

Rate Detectives

Find the constant multiplier in proportional relationships.

GRADE 7 • 7.PAR.4.2

7.PAR.4.2 "Determine the unit rate (constant of proportionality) in tables, graphs (1, r), equations, diagrams, and verbal descriptions of proportional relationships to solve realistic problems."

NAME _____

DATE _____

FIND THE UNIT RATE

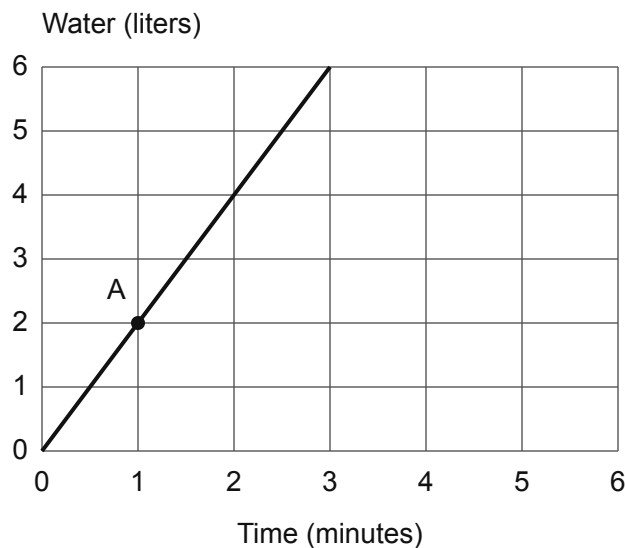
For proportional quantities, $y = rx$. The unit rate r tells how much y there is for one unit of x . Divide y by x when $x \neq 0$, and include units. On a graph, the point (1, r) identifies the unit rate.

WORKED EXAMPLE

An empty tank fills at a constant rate. The graph shows liters of water versus minutes. Read the amount at 1 minute and write the equation.

1. Point A is (1, 2), so 1 minute corresponds to 2 liters.
2. The unit rate is 2 liters per minute; multiply the time by 2.

Answer: $r = 2$ L/min; $V = 2t$.

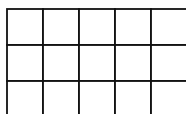


PRACTICE 4 problems

- 1** A pump follows $V = (3/4)t$, with V in liters and t in minutes. State the unit rate with units and find V after 8 minutes.

ANSWER _____

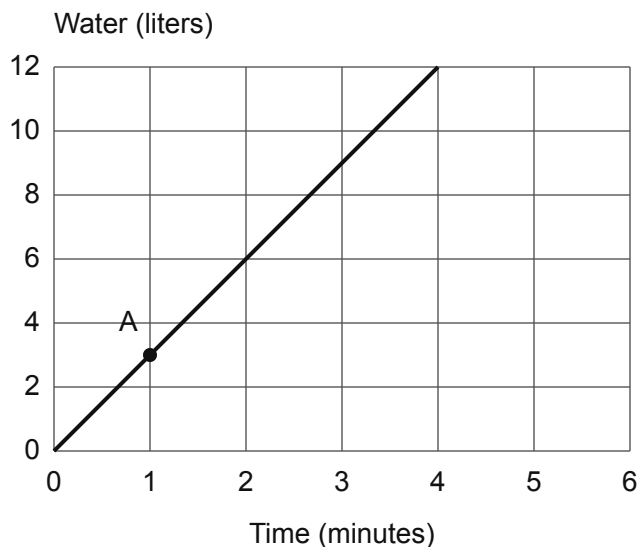
- 2** Each square is one sticker; each row is one identical pack. Find the unit rate. Write s in terms of p , then find the number of stickers in 7 packs.



ANSWER _____

- 3** This graph shows a second pump. Read its unit rate at $x = 1$, including units. How many liters flow in 4 minutes?

ANSWER _____



- 4** Eight meters of ribbon cost \$6 at a proportional rate. Find dollars per meter, then the cost of 10 meters.

ANSWER _____

APPLY IT Show your work

- 1** Use the table for identical glow-stick packs. State the unit rate, write C in terms of p, and find the cost of 15 packs.

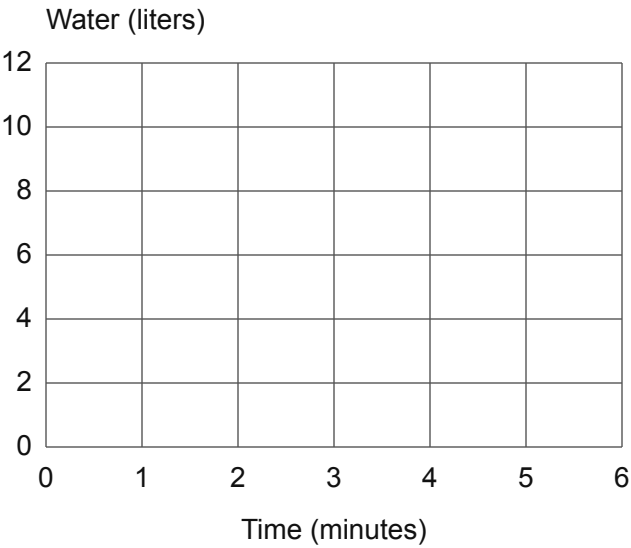
Packs	Cost (\$)
3	12
5	20
8	32

- 2** A fountain fills an empty basin continuously. In 4 minutes, it adds 6 liters. Find the unit rate in liters per minute and the water added in 6 minutes.

WORK SPACE

CHALLENGE One step up

Graph the fountain relationship from Apply It 2 on the blank grid for 0 to 6 minutes. Plot $(0, 0)$, $(1, 1.5)$, $(4, 6)$ and $(6, 9)$; connect them. Explain what $(1, 1.5)$ tells you. Notice each vertical interval represents 2 liters.



PRACTICE 1

$$r = 3/4 \text{ L/min. } V = (3/4) \times 8 = 6 \text{ L.}$$

PRACTICE 2

5 stickers per pack; $s = 5p$; 7 packs contain 35 stickers.

PRACTICE 3

Point A is (1, 3): 3 L/min. In 4 minutes, $V = 3 \times 4 = 12 \text{ L.}$

PRACTICE 4

$$6 \div 8 = \$0.75 \text{ per meter; } 10 \times 0.75 = \$7.50.$$

APPLY IT 1

\$4 per pack; $C = 4p$; 15 packs cost \$60.

$$12/3 = 20/5 = 32/8 = 4; 4 \times 15 = 60.$$

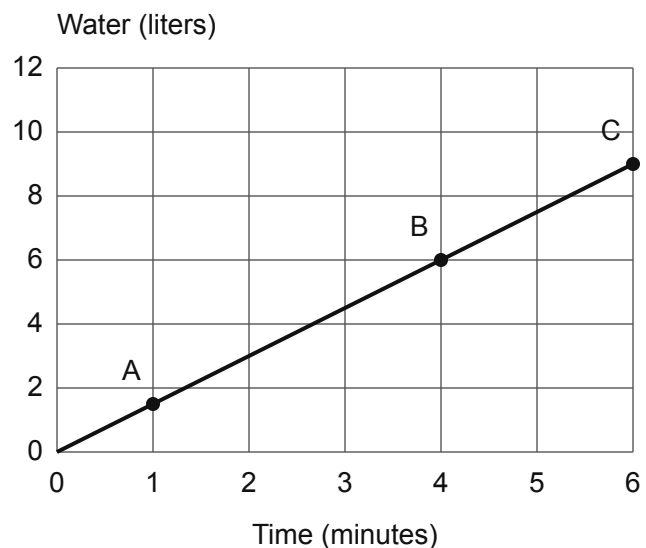
APPLY IT 2

$6/4 = 1.5 \text{ L/min; } 9 \text{ liters in 6 minutes.}$

$$V = 1.5t, \text{ so } V = 1.5 \times 6 = 9 \text{ L.}$$

CHALLENGE

Draw $V = 1.5t$ through the listed points. (1, 1.5) means 1.5 liters are added each minute. The plotted values between horizontal grid lines must respect the 2-liter scale.



Require units, correct scale use and equivalent values.