

GRADE 7 - MODULE 4 - PROPORTIONAL RELATIONSHIPS

Big Ideas

Rates, ratios, and proportional relationships can be used to describe, analyze and solve mathematical and real-world situations. Scale drawings are an application of proportionality.

Vocabulary

unit rates, ratios, proportional relationships, proportions, constant of proportionality, equivalent fractions, cross products, means, extremes, ordered pairs, x -coordinate, y -coordinate, dependent variable, independent variable, comparison, quantity, unit, coefficient, scale drawings, dimensions, scale factor, scale, perimeter, area

Prior Learning

In Grade 6, students are introduced to the concepts of rates and ratios and solve rate and ratio problems using equivalent ratios and unit rates generated by multiplication or division and ratio tables.

Essential Questions

- How do you recognize and represent proportional relationships between quantities?
- What does the unit rate tell you about the relationship between two quantities?
- How can you determine if two quantities in a table have a proportional relationship?
- How do you know that a graph shows a proportional relationship?
- How can you model a proportional relationship using manipulatives or a picture?
- What is meant by the constant of proportionality?
- How do you apply proportions?
- What are the similarities and differences between rate, ratio, and proportion?
- When would you use rate, ratio, and proportion in the real world?
- How can you find the constant of proportionality in an equation? in a graph?
- What are the dependent and independent variables in an equation and what do they represent?
- What is a ratio?
- How do you write a ratio as a unit rate?
- What does a unit rate tell you about the relationship between two quantities?
- Explain how to use fraction models to demonstrate a proportional relationship.
- How can one apply ideas about proportionality in geometric shapes in the everyday world?
- How are ideas about similarity used in the everyday world?
- When two figures are similar, what is the same? What is different?
- When two figures are similar, what is the relationship between the areas? The perimeters?
- How do the ratios of similar figures relate?
- How does one use scale factor to determine map distances?
- What is a scale diagram?
- How do we use scale diagrams in real-world situations?
- How can we use scale factors to find missing measures in similar figures?

Competencies

- Students will write ratios from situations and problems.
- Students will find equivalent ratios as well how to determine and unknown in an equivalent ratio.
- Students will use and graph ratio tables to solve problems and analyze situations.
- Students will be able to compute unit rates from ratios, including ratios of lengths and quantities measured in varied units.
- Students will know how to determine when two ratios are in a proportional relationship.
- Students will test proportions in a table, graph or equation to determine proportionality.
- Students will be able to solve proportions in various ways (cross-products, equivalent ratios).
- Students will be able to explain unit rates in a table and graph and determine the constant of proportionality.
- Students will write equation and interpret graphs of proportional relationships.
- Students will be able to draw scale diagrams.
- Students will be able to scale figures up and down.
- Students will be able to compute missing lengths and areas of scale drawings using proportions.

- Students will be able to solve problems using scale factor.

Misconceptions

- Students may confuse ratios and fractions and not understand that not all fraction concepts can be applied to ratios (i.e. no mixed ratios)
- Students may have difficulty with conversion rates (feet in a mile etc.) and should be allowed to use reference sheets or tables as needed.
- Students may have difficulty when graphing proportional relationships and determining the x-axis and y-axis values as well as the appropriate scale to use.
- Students may look at the ratios and proportions as mathematical relationships and not make the connection to proportional relationships with equations and graphs.
- Students may have difficulty correctly setting up proportions for scale drawings.
- Students may have difficulty with scaling when applying proportional reasoning to scale drawings.
- Students often confuse situations that require adding with multiplicative situations in regards to scale factor.

**Resources from The Key Elements to Mathematics Success - KEMS Grade 7
for Building the Conceptual Understanding of this Module**

KEMS LESSON 4– UNIT RATES

Additional Activities: Quiz – T78-T79, Chain Reaction T934

KEMS LESSON 5 – PROPORTIONAL RELATIONSHIPS

Additional Activities: Quiz – T98-T101, Chain Reaction T935

KEMS LESSON 6 – IDENTIFYING THE CONSTANT OF PROPORTIONALITY

Additional Activities: Quiz – T120-T122, Scavenger Hunt T936-T939

KEMS LESSON 7– REPRESENTING PROPORTIONAL RELATIONSHIPS WITH EQUATIONS

Additional Activities: Quiz – T144-T146, Scavenger Hunt T940- T943

KEMS LESSON 8 – PROPORTIONAL RELATIONSHIPS IN GRAPHS

Additional Activities: Quiz – T166-T169, Scavenger Hunt T944- T947

KEMS LESSON 22: SCALE DRAWINGS

Additional Activities: Quiz – T573-T575, Scavenger Hunt –T973-T976

| Mathematics Content Standards | Examples |
|---|---|
| <p>7. RP.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.</p> | <p>Students work with unit rates using fractions and converting units when needed. Example; If $\frac{1}{2}$ gallon of paint covers $\frac{1}{6}$ of a wall, then how much paint is needed for the entire wall? Solution: $\frac{\frac{1}{2} \text{ gal}}{\frac{1}{6} \text{ wall}} = \frac{1}{2} \cdot \frac{6}{1} = \frac{3 \text{ gallons}}{\text{wall}}$ 3 gallons per 1 wall</p> |

Questions for 7.RP.1

- What is the ratio of circles to squares?
 What is the ratio of squares to circles?
 ○ ○ ○
 □ □
- What is the unit rate of triangles to rectangles? Explain how you determined your answer.
 △ △ △ △ △ △
 □ □
- Thomas can mow 3 lawns in 4 hours. What is the unit rate of lawns per hour that he can mow?
- Emilie is walking at a rate of two feet per second. How much time will it take her to walk one mile? Show your work or explain your answer.
- Fred’s car gets 36 miles per gallon on highways and 26 miles per gallon when driving in cities. If Fred has a 12-gallon tank, how many miles can he travel in the city before having to refill his tank?
 A. Fred can drive 212 miles in the city before having to refill.
 B. Fred can drive 312 miles in the city before having to refill.
 C. Fred can drive 322 miles in the city before having to refill.
 D. Fred can drive 412 miles in the city before having to refill.
- What is the unit rate earned if the total pay is \$145 for 25 hours?
 A. The unit rate of pay is \$5.08 per hour. B. The unit rate of pay is \$5.80 per hour.
 C. The unit rate of pay is \$0.58 per hour. D. The unit rate of pay is \$58.00 per hour.
- Steven is jogging at a rate of 8 feet per second. How much time will it take him to jog one mile? Show your work or explain your answer.
- Tatiana helps out at her uncle’s store after school. If Tatiana works three hours a day on school days and makes \$123.75 in a week, at what rate is she paid?
 A. \$8.25/hour B. \$24.75/hour C. \$41.25/hour D. \$371.25/hour

Answer Key for Questions for 7.RP.1

1. Ratio of circles to squares is $\frac{3}{2}$.

Ratio of squares to circles is $\frac{2}{3}$.

2. The ratio of triangles to rectangles is $\frac{6}{2}$ so the unit rate is $\frac{3}{1}$.

3. The unit rate is $\frac{3}{4}$ of a lawn per hour.

4. It will take Emilie 2,640 seconds or 44 minutes to walk 1 mile.

5. $26 \times 12 = 312$

B. Fred can drive 312 miles in the city before having to refill.

6. $145 \div 25 = 5.8$

B. The unit rate of pay is \$5.80 per hour.

7. $5280 \div 8 = 660$ seconds $660 \text{ seconds} \div 60 = 11$ minutes

8. A. \$8.25 / hour

Tasks for 7.RP.1

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Track Practice

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/82>

Illustrative Math Task: Molly's Run

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/828>

Illustrative Math Task: Cooking with the Whole Cup

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/470>

Illustrative Math Task: Molly's Run, Assessment Variation

<http://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/1176>

Illustrative Math Task: Cider versus Juice – Variation 1

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/1968>

Illustrative Math Task: Cider versus Juice – Variation 2

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/1972>

Illustrative Math Task: Stock Swaps – Variation 2

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/98>

Illustrative Math Task: Stock Swaps – Variation 3

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/99>

MAP Task: A Golden Crown

<http://map.mathshell.org.uk/materials/tasks.php?taskid=282#task282>

Illustrative Math Task: Sale!

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/114>

Illustrative Math Task: Thunder and Lightning

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/1597>

Illustrative Math Task: Climbing the Steps of El Castillo

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/1564>

Illustrative Math Task: Dueling Candidates

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/1589>

Illustrative Math Task: Perfect Purple Paint II

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/2050>

Extra Questions for Warm-ups and Homework for 7.RP.1

1. Draw a pictorial representation of the following ratios using shapes. 4 to 5, 5 to 4
2. Explain the three ways that you can write a ratio
3. Mrs. Haskins is dividing her class into groups for a project. There are a total of 28 students. She wants to put the students into groups of 4. What is the unit rate of students per group?
4. Jason has to mow 15 lawns in 5 days. If he plans on mowing the same number of lawns each day, what is the unit rate of lawns per day? Explain your answer using a model or picture.

Mathematics Content Standards

Examples

7.RP.2

Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

c. Represent proportional relationships by equations.
For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.

d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$

Note: This standard focuses on the representations of proportions. Solving proportions is also addressed in 7.RP.A.3.

Students determine if two quantities are in a proportional relationship from a table or graph. Fraction and decimal values may be used.

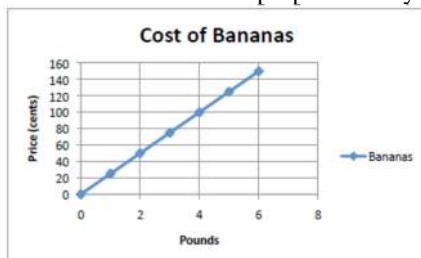
Example 1: The table below gives the price for different numbers of books. Do the numbers in the table represent a proportional relationship?

| Number of Books | Price |
|-----------------|-------|
| 1 | 3 |
| 3 | 9 |
| 4 | 12 |
| 7 | 18 |

Solution: Students can examine the numbers to determine that the price is the number of books multiplied by 3, except for 7 books. The row with seven books for \$18 is not proportional to the other amounts in the table; therefore, the table does not represent a proportional relationship.

Students can interpret the values from the table as ordered pairs. If the ordered pairs will form a straight line through the origin, then the relationship is proportional. For the ordered pairs $(1, 3)$, $(3, 9)$, $(4, 12)$ there is a proportional relationship. However, the ordered pair $(7, 18)$ would not be on the line, indicating that it is not proportional to the other pairs.

Example 2: The graph below represents the price of the bananas at one store. What is the constant of proportionality?



Solution: We can determine from the graph that the cost of 4 pounds of bananas is \$1.00. This is a proportional relationship so we can find the value of 1 pound of bananas which is \$0.25 - the constant of proportionality for the graph. Note: Any point on the line will yield this constant of proportionality.

and $(1, r)$ where r is the unit rate.

The unit rate is also the constant of proportionality.

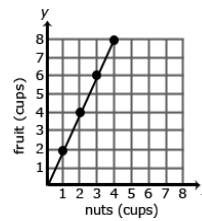
Example 3: The price of bananas at another store can be determined by the equation: $P = \$0.35n$, where P is the price and n is the number of pounds of bananas. What is the constant of proportionality (unit rate)?

Solution:

The constant of proportionality is the coefficient of x (or the independent variable). The constant of proportionality is 0.35.

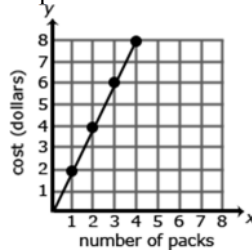
Example 4: A student is making trail mix. Create a graph to determine if the quantities of nuts and fruit are proportional for each serving size listed in the table. If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how the constant of proportionality was determined and how it relates to both the table and graph.

| | | | | |
|-----------------------|---|---|---|---|
| Serving Size | 1 | 2 | 3 | 4 |
| Cups of Nuts (x) | 1 | 2 | 3 | 4 |
| Cups of Fruit (y) | 2 | 4 | 6 | 8 |



The relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1). The constant of proportionality is shown in the first column of the table and by the steepness (rate of change) of the line on the graph.

Example 5: The graph below represents the cost of gum packs as a unit rate of \$2 dollars for every pack of gum. The unit rate is represented as \$2/pack. Represent the relationship using a table and an equation.



| Number of Packs of Gum (g) | Cost in Dollars (d) |
|--------------------------------|-------------------------|
| 0 | 0 |
| 1 | 2 |
| 2 | 4 |
| 3 | 6 |
| 4 | 8 |

Equation: $d = 2g$, where d is the cost in dollars and g is the packs of gum. Students may reverse the variables so it may be useful to use variables that relate to the equation instead of always using x and y . A student use the verbal model “the number of packs of gum times the cost for each pack is the total cost in dollars” to construct an equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost. ($g \times 2 = d$)

Questions for 7.RP.2

1. Identify which of the following fraction pairs are equivalent.

- A. $\frac{1}{2}$ and $\frac{3}{6}$ B. $\frac{2}{3}$ and $\frac{3}{5}$ C. $\frac{3}{4}$ and $\frac{6}{8}$ D. $\frac{10}{12}$ and $\frac{4}{6}$

2. Use the concept of means and extremes to explain whether or not the following fraction pair is equivalent.

$$\frac{8}{12} \text{ and } \frac{4}{6}$$

3. Does the table below model a proportional relationship? Use what you know about unit rates to defend your answer.

| | | | | |
|--------------------|----|----|----|-----|
| Number of Students | 27 | 54 | 81 | 108 |
| Classrooms | 1 | 2 | 3 | 4 |

4. Explain the meaning of the term “constant of proportionality” in the diagram below.



5. What is the constant of proportionality in the table below? Explain the meaning of the constant of proportionality for the movie rentals and the monthly fee.

| | | | | | | | |
|--------------------------------|---|---|---|----|----|----|----|
| Movie rentals (<i>m</i>) | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Total Monthly Fee (<i>t</i>) | 3 | 6 | 9 | 12 | 15 | 18 | 21 |

6. Jasmine got a new puppy when he was one month old and weighed two pounds. She has made a table of the puppy’s weights. Use the table to determine the constant of proportionality which represents the weight gain for the puppy.

| | | | | |
|--------|----------|----------|----------|-----------|
| Month | 1 | 2 | 3 | 4 |
| Weight | 3 pounds | 6 pounds | 9 pounds | 12 pounds |

A. 1 pound per month B. 2 pounds per month C. 3 pounds per month D. 4 pounds per month

7. Draw a picture of 4 squares and 2 circles. What is the constant of proportionality between the squares and circles? Show your work.

8. Write an equation to represent the proportional relationship between the cost of karate and the lessons per week.

| | | | | |
|-------------------------------|----|----|----|----|
| Lessons per week (<i>w</i>) | 1 | 2 | 3 | 4 |
| Total Cost (<i>c</i>) | 12 | 24 | 36 | 48 |

9. Write an equation to represent the proportional relationship between how many times the lawn was mowed and monthly cost.

| | | | | |
|---------------------------|---------|---------|----------|----------|
| Lawn mowed (<i>m</i>) | 2 | 4 | 5 | 6 |
| Monthly cost (<i>c</i>) | \$45.00 | \$90.00 | \$112.50 | \$135.00 |

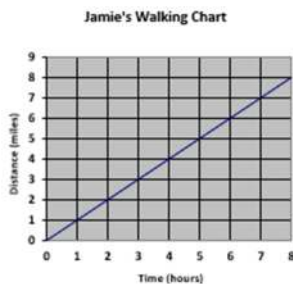
10. Explain the meaning of the term “unit rate”.

When graphing a proportional relationship, what is the value of the *x*-coordinate of the point that represents the unit rate?

11. The chart below shows the relationship between the time and distance Stephen walks to school. Identify the coordinate pairs that model the relationship in the chart.

| Hour | Miles |
|------|-------|
| 1 | 2 |
| 2 | 4 |
| 3 | 6 |
| 4 | 8 |

12. Does the information plotted in the graph below represent a proportional relationship? _____ What is the unit rate represented on the graph?



13. If a pound of candy costs \$5.50, how much will 3.5 pounds of candy cost?

- A. It will cost \$9.25 for 3.5 pounds of candy. B. It will cost \$16.25 for 3.5 pounds of candy.
 C. It will cost \$18.25 for 3.5 pounds of candy. D. It will cost \$19.25 for 3.5 pounds of candy.

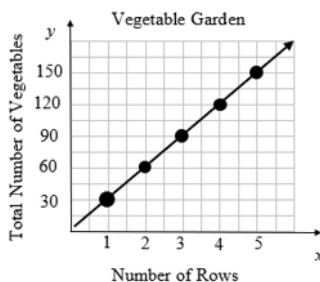
14. Mr. Lynaugh is a long-distance truck driver who travels across the United States for his job. The table below shows the cost of gasoline for the past week. What is cost per gallon for the gas?

| | | | | |
|--------------------------------|------|---------|----------|-------|
| Number of Gallons (<i>g</i>) | 15 | 22 | 42 | 30 |
| Total Gas Cost (<i>t</i>) | \$57 | \$83.60 | \$159.60 | \$114 |

15. Lori's Learning Center provides tutoring for students. The cost of the tutoring group is \$25 per week. Write an equation to model the total cost (*c*), after (*w*) weeks.

- A. $c = 25w$ B. $c = 25 + w$ C. $c = w - 25$ D. $w = 25c$

16. What does the point (4, 120) represent in the graph below?



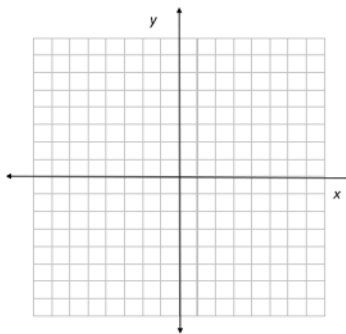
17. Tianna is training for a race. She is running every day Monday through Friday. She runs 75 laps in 3 days. If she runs the same number of laps every day, what is the unit rate of laps per day?

18. Write an equation to represent the relationship in the table below.

| x | y |
|-----|-----|
| 10 | -20 |
| 5 | -10 |
| 0 | 0 |
| -5 | 10 |
| -10 | 20 |

19. Graph the coordinate pairs in the table below and determine whether they represent a proportional relationship based on the line in the graph.

| | | | | |
|-----|---|---|---|----|
| x | 1 | 3 | 5 | 7 |
| y | 3 | 5 | 7 | 10 |



20. What is the constant of proportionality in the equation below? $14x = 238$

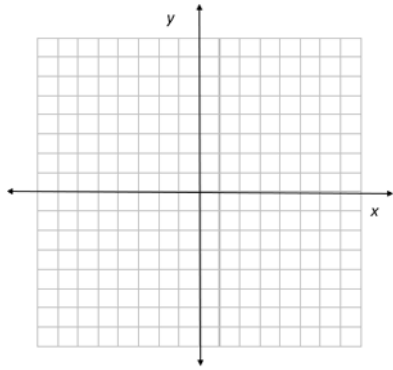
21. The computer club is selling cookie dough for a fundraiser. If they earn \$4.75 in profit for each tub of cookie dough, write an equation to determine their total earnings where (d) represents each tub of cookie dough and (t) represents the total earnings.

22. What does the point (4, 2) represent in the coordinate graph below?



23. Graph the coordinate pairs in the table below and determine whether they represent a proportional relationship based on the line in the graph.

| x | y |
|---|---|
| 0 | 0 |
| 1 | 2 |
| 2 | 4 |
| 3 | 6 |



24. Mrs. Harris gave a quiz in math class. The table below shows the relationship between the number of correct answers and the student's grade. What is the constant of proportionality (points per question) for the quiz?

| Number of Questions Correct | Grade |
|-----------------------------|-------|
| 10 | 40 |
| 15 | 60 |
| 16 | 64 |
| 25 | 100 |

25. Write an equation to represent the relationship between the number of video games purchased (g) and the total cost (t).



26. What does the point (2, 16) represent from the graph below?



Answer Key for Questions for 7.RP.2

1. A. $\frac{1}{2}$ and $\frac{3}{6}$

C. $\frac{3}{4}$ and $\frac{6}{8}$

2. If the product of the means equals the product of the extremes, the fractions are equivalent.

$8 \times 6 = 12 \times 4$, so the 2 fractions are equivalent.

3. Yes, it is a proportional relationship. The unit rate for each ratio is the same.

4. The constant of proportionality means that for every 3 stars, there will be 1 triangle. If there are 6 stars, there will be 2 triangles. If there are 9 stars, there will be 3 triangles.

5. The constant of proportionality is \$3 for every 1 movie.

6. C. 3 pounds per month

7. The constant of proportionality is 2 squares for every circle.



8. $c = 12w$

9. $c = 22.5m$

10. Unit rate is the ratio of two measurements in which the second term is 1. In a table, the unit rate can be identified when the independent variable (x-value) is 1.

The x-coordinate of the point representing the unit rate is the independent variable.

11. (1, 2), (2, 4), (3, 6), (4, 8)

12. Yes. The unit rate is 1 mile per hour.

13. $3.5 \times 5.50 = 19.25$

14. $\frac{57+83.60+159.60+114}{15+22+42+30} = \frac{414.20}{109} = 3.8$

The cost per gallon of gas is \$3.80.

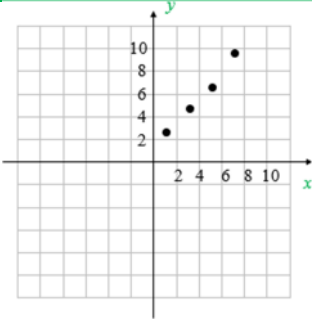
15. A. $c = 25w$

16. In 4 rows, there are 120 total vegetables.

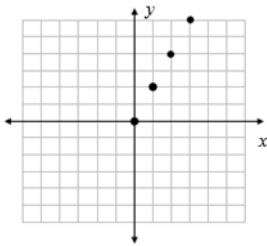
17. She runs 75 laps in 3 days which is a unit rate of 25 laps per day

18. $y = -2x$

19. This is not a proportional relationship



20. $238 \div 14 = 17$ The constant of proportionality is 17.
21. $t = 4.75d$
22. It will take 2 hours to walk 4 miles from school.
23. Yes, these points represent a proportional relationship.



24. The constant of proportionality is 4 points per question.
25. $t = 8g$
26. It will cost \$16 for 2 games

Tasks for 7.RP.2

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Track Practice

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/82>

Illustrative Math Task: Sore Throats, Variation 1

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/2/tasks/180>

Illustrative Math Task: Cider versus Juice – Variation 1

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/1968>

Illustrative Math Task: Cider versus Juice – Variation 2

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/1/tasks/1972>

Illustrative Math Task: Gym Membership Plans

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/2/tasks/1983>

Illustrative Math Task: Stock Swaps – Variation 2

<https://tasks.illustrativemathematics.org/content-standards/7/RP/A/tasks/98>

Illustrative Math Task: Stock Swaps – Variation 3

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/99>

Illustrative Math Task: Music Companies Variation 1

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/95>

Illustrative Math Task: Art Class, Variation 2

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/101>

Illustrative Math Task: Proportionality

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1527>

Illustrative Math Task: Robot Races

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/181>

Illustrative Math Task: Buying Coffee

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/104>

Illustrative Math Task: Robot Races, Assessment Variation

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1178>

MAP Task: A Golden Crown

<http://map.mathshell.org.uk/materials/tasks.php?taskid=282#task282>

Illustrative Math Task: Sale!

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/114>

Illustrative Math Task: Thunder and Lightning

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/1597>

Illustrative Math Task: Art Class, Variation 1

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/100>

Illustrative Math Task: Art Class, Assessment Variation

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1183>

Illustrative Math Task: Buying Bananas, Assessment Version

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1186>

Illustrative Math Task: Walk-a-Thon 2

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1526>

Illustrative Math Task: Climbing the Steps of El Castillo

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/1564>

Illustrative Math Task: Dueling Candidates

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/1589>

Illustrative Math Task: Perfect Purple Paint II

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/tasks/2050>

Illustrative Math Task: Scaling angles and polygons

<https://tasks.illustrativemathematics.org/content-standards/7/7.RP.A/2/tasks/1201>

Extra Questions for Warm-ups and Homework for 7.RP.2

1. Tanya is making cookies. She needs $\frac{1}{2}$ of a cup of sugar for the cookies. She cannot find the $\frac{1}{2}$ measuring cup. She can only find the $\frac{1}{4}$ measuring cup. How many times will she have to fill the $\frac{1}{4}$ measuring cup for her cookies?
2. Write four fraction pairs. Make two pairs of the fraction equivalent and two pairs not equivalent.
3. Draw a picture of 6 circles and 3 squares. Explain the constant of proportionality of the circles and squares.

4. There are tables in the library for students to work at during their research project. There are 5 chairs at each table. What is the constant of proportionality of chairs and tables? If there are 25 students, how many tables will be needed?

5. Identify the constant of proportionality in the table below.

| | | | | |
|-----------------------|---------|-------|---------|------|
| Money earned | \$62.50 | \$100 | \$37.50 | \$50 |
| Boxes of Cookies Sold | 25 | 40 | 15 | 20 |

6. Identify the constant of proportionality in the table below.

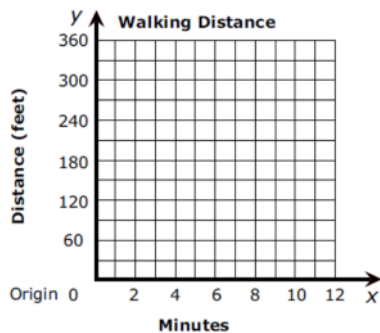
| | | | | |
|--------------|-----|-----|-----|-----|
| Beads Needed | 140 | 336 | 420 | 504 |
| Bracelets | 5 | 12 | 15 | 18 |

7. There are a total of 250 students who are divided evenly into 10 groups. Write an equation to represent the constant of proportionality for the students and groups.

8. Write an equation, create a table and then graph the points for the following situation: There are a total of 32 students in 8 groups in the science lab.

9. Steven is working on a project with his dad. They are planting sunflowers in the garden. They want to plant 5 sunflowers in each row. Write an equation that can be used to determine how many total sunflowers they will need for x rows in the garden.

10. The graph below shows the relationship between the distance Kyle walked and the time he walked. How many minutes did it take Kyle to walk 270 feet?



Mathematics Content Standards

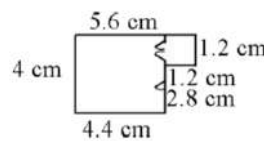
Examples

7.G.1

Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

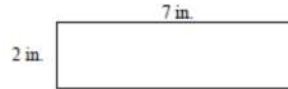
Students determine the dimensions of figures when given a scale and identify the impact of a scale on actual length (one-dimension) and area (two-dimensions). Students identify the scale factor given two figures. Using a given scale drawing, students reproduce the drawing at a different scale. Students understand that the lengths will change by a factor equal to the product of the magnitude of the two size transformations.

Example 1: Julie shows the scale drawing of her room below. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie’s room? Reproduce the drawing at 3 times its current size.



Solution: 5.6 cm → 14 ft 1.2 cm → 3 ft 2.8 cm → 7 ft 4.4 cm → 11 ft
4 cm → 10 ft

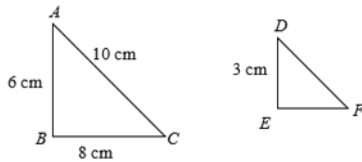
Example 2: If the rectangle below is enlarged using a scale factor of 1.5, what will be the perimeter and area of the new rectangle?



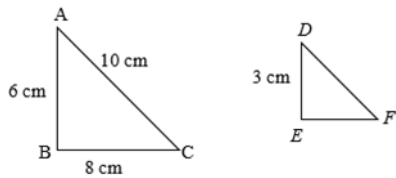
Solution: The perimeter is linear or one-dimensional. Multiply the perimeter of the given rectangle (18 in.) by the scale factor (1.5) to give an answer of 27 in. Students could also increase the length and width by the scale factor of 1.5 to get 10.5 in. for the length and 3 in. for the width. The perimeter could be found by adding $10.5 + 10.5 + 3 + 3$ to get 27 in. The area is two-dimensional so the scale factor must be squared. The area of the new rectangle would be 14×1.5^2 or 31.5 in^2 .

Questions for 7.G.1

1. The two triangles shown below are similar. What is the length of \overline{DF} ?



2. The two triangles shown below are similar. What is the perimeter of Triangle DEF?



3. There is a rectangle on a scale drawing that represents a garden. The perimeter of the rectangle on the drawing is 16 inches. If the scale is 1 inch = 2 feet, what is the perimeter of the actual garden?

4. On the world map in class, 5 cm is equal to 50 miles. If Brittany's home town is 370 miles from her college, how many centimeters would represent that distance on the map?

5. Tina walks to school each day. On the map, the distance she walks is 7.5 cm. The scale on the map is 3 cm = 0.5 miles. What is the actual distance Tina walks to school each day?

Answer Key for Questions for 7.G.1

1. C. 5 centimeters
2. The perimeter of triangle DEF is 12 cm.
3. The perimeter of the garden is 32 feet
4. 37 centimeters

5.

$$\frac{3 \text{ cm}}{0.5 \text{ miles}} = \frac{7.5 \text{ cm}}{x} \quad 3x = 3.75 \quad x = 1.25 \text{ miles}$$

Tasks for 7.G.1

*Teacher Note: Please read the Commentary section for the Illustrative Math Tasks. Some tasks will be instructional requiring more teacher modeling and direction. Others will provide the opportunity for students to demonstrate their knowledge of a concept.

Illustrative Math Task: Floor Plans

<https://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/107>

Illustrative Math Task: Map Distance

<https://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/1082>

Illustrative Math Task: Scaling Angles and Polygons

<https://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/1201>

Illustrative Mathematics: Rescaling Washington Park

<https://tasks.illustrativemathematics.org/content-standards/7/G/A/1/tasks/1991>

Extra Questions for Warm-ups and Homework for 7.G.1

1. A room measures 24 feet by 16 feet. If a scale drawing were created using a scale of 2 cm = 12 feet, what would the dimensions be for the room in the drawing?
2. On a map, a playground is represented by a rectangle that is 2 inches wide and 3 inches long. If the scale of the map is 1 inch = 25 feet. What are the dimensions of the actual playground?
3. If the scale is 3 centimeters = 8 meters, and a garden is 36 meters by 96 meters, what would be the dimension of a scale drawing of the garden?
4. A field measures 80 meters by 50 meters. If a scale drawing were created using a scale of 1 centimeter = 10 meters, what would the dimensions be for the field in the drawing?
5. If the scale is 1 inch = 9 inches, what would be the actual dimensions of a 4 inch by 8-inch poster?

Works Referenced in the Development of the Module

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|---|---|
| Common Core State Standards Initiative www.corestandards.org | Ohio Department of Education http://education.ohio.gov/Topics/Learning-in-Ohio/Mathematics |
| Illustrative Mathematics Project https://illustrativemathematics.org/ | North Carolina Math Tools for Teachers https://tools4ncteachers.com/ |
| Mathematics Assessment Project https://www.map.mathshell.org/index.php | Smarter Balanced Assessment Consortium https://smarterbalanced.org/ |
| PARCC http://parconline.org/ | Utah Education Network https://www.uen.org/core/math/ |
| NOYCE Foundation: https://www.insidemathematics.org/ | |