SAMPLER

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GEORGIA Coach®

7

MATHEMATICS

EPS LEARNING Coach®

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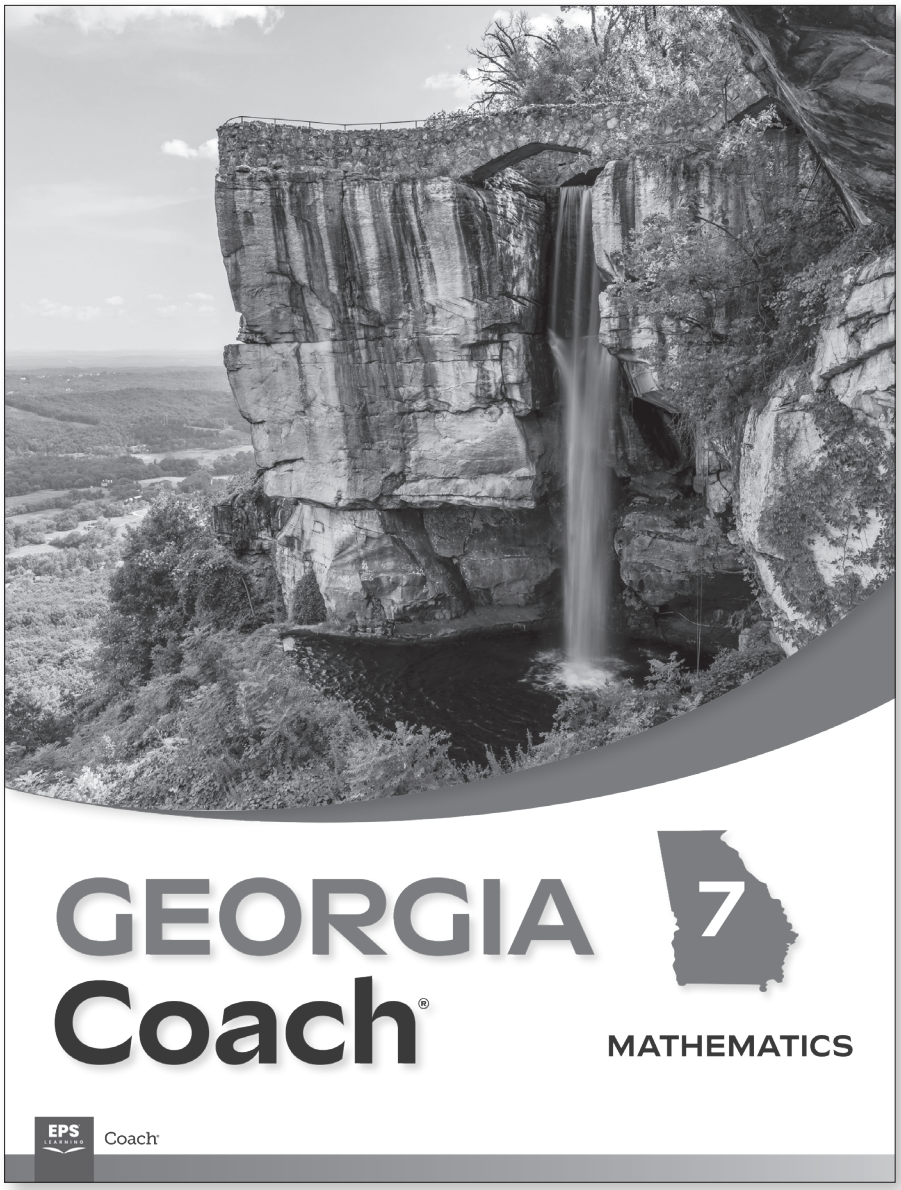


GRADE 7

LESSON 11 SAMPLE

Proportional Relationships

Getting the Idea

You can use proportions to solve problems. Proportional relationships, such as the number of miles driven at a constant speed and the amount of time spent driving, can be represented by equal ratios. Relationships that are not proportional, such as a person's age and height, cannot be represented by equal ratios.

Example 1

Derek counted 24 marshmallows in 3 servings of Marshy Morsels. At this rate, how many marshmallows are in 12 servings?

Strategy **Write and solve a proportion.**

Step 1 Set up a proportion.

Keep the units consistent.

$$\frac{24 \text{ marshmallows}}{3 \text{ servings}} = \frac{m \text{ marshmallows}}{12 \text{ servings}}$$

Step 2 Find a common denominator.

3 is a factor of 12.

Step 3 Rename $\frac{24}{3}$ as a fraction with 12 as the denominator.

$$\frac{24}{3} \times \frac{4}{4} = \frac{96}{12}$$

$$m = 96$$

Solution **At this rate, there are 96 marshmallows in 12 servings.**

In a proportional relationship, when one quantity increases, the other quantity also increases. The ratio of the two quantities stays constant in a proportional relationship. The constant ratio is also called the unit rate, or the **constant of proportionality**.

Example 2

A train travels 120 miles in 1.5 hours. At this rate, how many miles can it travel in 5 hours?

Strategy **Find and use the unit rate.**

Step 1 Write the rate as a fraction.

$$\frac{120 \text{ mi}}{1.5 \text{ hr}}$$

Step 2 Divide to find the unit rate, or the constant of proportionality.

$120 \div 1.5 = 80$

The unit rate is 80 mph.

Step 3 Write the distance equation.

rate $\times$ time $=$ distance

Step 4 Substitute the known values into the equation and solve for the distance.

rate $= 80$ mph

time $= 5$ hr

rate $\times$ time $=$ distance

$80 \times 5 = 400$ miles

Solution **At this rate, the train can travel 400 miles in 5 hours.**

In Example 2, you could also have solved the problem by writing and solving a proportion.

$\frac{120}{1.5} = \frac{x}{5}$ Let x represent the distance traveled in 5 hours.

$120 \times 5 = 1.5 \times x$ Write the factors of the cross products.

$600 = 1.5x$ Find the cross products.

$\frac{600}{1.5} = \frac{1.5x}{1.5}$ Divide to solve for x.

$400 = x$

Some problems involving percents can be solved by writing and solving a proportion.

Example 3

18 is what percent of 60?

Strategy **Write and solve a proportion.**

Step 1 Let x represent the percent, which is unknown.

Write a proportion that compares 18 and 60 to x%.

$$\frac{18}{60} = \frac{x}{100}$$

Step 2 Cross multiply.

$$\frac{18}{60} = \frac{x}{100}$$

$$60 \times x = 18 \times 100$$

$$60x = 1{,}800$$

$$\frac{60x}{60} = \frac{1{,}800}{60}$$

$$x = 30$$

Solution **18 is 30% of 60.**

A proportional relationship exists between two quantities if the ratios of one quantity to the other are always equivalent.

Example 4

The table below shows the number of apples needed to make various amounts of an applesauce recipe.

Number of Apples	Cups of Applesauce
4	3
8	6
16	12

Is the number of apples to cups of applesauce proportional?

Strategy **Write ratios for each corresponding number of apples to cups of applesauce, simplify, and check for equivalence.**

Step 1 Write ratios based on the data from the table and simplify them.

$$\frac{\text{number of apples}}{\text{cups of applesauce}} = \frac{4}{3}$$

$$\frac{\text{number of apples}}{\text{cups of applesauce}} = \frac{8}{6} = \frac{4}{3}$$

$$\frac{\text{number of apples}}{\text{cups of applesauce}} = \frac{16}{12} = \frac{4}{3}$$

Step 2 Verify that the ratios are equivalent.

All three ratios, in simplest form, equal $\frac{4}{3}$.

Solution **Yes, the number of apples to cups of applesauce is proportional.**

Coached Example

Mr. Collins is planning a party for his homeroom class. There are 30 students in his class. He wants each student to have a serving of 8 fluid ounces of juice. Each jug of juice contains 40 fluid ounces. At this rate, how many jugs of juice will he need for the party?

First find the unit rate, the number of servings of juice in each jug.

Write the number of fluid ounces for each student. _____

Write the number of fluid ounces in each jug. _____

To find the unit rate, write a _____ that compares the number of fluid ounces in each jug to the number of fluid ounces for each student. _____

Simplify the ratio to write the unit rate. _____ servings per jug

To find the number of jugs Mr. Collins needs, _____ the number of students in the class by the number of servings per jug.

_____ ÷ _____ = _____

Mr. Collins will need _____ jugs of juice for the party.

Lesson Practice • Part 1

Choose the correct answer.

1. Mrs. Simpson drove 105 miles in $2\frac{1}{2}$ hours. What was Mrs. Simpson's speed in miles per hour?

A. 35 miles per hour
B. 42 miles per hour
C. 45 miles per hour
D. 52.5 miles per hour

2. The table below shows the number of baseball and football cards owned by four friends.

Person	Baseball	Football
Peter	48	60
Dominic	26	32
Alfonso	18	21
Troy	12	15

Between which two friends' card collections does a proportional relationship exist?

A. Peter and Alfonso
B. Dominic and Alfonso
C. Dominic and Troy
D. Peter and Troy

3. On a standardized test, Raul answered the first 22 questions in 5 minutes. There are 77 questions on the test. If he continues to answer questions at the same rate, how long will it take him to complete the test from start to finish?

A. 15 minutes
B. 16 minutes
C. 16.5 minutes
D. 17.5 minutes

4. Kendall knows that a 45-fluid ounce pitcher can hold enough lemonade for 6 people. At this rate, how many fluid ounces of lemonade will Kendall need to serve 26 people?

A. 45 fluid ounces
B. 71 fluid ounces
C. 180 fluid ounces
D. 195 fluid ounces

5. One 50-pound bag of fertilizer will cover 75 square feet of lawn. How many pounds of fertilizer will Tawny need to cover 120 square feet of lawn?

A. 80 pounds
B. 70 pounds
C. 60 pounds
D. 50 pounds

6. What value of x makes the proportional relationship true?

$$\frac{10 \text{ lemons}}{8 \text{ cups of lemonade}} = \frac{5 \text{ lemons}}{x \text{ cups of lemonade}}$$

A. 3

B. 4

C. 8

D. 16

7. A computer downloads a 48-kilobyte file in 5 seconds. At this rate, how long will it take the computer to download a file that is 120 kilobytes?

A. 2 seconds

B. 11 seconds

C. 12.5 seconds

D. 14.4 seconds

8 Which pair of ratios is proportional?

A. $\frac{5}{12}$ and $\frac{12}{5}$

B. $\frac{5}{12}$ and $\frac{15}{36}$

C. $\frac{5}{12}$ and $\frac{10}{17}$

D. $\frac{5}{12}$ and $\frac{25}{12}$

9. Taylor buys 8 comic books for $18. Each comic book costs the same amount.

A. What is the cost per comic book that Taylor pays? Show your work.

B. At this rate, how many comic books can Taylor buy with $27? Show your work.

Lesson Practice • Part 2

Choose the correct answer.

Use this information for questions 1 and 2.

Mrs. Graham put 150 gallons of water into a swimming pool in 6 minutes.

1. At that rate, how many minutes would it take to fill a 20,000-gallon pool?

A. $133\frac{1}{3}$ minutes

B. 156 minutes

C. 800 minutes

D. 900 minutes

2. Which describes the constant of proportionality?

A. 25 gallons per minute

B. 25 gallons per hour

C. 900 gallons per minute

D. 900 gallons per hour

3. Two gallons of paint will cover 700 square feet. How many gallons of paint are needed to cover 1,960 square feet?

A. $3\frac{4}{5}$ gallons

B. $4\frac{3}{5}$ gallons

C. $4\frac{4}{5}$ gallons

D. $5\frac{3}{5}$ gallons

4. What value of b makes this proportion true?

$$\frac{12}{16} = \frac{21}{b}$$

A. $b = 25$

B. $b = 27$

C. $b = 28$

D. $b = 30$

Use this information for questions 5 and 6.

A bullet train traveled 270 kilometers in 1.5 hours. The entire trip is scheduled to last 5 hours.

5. If the train continues at the same rate, which proportion can be used to find the length, in kilometers, k, of the trip?

A. $\frac{1.5}{270} = \frac{5}{k}$

B. $\frac{1.5}{k} = \frac{5}{270}$

C. $\frac{270}{1.5} = \frac{5}{k}$

D. $\frac{270}{k} = \frac{5}{1.5}$

6. What is the value of k?

A. $k = 630$

B. $k = 810$

C. $k = 900$

D. $k = 945$

7. Gisele used 2 cups of sugar to make 72 cookies. If the amount of sugar used is proportional to the number of cookies made, how many cookies can Gisele bake using 4 cups of sugar?

A. 36

B. 76

C. 144

D. 288

8. Major league baseball teams play a 162-game schedule. So far, Grace's favorite team has won 11 games and lost 7 games. If Grace's team wins at the same rate, how many games can she expect for them to win this season?

A. 63
B. 77
C. 85
D. 99

9. Which pair of ratios is proportional?

A. $\frac{1}{3}$ and $\frac{3}{1}$
B. $\frac{1}{3}$ and $\frac{4}{6}$
C. $\frac{1}{3}$ and $\frac{3}{9}$
D. $\frac{1}{3}$ and $\frac{1}{6}$

Use this information for questions 10 and 11.

Thomas received $79 for exchanging 50 British pounds for dollars.

10. How many dollars would Thomas receive for 160 British pounds?

A. $252.80
B. $173.80
C. $132.91
D. $101.27

11. What is the constant of proportionality?

A. $0.31 per British pound
B. $0.63 per British pound
C. $1.58 per British pound
D. $2.03 per British pound

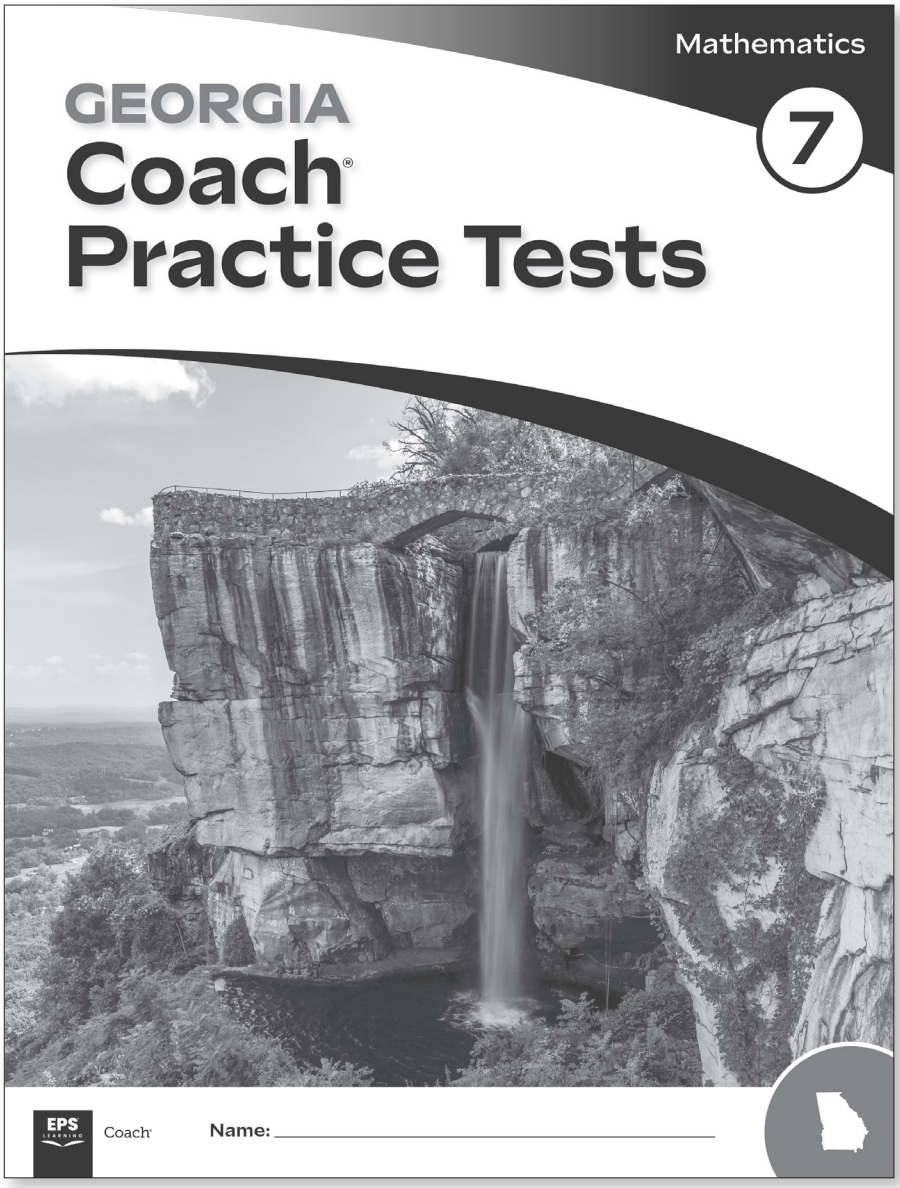
12. A person who weighs 150 pounds weighs 25 pounds on the Moon.

A. What is the weight of a 1,800-pound car on the Moon? Show your work.

_____

B. Suppose an object weighs 80 pounds on the Moon. What is that object's weight on Earth? Show your work.

_____



GRADE 7

PRACTICE TEST SAMPLES

16. **A bird is flying northeast. In the same time it flies $\frac{3}{8}$ mile east, it flies $\frac{5}{6}$ mile north. How many miles does the bird fly east for every mile it travels north?**

A $2\frac{2}{9}$ miles east for every mile north

B $\frac{3}{5}$ mile east for every mile north

C $\frac{9}{20}$ mile east for every mile north

D $\frac{5}{16}$ mile east for every mile north

17. **The original price of a pair of pants is $20.00. The price of the pants is discounted by 25%.**

Then a sales tax of 8% is added to the discounted price.

What is the final price of the pants after the discount is taken and the sales tax is added?

Write your answer in the box below.

18. **The circumference of a circle is $6\frac{2}{7}$ miles. What is the area of the circle in square miles? (Use $\frac{22}{7}$ for π.)**

A $\frac{11}{7}$

B $\frac{22}{7}$

C $\frac{44}{7}$

D $\frac{88}{7}$

GO ON

19. There are 20 marbles in a bag. Colin randomly selects a marble 50 times and returns the marble to the bag after each selection. The table shows Colin's results.

	Red	Blue	Green	Purple	Orange
Number of times selected	20	14	9	5	2

Based on these results, which is the most likely number of green marbles in the bag? Assume that each marble is equally likely to be chosen.

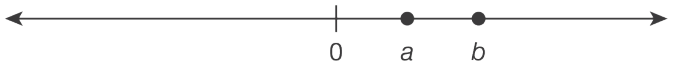
A 1

B 3

C 5

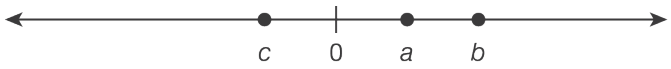
D 9

20. Two points, a and b, are plotted on the number line below.

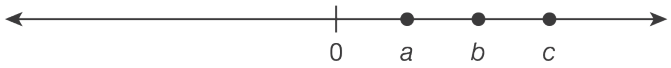


If $c = a - b$, which shows the approximate location of c on the number line?

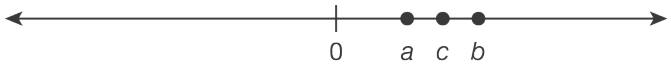
A



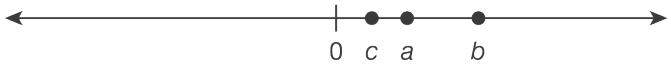
B



C



D



GO ON

21. **Mr. Washington drills a water well. Ground conditions cause an increase of 5% to the cost per meter, c. In addition, the cost of equipment is $1,400. He writes the expression $1{,}400 + c + 0.05c$ to represent the total cost of his well. How can he rewrite the expression to best help him understand the cost per meter separated from the cost of equipment?**

A $1{,}401.05c$

B $1{,}400 + 1.05c$

C $1.05(c + 1{,}400)$

D $1{,}400 + 1c + 0.05c$

22. **Each month a certain manufacturing plant produces 15,000 cellphone batteries. Quality control testers sample 200 batteries.**

- **Tester A tested the first 200 batteries produced during the first shift of the month and found 8 defective batteries.**
- **Tester B tested 200 batteries from the newest assembly line and found 2 defective batteries.**
- **Tester C tested 200 batteries collected from different shifts and different assembly lines and found 6 defective batteries.**

Based on the samples, what is a reasonable prediction for the total number of defective batteries produced each month?

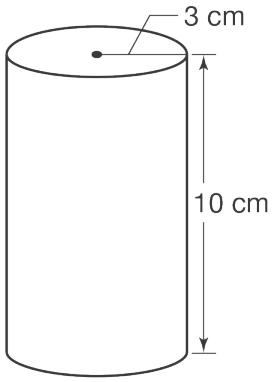
Choose the correct letter and number to complete the sentence.

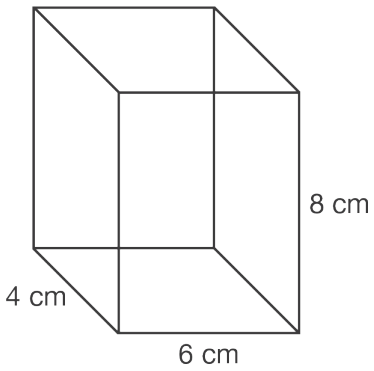
Tester	**A** A **B** B **C** C	**used an unbiased sample, so the most reasonable prediction is**

about	**A** 200 **B** 450 **C** 600	**defective batteries.**

GO ON

23. **Sarah is working on a project for her art class, where she needs to create a sculpture using two different shapes: a cylindrical can and a rectangular prism box. She needs to find the volume of both shapes to know how much space they will take up in her sculpture.**





If Sarah combines the volumes of the cylindrical can and the rectangular prism box, what is the total volume of her sculpture?

A 474.6 cm^3

B 478.6 cm^3

C 462.6 cm^3

D 480.6 cm^3

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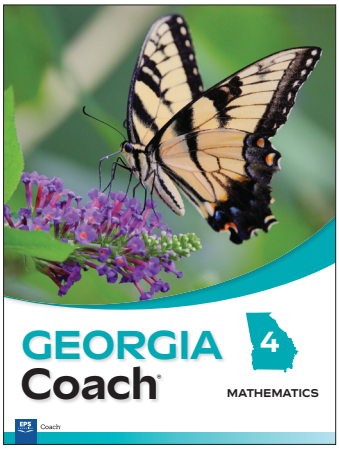
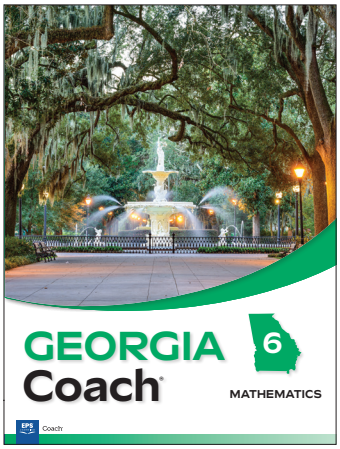
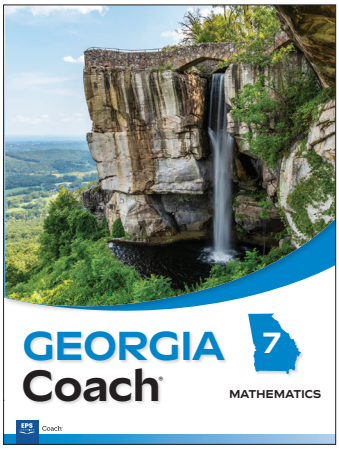
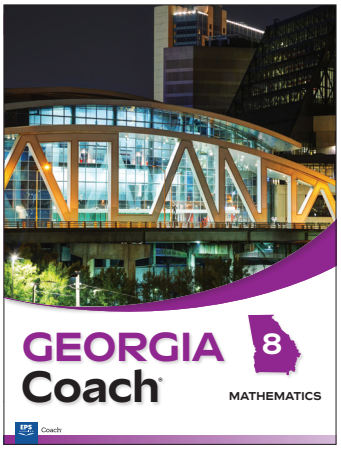
MATHEMATICS

GRADES 3–8









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