

# Ratios, Proportions & Percents



Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

Period: \_\_\_\_\_

## **Notes Section:**

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# Lesson 1 Homework Practice

## *Ratios*

Express each ratio as a fraction in simplest form.

1. 56 pencils to 64 erasers
2. 25 calculators to 20 students
3. 36 cassettes to 60 CDs
4. 18 minnows to 27 fish
5. 26 tents to 65 campers
6. 49 apples out of 63 fruit
7. 45 out of 75 days
8. 60 forks to 144 spoons
9. 112 out of 200 pages
10. 36 balls to 81 players
11. 6 pounds to 256 ounces
12. 5 hours to 720 minutes
13. 9 gallons to 48 quarts
14. 24 feet to 30 yards
15. 420 seconds to 10 minutes
16. 96 inches to 9 feet
17. 64 cups to 50 pints
18. 35 pints to 7 gallons
19. 4 inches to 3 yards
20. 780 seconds to 1 hour
21. At a homecoming game, there are 630 students and 1080 alumni in attendance. Express the ratio of students to alumni as a fraction in simplest form. Explain its meaning.

## Lesson 2 Homework Practice

### Unit Rates

Express each rate as a unit rate. Round to the nearest tenth or nearest cent, if necessary.

- \$4.60 for 5 cans of soup
- \$51 for a box of 75 tiles
- 652 miles in 9 days
- 116 meters in 12 seconds
- 176 new employees in 22 years
- 34 yards for 6 costumes
- 55 pages in 25 minutes
- \$3015 from 36 people
- Happy Times Summer Camp has 356 campers and 38 counselors. PlayDay Summer Camp has 219 campers and 28 counselors. Which camp has the lower rate of campers to counselors?
- A roller coaster can accommodate 346 riders in 20 minutes. How many riders could ride in 90 minutes?
- The bakers at Joey's Bagels can make 340 bagels in 4 hours. How many bagels could the bakers make in 10 hours?
- The prices for various sizes of Health Crunch cereal are given in the table at the right. Which size has the best cost per ounce?

Size (oz)	Price
11	\$4.75
15	\$4.85
19.1	\$5.89
- The Music Factory offers 45-minute music lessons for \$40. The Music Makers offers 60-minute lessons for \$55. Which is the better deal?
- Leslie ran a 5-kilometer race in 22 minutes. Jorge ran a 2-kilometer race in 8.5 minutes. Which runner ran at the faster rate?
- It took Michala 4 hours to sew 9 scarves. How many scarves could she make in 24 hours?

# Lesson 7 Homework Practice

## Solving Proportions

Solve each proportion.

1.  $\frac{5}{m} = \frac{20}{32}$

2.  $\frac{12}{28} = \frac{r}{63}$

3.  $\frac{8}{50} = \frac{4}{f}$

4.  $\frac{40}{48} = \frac{h}{42}$

5.  $\frac{6.4}{16} = \frac{32}{n}$

6.  $\frac{q}{18} = \frac{90}{135}$

7.  $\frac{21}{24} = \frac{c}{64}$

8.  $\frac{9}{d} = \frac{3}{4}$

9.  $\frac{4}{32} = \frac{8}{k}$

10.  $\frac{2.6}{4} = \frac{u}{8}$

11.  $\frac{5.1}{1.7} = \frac{7.5}{q}$

12.  $\frac{8.5}{25} = \frac{x}{50}$

13.  $\frac{n}{12} = \frac{6}{18}$

14.  $\frac{8}{v} = \frac{56}{105}$

15.  $\frac{15}{35} = \frac{s}{7}$

16.  $\frac{24}{30} = \frac{8}{w}$

17.  $\frac{c}{28} = \frac{5}{7}$

18.  $\frac{3}{r} = \frac{39}{65}$

19.  $\frac{9}{15} = \frac{m}{25}$

20.  $\frac{7.5}{6} = \frac{3.6}{x}$

21.  $\frac{12}{25} = \frac{u}{40}$

22.  $\frac{1}{a} = \frac{33}{132}$

23.  $\frac{f}{5} = \frac{16}{40}$

24.  $\frac{r}{6.5} = \frac{0.2}{1.3}$

25.  $\frac{30}{14} = \frac{k}{1.54}$

26.  $\frac{3.5}{7.2} = \frac{k}{57.6}$

27.  $\frac{2.1}{42} = \frac{7}{t}$

28. Gayle is making fruit punch that consists of 2 quarts of juice and 1 quart of soda water. How much soda water does she need if she has 5 quarts of juice?

29. A school is running a fundraiser. For every \$75 worth of wrapping paper sold, the school receives \$20. How much wrapping paper must be sold to reach the fundraising goal of \$2500?

# Lesson 8 Homework Practice

## Scale Drawings and Models

On a map, the scale is 5 centimeters = 2 kilometers. Find the missing distances.

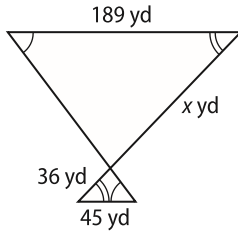
	Location	Map Distance	Actual Distance
1.	Town A to Town B	10 cm	
2.	Town A to Town C		10 km
3.	Town A to Town D		5.6 km
4.	Town A to Town E	2 cm	
5.	Town A to Town F	0.5 cm	
6.	Town A to Town G		3.2 km
7.	Town A to Town H	0.25 cm	
8.	Town A to Town I		2.4 km
9.	Town A to Town J		0.04 km
10.	Town A to Town K	1 cm	
11.	Town A to Town L	2.5 cm	
12.	Town A to Town M		0.48 km

13. Refer to Exercises 1–12. What is the scale factor?
14. What is the scale factor if the scale is 15 inches = 1 yard?
15. A barn is 50 feet wide by 80 feet long. Make a scale drawing of the barn that has a scale of  $\frac{1}{2}$  inch = 10 feet.
16. A man in a photograph is 1.5 inches in height. If the man is 6 feet tall, what is the scale?
17. The Chrysler Building is 1050 feet tall. Sally built a scale model of the building. How tall is the model if she used the scale 1 centimeter = 35 feet?
18. The dimensions of a floor in an office building are 315 feet by 225 feet. Marcus drew a scale model of the office building using the scale 1 inch = 30 feet. What are the dimensions of the floor in the office building on the drawing?

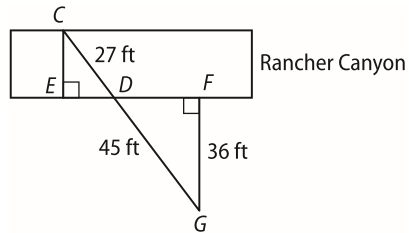
# Lesson 10 Homework Practice

## Indirect Measurement

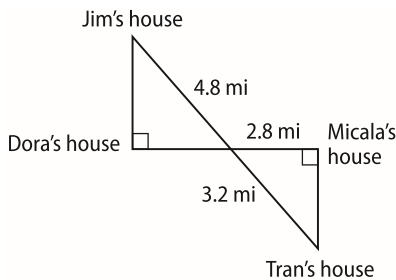
1. The triangles below are similar. What is the value of  $x$ ?



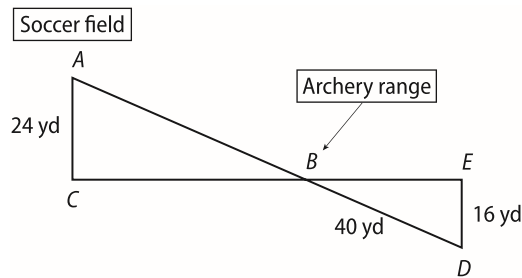
2. In the figure,  $\triangle CDE \sim \triangle GDF$ . Find the distance  $CE$  across Rancher Canyon.



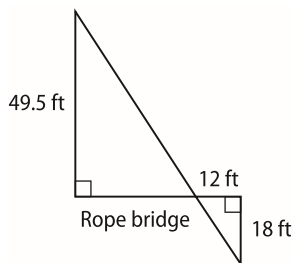
3. The triangles below are similar. How far is Dora's house from Micala's house?



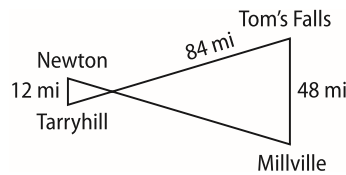
4. In the figure,  $\triangle ABC \sim \triangle DBE$ . How far is the archery range from the soccer field?



5. The triangles below are similar. How long is the rope bridge?



6. The triangles below are similar. What is the distance between Tarryhill and Tom's Falls?



7. A 6-ft observer casts a 4-ft shadow at the same time a chimney casts a 238-foot shadow. How tall is the chimney?
8. The May Road Apartments in Hong Kong cast a 90-meter shadow at the same time a 1.5-meter tall tenant casts a 0.75-meter shadow. How tall is the apartment building?
9. The world's tallest man lived from 1918 to 1940. He cast a 4-foot  $5\frac{1}{2}$ -inch shadow when a 6-foot pole cast a 3-foot shadow. How tall was he?
10. A man casts a 14-foot shadow. A 4-foot-tall child casts a 9-foot 4-inch shadow at the same time. How tall is the man?



# Lesson 1 Reteach

## Using the Percent Proportion

In a **percent proportion**, one ratio compares *part* of a quantity to the *whole* quantity. The other ratio is the equivalent percent, written as a fraction, with a denominator of 100.

### Example 1 Find each percent.

a. Twelve is what percent of 16?

$$\frac{a}{b} = \frac{P}{100} \rightarrow \frac{12}{16} = \frac{P}{100} \quad \text{Replace the variables.}$$

$$12 \cdot 100 = P \cdot 16 \quad \text{Find the cross products.}$$

$$1200 = 16P \quad \text{Multiply.}$$

$$75 = P \quad \text{Divide.}$$

So, twelve is 75% of 16.

b. What percent of 8 is 7?

$$\frac{a}{b} = \frac{P}{100} \rightarrow \frac{7}{8} = \frac{P}{100}$$

$$P \cdot 8 = 100 \cdot 7$$

$$700 = 8P$$

$$87.5 = P$$

So, 87.5% of 8 is 7.

### Example 2 Find the part or the whole.

a. What number is 1.4% of 15?

$$\frac{a}{b} = \frac{P}{100} \rightarrow \frac{a}{15} = \frac{1.4}{100} \quad \text{Replace the variables.}$$

$$a \cdot 100 = 15 \cdot 1.4 \quad \text{Find the cross products.}$$

$$100a = 21 \quad \text{Multiply.}$$

$$a = 0.21 \quad \text{Divide.}$$

So, 0.21 is 1.4% of 15.

b. 225 is 36% of what number?

$$\frac{a}{b} = \frac{P}{100} \rightarrow \frac{225}{b} = \frac{36}{100}$$

$$225 \cdot 100 = 36 \cdot b$$

$$22,500 = 36b$$

$$625 = b$$

So, 225 is 36% of 625.

## Exercises

Use the percent proportion to solve each problem.

1. 43.2 is what percent of 48?

2. 292 is what percent of 400?

3. What percent of 22 is 55?

4. What percent of 20 is 4?

5. What is 80% of 840?

6. What is 5% of 38?

7. What is 16% of 36?

8. 85 is 80% of what number?

9. 60 is 30% of what number?

10. 4.5 is 90% of what number?

# Lesson 2 Reteach

## Find Percent of a Number Mentally

When working with common percents like 10%, 25%, 40%, and 50%, it may be helpful to use the fraction form of the percent.

Percent-Fraction Equivalents				
$25\% = \frac{1}{4}$	$10\% = \frac{1}{10}$	$20\% = \frac{1}{5}$	$12\frac{1}{2}\% = \frac{1}{8}$	$16\frac{2}{3}\% = \frac{1}{6}$
$50\% = \frac{1}{2}$	$30\% = \frac{3}{10}$	$40\% = \frac{2}{5}$	$37\frac{1}{2}\% = \frac{3}{8}$	$33\frac{1}{3}\% = \frac{1}{3}$
$75\% = \frac{3}{4}$	$70\% = \frac{7}{10}$	$60\% = \frac{3}{5}$	$62\frac{1}{2}\% = \frac{5}{8}$	$66\frac{2}{3}\% = \frac{2}{3}$
$100\% = 1$	$90\% = \frac{9}{10}$	$80\% = \frac{4}{5}$	$87\frac{1}{2}\% = \frac{7}{8}$	$83\frac{1}{3}\% = \frac{5}{6}$

### Example 1 Find 20% of 35 mentally.

$$20\% \text{ of } 35 = \frac{1}{5} \text{ of } 35 \quad \text{Think: } 20\% = \frac{1}{5}.$$

$$= 7 \quad \text{Think: } \frac{1}{5} \text{ of } 35 \text{ is } 7. \text{ So, } 20\% \text{ of } 35 \text{ is } 7.$$

When an exact answer is not needed, estimate by rounding and using mental math to compute the answer.

### Example 2 Estimate.

#### a. 23% of 84

23% is about 25% or  $\frac{1}{4}$ .

$\frac{1}{4}$  of 84 is 21.

So, 23% of 84 is about 21.

#### b. $\frac{1}{2}\%$ of 490

$$\frac{1}{2}\% = \frac{1}{2} \cdot 1\%$$

490 is almost 500.

So,  $\frac{1}{2}\%$  of 490 is about  $\frac{1}{2} \times 5$  or 2.5.

## Exercises

Find the percent of each number mentally.

- |              |                            |               |
|--------------|----------------------------|---------------|
| 1. 50% of 6  | 2. 25% of 100              | 3. 60% of 25  |
| 4. 75% of 28 | 5. $66\frac{2}{3}\%$ of 33 | 6. 150% of 2  |
| 7. 125% of 4 | 8. 175% of 4               | 9. 10% of 110 |

Estimate.

- |                            |                 |               |
|----------------------------|-----------------|---------------|
| 10. 19% of 20              | 11. 52% of 129  | 12. 8% of 35  |
| 13. $\frac{1}{2}\%$ of 390 | 14. 150% of 200 | 15. 33% of 33 |

## Lesson 3 Reteach

### Using the Percent Equation

A **percent equation** is an equivalent form of the percent proportion. In a percent equation, the percent is written as a decimal.

**Example** Solve each problem using a percent equation.

a. Find 22% of 95.

$$n = 0.22(95)$$

$$n = 20.9$$

So, 22% of 95 is 20.9.

b. 15 is what percent of 75?

$$15 = n(75)$$

$$0.2 = n$$

So, 15 is 20% of 75.

c. 90 is 20% of what number?

$$90 = 0.2n$$

$$450 = n$$

So, 90 is 20% of 450.

### Exercises

Solve each problem using a percent equation.

1. Find 76% of 25.

2. Find 9% of 410.

3. Find 40% of 7.

4. Find 26% of 505.

5. Find 3.5% of 280.

6. Find 18.5% of 60.

7. Find 107% of 1080.

8. 256 is what percent of 800?

9. 36 is what percent of 240?

10. 2089.5 is what percent of 2100?

11. 15.4 is what percent of 55?

12. 7 is what percent of 350?

13. 13.2 is what percent of 80?

14. 14.4 is what percent of 120?

15. 36 is 9% of what number?

16. 2925 is 39% of what number?

17. 576 is 90% of what number?

18. 24.2 is 55% of what number?

19. 25 is 125% of what number?

20. 0.6 is 7.5% of what number?

# Lesson 5 Reteach

## Discount and Markup

A store sells items for more than it pays for those items so it can make a profit. The amount of increase is the **markup**. The percent of markup is a percent of increase. The amount the customer actually pays for an item is the **selling price**. When a store has a sale, the **discount** is the amount by which the regular price is reduced. The percent discount is a percent of decrease.

**Example 1** Find the selling price if a store pays \$167 for a set of luggage and the markup is 38%.

**Method 1** Find the amount of the markup first.

The whole is \$167. The percent is 38. You need to find the amount of the markup, or the part. Let  $m$  represent the amount of the markup.

$$m = 0.38 \cdot 167 \quad \text{part} = \text{percent} \cdot \text{whole}$$

$$m = 63.46 \quad \text{Multiply.}$$

Add the markup to the cost. So,  $\$167 + \$63.46 = \$230.46$ .

**Method 2** Find the total percent first.

The customer will pay 100% of the store's price plus an extra 38%, or 138% of the store's price. Let  $p$  represent the price.

$$p = 1.38(167) \quad \text{part} = \text{percent} \cdot \text{whole}$$

$$p = 230.46 \quad \text{Multiply.}$$

The selling price is \$230.46.

**Example 2** Find the sale price of a purebred German Shepherd puppy that is regularly \$450 and is on sale for 35% off.

**Method 1** Find the amount of discount first. Let  $d$  represent the amount of the discount.

$$d = 0.35 \cdot 450 \quad \text{part} = \text{percent} \cdot \text{whole}$$

$$d = 157.50 \quad \text{Multiply.}$$

Subtract the discount from the original cost. So,  $\$450 - 157.50 = \$292.50$

**Method 2** Find the total percent first. Let  $p$  represent the sale price.

The amount of the discount is 35%, so the customer will pay 100% – 35% or 65% of the original cost.

$$p = 0.65(450) \quad \text{part} = \text{percent} \cdot \text{whole}$$

$$p = 292.50 \quad \text{Multiply.}$$

The sale price is \$292.50.

### Exercises

Find the selling price for each item given the cost and the percent of the markup or discount.

1. guitar: \$500; 60% discount
2. MP3 player: \$28; 78% markup
3. lamp: \$24; 18% markup
4. jeans: \$26; 5% discount

# Percent of a Number

Option 1:

$$\frac{\text{part (is)}}{\text{whole (of)}} = \frac{\%}{100}$$

Option 2:

$$\text{part} = \text{percent}(\text{whole})$$

*\*\*percent is written as decimal in this option*

1. A sweatshirt from Kohl's cost \$20. It was on sale for 15% off the original price.
  - a) How much was the discount?
  
  
  
  
  
  
  
  
  
  
  - b) How much was the sweatshirt on sale for?
  
2. 30% of \$47 is?
  
  
  
  
  
  
  
  
  
  
3. Kelly goes to the store and wants to buy a pocketbook on sale for 20% off of a \$34 bag. How much was the bag on sale for?  
  
Solve using Option 1 : Solve using Option 2:
  
  
  
  
  
  
  
  
  
  
4. Joe wants to buy a basketball for \$15 but has to pay a 8.625% sales tax. Find out how much Joe has to pay for the ball with tax.

5. Annie went grocery shopping and bought many items that together totaled \$125. She used a few coupons and ended up only paying \$98. What was her percent of savings?

**Try it!**

1. Sam went to the mall and bought a shirt, water bottle and socks. Her total bill was \$38. She used a 15% off her total purchase coupon. What was her new bill?
  
2. A baseball pitcher won 80% of the games he pitched. If he pitched 35 ballgames, how many games did he win?
  
3. You and your five friends went to lunch and the bill came out to \$75.50. You and your friends want to leave a 20% tip. How much is the tip? How much is the total bill? How much should each person pay?
  
4. A woman put \$580 into a savings account for one year. The rate of interest on the account was  $6\frac{1}{2}\%$ . How much was the interest for the year in dollars and cents? (Round to the nearest cent)
  
5. A student answered 86 problems on a test correctly and received a grade 98%. How many problems were on the test, if all the problems were worth the same number of points? (Round to the nearest whole number)
  
- \*6. Pamela bought an electric drill at 85% of the regular price. She paid \$32.89 for the drill. What was the regular price? (Round to the nearest cent)

# Lesson 1 Homework Practice

## *Using the Percent Proportion*

Use the percent proportion to solve each problem. Round to the nearest tenth, if necessary.

1. 128 is what percent of 640?
2. What percent of 21 is 28?
3. 3.4 is what percent of 5?
4. What percent of 930 is 720?
5. 15 is what percent of 120?
6. What percent of 24 is 21?
7. 36 is what percent of 40?
8. What percent of 48 is 0.6?
9. 12 is 80% of what number?
10. 15 is 4% of what number?
11. 33 is 90% of what number?
12. 0.24 is 36% of what number?
13. 19 is 10% of what number?
14. 49 is 77% of what number?
15. 42 is 7.5% of what number?
16. 65 is 5% of what number?
17. 27.5 is 2% of what number?
18. What is 15.8% of 21?
19. What is 65% of 441.1?
20. What is 0.4% of 82?
21. What is 7% of 329.8?
22. What is 88% of 1?
23. Stacia has saved \$36 toward the purchase of a new MP3 player. This is 28% of the total price. What is the price of the MP3 player?
24. About 42% of a paint mix is white. A painter orders 18 gallons of the paint mix. How much of it is white?

## Lesson 2 Homework Practice

### *Find Percent of a Number Mentally*

Find the percent of each number mentally.

1. 10% of 812

2. 50% of 1044

3. 40% of 25

4. 20% of 45

5.  $62\frac{1}{2}\%$  of 80

6. 80% of 15

7. 30% of 400

8. 75% of 880

9.  $16\frac{2}{3}\%$  of 72

10.  $33\frac{1}{3}\%$  of 150

11. 60% of 2500

12.  $37\frac{1}{2}\%$  of 48

13. 25% of 244

14. 900% of 3

15. 150% of 260

**Estimate.**

16. 31% of 62

17. 65% of 83

18. 87% of 850

19. 32% of 26

20. 47% of 213

21. 22% of 536

22. 68% of 12

23. 11% of 29

24. 78% of 4

25.  $\frac{1}{2}\%$  of 381

26.  $\frac{1}{6}\%$  of 567

27.  $\frac{2}{3}\%$  of 856

28. 210% of 425

29. 153% of 801

30. 689% of 2981

31. Last week a waitress made \$204 in tips. This week she made 135% of that. About how much did she make this week?



## Lesson 3 Homework Practice

### *Using the Percent Equation*

Solve each problem using a percent equation.

1. What is 5% of 224?
2. What is 18% of 65?
3. What is 63% of 300?
4. What is 40% of 980?
5. What is 18% of 650?
6. Find 2% of 820.
7. Find 75% of 312.
8. Find 312% of 75.
9. Find 5.6% of 1050.
10. Find 21.4% of 855.
11. 52.3 is what percent of 1046?
12. 48 is what percent of 75?
13. 100 is what percent of 250?
14. 96 is what percent of 400?
15. 10 is what percent of 625?
16. 49.8 is what percent of 415?
17. 0.4 is what percent of 5?
18. 157 is what percent of 2512?
19. 1206 is what percent of 8040?
20. 63 is what percent of 60?
21. 13 is 50% of what number?
22. 121 is 22% of what number?
23. 11 is 4% of what number?
24. 438 is 24% of what number?
25. 3570 is 42% of what number?
26. 8 is 1% of what number?
27. Michael's bill at a restaurant was \$46.32. He wants to leave a 17% tip. What will the new total be, including tip?
28. A jacket is on sale for \$68.00. There is 5% sales tax on the purchase. What is the total cost, including tax?



# Lesson 3 Problem-Solving Practice

## Using the Percent Equation

<p>1. Bob is looking to buy a new baseball cap with his favorite team's logo on it. He finds one that normally sells for \$32. If a 7% sales tax is added, what is the total cost?</p>	<p>2. Harold is interested in selling his father's baseball card collection. A local sports card dealer will sell the collection for Harold, but will collect a fee equal to 18% of the selling price. If the card dealer sells the baseball card collection for \$325, what is the amount of the fee?</p>
<p>3. Martina bought a new pair of shoes. Her receipt is shown below. She wants to know the sales tax rate, but she spilled water on the receipt, blurring the information. What is the sales tax rate in Martina's state?</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;"><b>Shoes R Us</b> Receipt of Purchase</p> <hr style="border-top: 1px dashed black;"/> <p style="text-align: center;">Shoes, white \$39.90</p> <hr style="border-top: 1px dashed black;"/> <p style="text-align: center;"><b>Subtotal:</b> \$39.90</p> <p style="text-align: center;"><b>Sales Tax:</b> _____</p> <hr style="border-top: 1px dashed black;"/> <p style="text-align: center;"><b>Total:</b> \$41.50</p> </div>	<p>4. Bria has a coupon for an additional 25% off the purchase of any sale item at a garden store. She finds a birdbath that is on sale at 10% off the original price of \$79. What is the price of the birdbath after both discounts are applied? Round your answer to the nearest cent.</p>
<p>5. South State University has 54,000 students enrolled. Enrollment predictions show that the number of students will grow 1.2% each year for the next 5 years. According to the enrollment prediction, how many students will be enrolled at South State University next year?</p>	<p>6. Chan bought a \$600 computer, but his total was \$648. What percent sales tax did he pay?</p>

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