Shaunda said that buying 4 towels for \$17 was a better buy than buying 2 towels for \$9. She found her answer by doubling the terms in the ratio $\frac{9}{2}$ and comparing the first terms in the ratio. Is she correct? Use unit prices to support your answer.

Yes, the unit price for 2 towels for \$9 is \$4.50 per towel,

and the unit price for 4 towels for \$17 is \$4.25 per towel.

Since \$4.25 < \$4.50, the 4 towels for \$17 are a better buy.

Name _____

Enrichment

10-4

Unscrambling Fractions

Find the numbers in each box to write two fractions that are equivalent to the fraction given.

Number Sense

1.

40	28	16
4	3	14
24	20	5

$$\frac{4}{5}, \frac{16}{20} \quad \underline{\hspace{2cm}} = \frac{8}{10}$$

2.

3	15	27
6	2	4
44	21	36

$$\frac{3}{4}, \frac{27}{36} \quad \underline{\hspace{2cm}} = \frac{9}{12}$$

3.

4	21	16
63	6	8
20	35	14

$$\frac{4}{14}, \frac{6}{21} \quad \underline{\hspace{2cm}} = \frac{2}{7}$$

4.

24	3	12
2	24	50
32	18	8

$$\frac{2}{12}, \frac{3}{18} \quad \underline{\hspace{2cm}} = \frac{1}{6}$$

5.

15	75	3
1	20	5
50	7	21

$$\frac{1}{3}, \frac{5}{15}, \frac{7}{21} \quad \underline{\hspace{2cm}} = \frac{15}{45}$$

6.

6	7	33
4	36	3
2	20	14

$$\frac{2}{3}, \frac{4}{6} \quad \underline{\hspace{2cm}} = \frac{28}{42}$$

Name _____

Constant Speed

The formula $d = r \times t$ uses symbols to relate the quantities for distance (d), constant rate of speed (r), and time (t).

Example 1

How long will it take a car moving at 50 mph to travel 70 mi?

Substitute what you know into the formula $d = r \times t$.

Solve the equation.

$$\begin{aligned} 70 \text{ mi} &= 50 \text{ mph} \times t \\ \frac{70 \text{ mi}}{50 \text{ mph}} &= \frac{50 \text{ mph} \times t}{50 \text{ mph}} \\ 1.4 \text{ h} &= t \end{aligned}$$

It will take 1.4 h to travel 70 mi at 50 mph.

Example 2

A car travels 325 mi in 5 h. What is its rate of speed?

Substitute what you know into the formula $d = r \times t$.

Solve the equation.

$$\begin{aligned} 325 \text{ mi} &= r \times 5 \text{ h} \\ \frac{325 \text{ mi}}{5 \text{ h}} &= \frac{r \times 5 \text{ h}}{5 \text{ h}} \\ 65 \text{ mph} &= r \end{aligned}$$

The rate of speed of a car that travels 325 mi in 5 h is 65 mph.

-
1. An airplane flies at 250 mph. How far will it travel in 5 h at that rate of speed?

Substitute the information you know into the formula $d = r \times t$:

$$d = \underline{250 \text{ mph} \times 5\text{h}}$$

Solve the equation.

$$d = \underline{1,250 \text{ mi}}$$

Write the answer with the correct units.

$$\underline{1,250 \text{ mi}}$$

Find the missing variable.

2. Distance = 60 km

time = 4 h

rate = 15 km/h

3. Distance = 24 cm

time = 12 sec

rate = 2 cm/sec

4. Distance = 56 yd

time = 7 min

rate = 8 yd/min

5. Distance = 4,000 m

time = 25 d

rate = 160 m/d

6. **Writing to Explain** A storm is 15 mi from Lodi. If the storm travels at 6 mph towards the city, how many hours will it take for the storm to get to Lodi? Show your work.

$$\underline{2\frac{1}{2} \text{ h}; d = r \times t; 15 = 6 \times t; 15 \div 6 = t; t = 2\frac{1}{2}}$$

Name _____

Constant Speed

Find the missing variable.

- Distance = 15 mi time = 2 h rate = 7.5 mph
- Distance = 56 km time = 4 h rate = $\frac{14 \text{ km}}{\text{h}}$
- Distance = 72 yd time = 6 min rate = $\frac{12 \text{ yd}}{\text{min}}$
- Distance = 27 cm time = 9 sec rate = $\frac{3 \text{ cm}}{\text{sec}}$
- Distance = 10,000 m time = 2 d rate = $\frac{5,000 \text{ m}}{\text{d}}$
- Distance = 480 ft time = 6 wk rate = $\frac{80 \text{ ft}}{\text{wk}}$

7. The California Speedway hosts automobile races. Which rate of speed is higher: a car completing a 500-mi race in about $3\frac{1}{3}$ h or a car completing a 300-mi race in about $2\frac{1}{2}$ h? 500 mi race in about $3\frac{1}{3}$ h

8. A train traveled 250 mi in 2 h. If it traveled at the same rate of speed, how long would it take the train to travel 600 mi? 4.8 h

9. The space shuttle travels 4,375 mi in 15 min as it orbits the earth. Estimate its constant rate of speed during that time to the nearest hundred.

- A About 400 mi per min
- B About 300 mi per min
- C About 60,000 mi per min
- D About 70,000 mi per min

10. **Writing to Explain** Kevin drove his scooter 62 km in 2 h. Explain how to find how far he drives if he drives at the same rate for 3 h.

93 km; Substitute known values in formula $d = r \times t$ to get $62 = r \times 2$. Then solve the equation to find $r = \frac{31 \text{ km}}{\text{hr}}$. Multiply the rate of $\frac{31 \text{ km}}{\text{h}}$ and the time of 3 h to find the distance, 93 km.

Name _____

Enrichment

10-5

Computing Remainders

Solve. Explain your answer.

Reasoning

1. A computer printer prints 68 lines on each page. How many sheets of paper will you need to print a report that is 4,592 lines long?

**68 sheets; The answer is 67 R36,
so 68 sheets will be needed.**

2. How many lines will be on the last sheet of paper?

36 lines; The remainder is 36.

3. Carla buys a computer for \$1,158 and a printer for \$239. She pays the store at a rate of \$79 per month. How long will it take her to pay off the entire amount?

**18 months; The total cost of the
computer and printer is \$1,397.**

$\$1,397 \div \$79 = 17 \text{ R}54$, so it will take

Carla 18 months.

4. How much will Carla's last payment be?

\$54; The remainder is 54.

5. The ink cartridge for Carla's printer is supposed to last for 2 million characters. Carla counts the characters on several of the pages she prints and finds that the pages have an average of 2,078 characters. Carla divides 2,000,000 by 2,078 on her calculator and gets 962.4639. Circle the letter of the most reasonable conclusion Carla can draw. Explain.

A The cartridge will run out of ink as Carla is printing the 963rd page.

B The cartridge will run out of ink about halfway through the last page.

C The cartridge will last about as long as a 1,000-sheet package of paper.

**It is not reasonable to think that the
cartridge will run out of ink on exactly
the 963rd page.**

Name _____

Reteaching

10-6

Converting Customary Units

Units of Length

- 1 foot (ft) = 12 in.
1 yard (yd) = 3 ft
= 36 in.
1 mile (mi) = 5,280 ft
= 1,760 yd

Units of Capacity

- 1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 c
1 quart (qt) = 2 pt
1 gallon (gal) = 4 qt

Units of Weight

- 16 ounces (oz) = 1 pound (lb)
2,000 pounds = 1 ton (T)

How to change from one unit of measurement to another:

To change from larger units to smaller units, you have to multiply.

- 120 yd = _____ ft
1 yd = 3 ft
 $120 \times 3 = 360$
120 yd = 360 ft

To change from smaller units to larger ones, you have to divide.

- 256 fl oz = _____ c
1 c = 8 fl oz
 $256 \div 8 = 32$
256 fl oz = 32 c

Complete.

- | | |
|-----------------------------|----------------------------|
| 1. 36 in. = <u>3</u> ft | 2. 4 qt = <u>16</u> c |
| 3. 5 lb = <u>80</u> oz | 4. 39 ft = <u>13</u> yd |
| 5. 1.5 mi = <u>7,920</u> ft | 6. 3.5 gal = <u>14</u> qt |
| 7. 2 T = <u>4,000</u> lb | 8. 16 pt = <u>8</u> qt |
| 9. 64 oz = <u>4</u> lb | 10. 3 yd = <u>108</u> in. |
| 11. 4 gal = <u>32</u> pt | 12. 55 yd = <u>165</u> ft |
| 13. 6.5 lb = <u>104</u> oz | 14. 20 pt = <u>2.5</u> gal |
| 15. 4.5 qt = <u>18</u> c | 16. 205 yd = <u>615</u> ft |

17. **Reasoning** A vendor at a festival sells soup for \$1.25 per cup or \$3.75 per quart. Which is the better buy?

\$3.75 per quart is the better buy.

Name _____

Converting Customary Units

Complete.

1. 3.5 ft = 42 in.

2. 17 yd = 51 ft

3. 1.5 gal = 24 c

4. 4 mi = 21,120 ft

5. 160 fl oz = 5 qt

6. 72 in. = 6 ft

7. 3 mi = 5,280 yd

8. 12 pt = 6 qt

9. 180 ft = 60 yd

10. 2 gal = 256 fl oz

11. How many tons are in 35,000 lb? 17.5

12. **Number Sense** Brian pole vaulted over a bar that was 189 in. high. How many more inches would he need to vault to go over a bar that was 16 ft high?

3 more inches

A paving company was hired to make a 4 mile section of the highway. They need 700 tons of concrete to complete the job.

13. How many yards of highway do they need to repave?

7,040 yd

14. How many pounds of concrete will they need to repave the highway?

1,400,000 lb

15. Gary's cat weighs 11 lb. How many ounces is that?

A 132

B 144

C 164

D 176

16. **Writing to Explain** The average car manufactured in the United States in 2001 could drive 24.5 mi on 1 gal of gas. Explain how to find the number of yards the car can travel on 1 gal of gas.

Sample answer: To find the answer, multiply

24.5 by the number of yards in a mile (1,760):

$24.5 \times 1,760 = 43,120.$

Name _____

Enrichment

10-6

Apothecaries' Weights and Measures

Number Sense

The word *apothecary* is an old word for *pharmacist*. Pharmacists use a system to measure capacity known as apothecaries' measure and a system to measure weights known as apothecaries' weight. The units used in each system are shown below.

Apothecaries' Measure of Capacity

60 minims = 1 fluid dram
8 fluid drams = 1 fluid ounce
16 fluid ounces = 1 pint
2 pints = 1 quart
4 quarts = 1 gallon

Apothecaries' Measure of Weight

20 grains = 1 scruple
3 scruples = 1 dram apothecaries'
8 drams apothecaries' = 1 ounce apothecaries'
12 ounces apothecaries' = 1 pound apothecaries'

1. How many minims are in 1 pint? 1 quart? 1 gallon?

7,680 minims; 15,360 minims; 61,440 minims

2. How many fluid drams are in 1 pint? 1 quart? 1 gallon?

128 fluid drams; 256 fluid drams; 1,024 fluid drams

3. How many fluid drams are in a 12-ounce bottle of cold medicine?

96 fluid drams

4. How many grains are in 1 dram apothecaries'? 1 ounce apothecaries'? 1 pound apothecaries'?

60 grains; 480 grains; 5,760 grains

5. How many scruples are in 1 ounce apothecaries'? 1 pound apothecaries'?

24 scruples; 288 scruples

6. How many drams apothecaries' are in 1 pound apothecaries'?

96 drams apothecaries'

7. An average-sized aspirin is 5 grains. What fraction of a scruple and an ounce apothecaries' is an average-sized aspirin?

$\frac{1}{4}$ scruple; $\frac{1}{96}$ ounce apothecaries'

Name _____

Converting Metric Units

Changing from one metric unit to another:

To change from a larger unit to a smaller unit, multiply by a power of ten.

$$3.8 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

A liter is a larger unit than a milliliter. To change from liters to milliliters, multiply.

$$1 \text{ L} = 1,000 \text{ mL}$$

$$3.8 \times 1,000 = 3,800$$

$$3.8 \text{ L} = 3,800 \text{ mL}$$

To change from a smaller unit to a larger unit, divide by a power of ten.

$$100 \text{ m} = \underline{\hspace{2cm}} \text{ km}$$

The meter is a smaller unit than the kilometer. To change from meters to kilometers, divide.

$$1,000 \text{ m} = 1 \text{ km}$$

$$100 \div 1000 = 0.1$$

$$100 \text{ m} = 0.1 \text{ km}$$

Name the most appropriate metric unit for each measurement.

1. mass of a cow

kg

2. length of a carrot

cm

3. capacity of a thimble

mL

Complete.

4. $45 \text{ g} = \underline{45,000} \text{ mg}$

5. $3450 \text{ mL} = \underline{3.45} \text{ L}$

6. $4.5 \text{ m} = \underline{4,500} \text{ mm}$

7. $1.68 \text{ L} = \underline{1,680} \text{ mL}$

8. $28 \text{ cm} = \underline{280} \text{ mm}$

9. $7,658 \text{ g} = \underline{7.658} \text{ kg}$

10. $600 \text{ cm} = \underline{6} \text{ m}$

11. $5,000 \text{ mg} = \underline{5} \text{ g}$

12. $5.1 \text{ km} = \underline{5,100} \text{ m}$

13. $1.780 \text{ L} = \underline{1,780} \text{ mL}$

14. $0.780 \text{ L} = \underline{780} \text{ mL}$

15. $4,300 \text{ m} = \underline{4.3} \text{ km}$

16. $9,000 \text{ cm} = \underline{90} \text{ m}$

17. $8,000 \text{ mg} = \underline{8} \text{ g}$

18. **Reasoning** It is recommended that people have 1 g of calcium each day. How many milligrams of calcium is that?

1,000 mg

Name _____

Converting Metric Units

Name the most appropriate metric unit for each measurement.

1. mass of a paperclip

Gram

2. capacity of a water cooler

Liter

3. width of a sheet of paper

Centimeter

Complete.

4. $2.7 \text{ m} = \underline{270} \text{ cm}$

5. $1.6 \text{ kg} = \underline{1,600} \text{ g}$

6. $9 \text{ L} = \underline{9,000} \text{ mL}$

7. $14 \text{ m} = \underline{14,000} \text{ mm}$

8. $1.6 \text{ cm} = \underline{16} \text{ mm}$

9. $5,400 \text{ g} = \underline{5.4} \text{ kg}$

10. $1,840 \text{ mL} = \underline{1.84} \text{ L}$

11. $32 \text{ km} = \underline{32,000} \text{ m}$

12. **Number Sense** The chemist needs 2,220 mL of potassium chloride to complete an experiment. He has 2 L. Does he have enough to complete the experiment? Explain.

No; 2 L is only 2,000 mL.

13. A computer floppy disk has a mass of 20 g. How many would you need to have a total mass of 1 kg?

50 disks

14. A battery is 5 cm long. How many batteries would you need to line up to get 3 m?

60 batteries

15. Which would you do to convert 25 cm to millimeters?

A Divide by 10

C Multiply by 10

B Divide by 100

D Multiply by 100

16. **Writing to Explain** A banana has a mass of 122 g. Explain how to find the mass of the banana in milligrams.

Sample answer: $1 \text{ g} = 1,000 \text{ mg}$, so multiply by 1,000 ($122 \times 1,000 = 122,000 \text{ mg}$).

Name _____

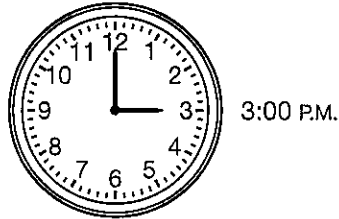
Time After Time

For each clock in column 1, find the correct time in column 2 that shows the time difference listed in each problem below.

Reasoning

1. 2 h 45 min earlier

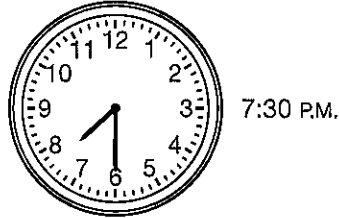
c _____



- a. 9:05 P.M.

2. 1 h 35 min later

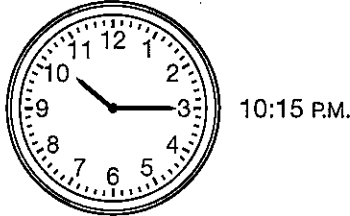
a _____



- b. 11:20 P.M.

3. 2 h 45 min earlier

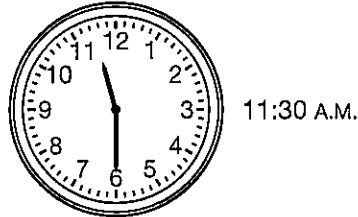
e _____



- c. 12:15 P.M.

4. 6 h 50 min later

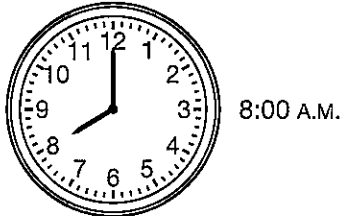
f _____



- d. 3:05 A.M.

5. 8 h 40 min earlier

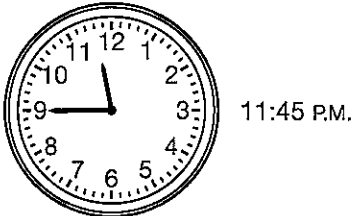
b _____



- e. 7:30 P.M.

6. 3 h 20 min later

d _____



- f. 6:20 P.M.

Name _____

Reteaching

10-8

Problem Solving: Writing to Explain

In a chess club, 1 out of every 4 members is in sixth grade. There are 24 members in the chess club. How many members are in the sixth grade? Explain your solution.

Gerry's explanation:

6 members are in the sixth grade.

Use reasoning: I multiplied 4 members by 6 to get 24 members, so I multiplied 1 by 6 to get 6 members in the sixth grade.

Then I checked to see if the ratios were proportional.

$$\frac{1 \text{ sixth grader}}{4 \text{ members}} = \frac{6 \text{ sixth graders}}{24 \text{ members}}$$

Since the ratios are proportional, the answer is correct.

- Use words, numbers, symbols, pictures, diagrams, or tables. If the problem includes pictures, diagrams, or tables that provide information or give details, refer to these.
- Describe the steps and operations you used. Show your work.

Explain your solution. Show your work.

1. Ms. Chin's class recorded the weather conditions for 14 days. The weather was cloudy 3 days out of every 7 days. Ms. Jensen's class recorded the weather for the next 10 days. The weather was cloudy 4 days out of every 5 days. Which class recorded more cloudy days?

Ms. Jensen's class; Sample answer: Use Algebra; I set up a proportion and used multiplication to find x , the

number of cloudy days in each class. Then I compared the cloudy days recorded in each class. $\frac{3 \text{ cloudy days}}{7 \text{ days}} = \frac{x \text{ cloudy days}}{14 \text{ days}}$,

$$\frac{3 \times 2}{7 \times 2} = \frac{6}{14}; x = 6 \text{ cloudy days. } \frac{4 \text{ cloudy days}}{5 \text{ days}} = \frac{x \text{ cloudy days}}{10 \text{ days}}$$

$$\frac{4 \times 2}{5 \times 2} = \frac{8}{10}; x = 8 \text{ cloudy days. Since } 8 > 6,$$

Ms. Jensen's class recorded more cloudy days.

2. Lynette earns \$5 by delivering newspapers. She saves \$3 and she spends the rest. If she saved \$27 one month, how much did she spend?

She spent \$18; Sample answer: Use Algebra; I set up a proportion and used multiplication to find x .

$$\frac{\$3 \text{ saved}}{\$2 \text{ spent}} = \frac{\$27 \text{ saved}}{x \text{ spent}} \cdot \frac{3 \times 9}{2 \times 9} = \frac{27}{18}; x = 18.$$

Problem Solving: Writing to Explain

Explain your solution. Show your work. **Sample answers given.**

1. A fundraiser is being held to raise money for a new school playground. Of every \$20 raised, \$16 will be spent on playground equipment. If the goal of the fundraiser is \$320.00 for playground equipment, how much total money will it need to raise?

Use Algebra: I set up a proportion and then used multiplication to solve for the variable.

$$\frac{\$20 \text{ raised}}{\$16 \text{ playground equipment}} = \frac{x \text{ amount raised}}{\$320 \text{ playground equipment}}$$

$$\text{equipment; } \frac{20 \times 20}{16 \times 20} = \frac{400}{320}; x = 400.$$

The fundraiser will need to raise a total of \$400.

2. Stephan is planning a hiking trip at Kings Canyon National Park. He plans to hike 14 miles every 2 days. If he hikes 42 miles, how many days will he hike?

Use Number Sense: I multiplied 14 miles by 3 to get 42 miles, so I multiplied 2 days by 3 to get 6 days. Then I set up a proportion to see if the ratios were equal: $\frac{14 \text{ miles}}{2 \text{ days}} = \frac{42 \text{ miles}}{6 \text{ days}}$. He will hike 6 days if he hikes 42 miles.

3. A rental store at the beach has 56 umbrellas and 24 surfboards. Which ratio describes the relationship of surfboards to umbrellas?

A 56:24

B 7:3

C 3:8

D 3:7

4. **Writing to Explain** Kara can run 3 miles in 25.5 minutes. At this rate, how long would it take her to run 2 miles? *Diana's answer: If I subtract 1 mile from 3 miles, I get 2 miles, so if I subtract 1 minute from 25.5 minutes, I get 24.5 minutes. Kara takes 24.5 minutes to run 2 miles. Is Diana's answer correct? Explain.*

No; Sample answer: Find the unit rate by dividing 25.5 by 3 to get 8.5 mi per min. Then multiply the unit rate by 2 to find the time that it takes Kara to run 2 mi. $8.5 \times 2 = 17$, so it takes Kara 17 min. to run 2 mi.

Name _____

Enrichment

10-8

Proper Proportions

The proportions in the left column are missing a term. Find the term in the right column that will complete the proportion. Write the letter of the missing term in the space provided.

Reasonableness

M 1. $\frac{\$3.00}{5\text{h}} = \frac{\$7.20}{x}$

H 2. $\frac{x}{9\text{ min}} = \frac{12\text{ oz}}{18\text{ oz}}$

B 3. $\frac{7\text{ ft}}{2\text{ sec}} = \frac{x}{90\text{ sec}}$

E 4. $\frac{75\text{ mi}}{100\text{ mi}} = \frac{3\text{ h}}{x}$

C 5. $\frac{x}{65\text{ sec}} = \frac{6\text{ m}}{32.5\text{ m}}$

G 6. $\frac{17\text{ cm}}{2\text{ min}} = \frac{x}{4\text{ min}}$

I 7. $\frac{14\text{ mi}}{7\text{ days}} = \frac{36\text{ mi}}{x}$

O 8. $\frac{\$500}{x} = \frac{\$1,500}{3\text{ months}}$

P 9. $\frac{45\text{ min}}{10\text{ pages}} = \frac{x}{50\text{ pages}}$

J 10. $\frac{90\text{ books}}{6\text{ weeks}} = \frac{x}{5\text{ weeks}}$

A 7.5 days

B 315 ft

C 12 sec

D 45 cm

E 4 h

F 12 m

G 34 cm

H 6 min

I 18 days

J 75 books

K \$12.00

L 4 mi

M 12 h

N 6 oz

O 1 month

P 225 min