

Rate Relationship Lab

Show how two quantities change together.

GRADE 7 • 7.RP.A.2

CCSS.Math.Content.7.RP.A.2 "Recognize and represent proportional relationships between quantities."

NAME _____

DATE _____

SPOT THE CONSTANT RATE

In a proportional relationship, $y=kx$ and y/x is the same constant k for every nonzero x . Its graph lies on a straight line through $(0,0)$. A single observed pair cannot establish the rule; use a stated relationship or compare the given data.

WORKED EXAMPLE

Eleven keychains cost \$55. At the same rate, how much do 12 keychains cost?

Let x be the number of keychains and y be the cost in dollars.

1. Find the unit rate: $55 / 11 = 5$ dollars per keychain.
2. Write the equation: $y=5x$.
3. Substitute $x=12$: $y=5(12)=60$.

Answer: \$60

PRACTICE 6 problems

- 1** For the equation $y=6x$, identify the constant of proportionality. Is y proportional to x ?

ANSWER _____

- 2** Four game tokens cost \$18. Each token has the same price and there are no extra fees. How much do 10 tokens cost?

ANSWER _____

- 3** A runner travels 7 miles in $\frac{1}{2}$ hour at a constant speed. Let x be elapsed hours and y be miles since the start. Write an equation.

ANSWER _____

- 4** A club charges a \$9 joining fee and \$3 for each meeting attended. Is the total cost proportional to the number of meetings? Explain.

ANSWER _____

- 5** The equation $y = \frac{3}{2}x$ represents a proportional relationship. Find y when $x = 16$.

ANSWER _____

- 6** Six smoothie bowls use 18 ounces of fruit. Every bowl uses the same amount, with no extra fruit used. Let x be bowls and y be ounces. Write y as a function of x and explain why it is proportional.

ANSWER _____

APPLY IT Show your work

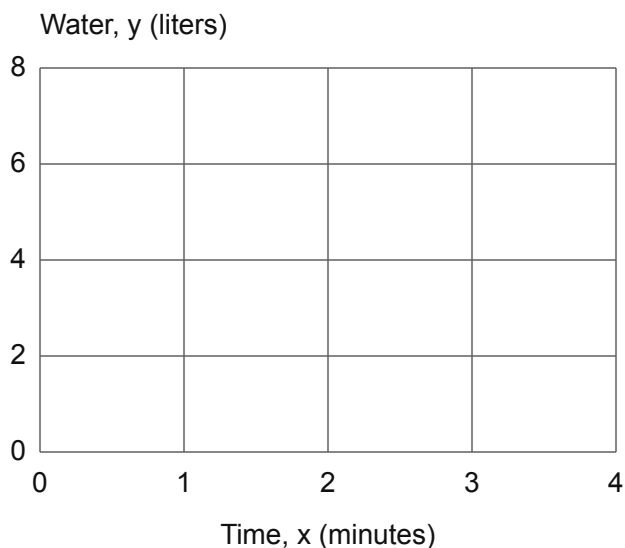
- 1** For the three observations in the table, test whether the ratios of cost to gigabytes are equal. If this same rate continues with no extra fee, write y as a function of x and predict the cost of 9 gigabytes. Explain what the table alone establishes.

STREAMING DATA PLAN

Gigabytes, x	Cost, y
2	\$14
4	\$28
6	\$42

ANSWER _____

- 2** A faucet adds water to an empty tank at a constant 2 liters per minute. Graph $y=2x$ from 0 to 4 minutes on the grid, including fractional times. Interpret $(0,0)$, $(1,2)$ and $(3,6)$ in this situation.



ANSWER _____

CHALLENGE One step up

Observed pairs are $(1,2)$, $(2,4)$, $(3,6)$ and $(4,10)$. Do all four fit one proportional relationship? Explain. Hypothetically, what y -value at $x=4$ would make the set proportional while keeping the first three pairs? Does that prove the recorded 10 is a mistake?

PRACTICE 1

For the equation $y=6x$, identify the constant of proportionality. Is y proportional to x ?

$k=6$; yes, y is proportional to x .

PRACTICE 2

Four game tokens cost \$18. Each token has the same price and there are no extra fees. How much do 10 tokens cost?

\$45

PRACTICE 3

A runner travels 7 miles in $\frac{1}{2}$ hour at a constant speed. Let x be elapsed hours and y be miles since the start. Write an equation.

$y=14x$

PRACTICE 4

A club charges a \$9 joining fee and \$3 for each meeting attended. Is the total cost proportional to the number of meetings? Explain.

No. The \$9 joining fee means the total cost does not start at 0.

PRACTICE 5

The equation $y=(\frac{3}{2})x$ represents a proportional relationship. Find y when $x=16$.

24

PRACTICE 6

Six smoothie bowls use 18 ounces of fruit. Every bowl uses the same amount, with no extra fruit used. Let x be bowls and y be ounces. Write y as a function of x and explain why it is proportional.

$y=3x$; each bowl uses $18/6=3$ ounces, so $y/x=3$ for nonzero x and 0 bowls use 0 ounces.

APPLY IT 1

The given pairs have equal ratio 7; under the stated extension, $y=7x$ and 9 gigabytes cost \$63. $14/2=28/4=42/6=7$ dollars per gigabyte. The three pairs fit a proportional relationship. Predicting another input depends on the stated same-rate, no-fee assumption.

CHALLENGE

No: the first three ratios are 2, but $10/4=2.5$. A hypothetical $y=8$ would make all ratios 2. This does not prove that the observed 10 is wrong; the observations may describe a nonproportional relationship.

Accept equivalent equations and explanations. Distinguish checking a finite set of pairs from claiming an unstated rule for all inputs. The scaled graph has actual y -axis values 0,2,4,6,8; the teacher segment is shown only on the key. Do not replace observed data without evidence of an error.

APPLY IT 2

A straight segment from (0,0) to (4,8). At time 0, no water has been added. In 1 minute, 2 liters are added: the unit rate. In 3 minutes, 6 liters are added. Fractional times are possible, so draw the connecting segment. The vertical grid step is 2 liters.

