Rate Detectives

Find the constant multiplier in proportional relationships.

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

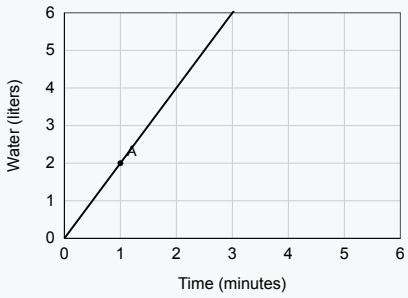
For proportional quantities, y = rx. The unit rate r tells how much y there is for one unit of x. Divide y by x when x ≠ 0, and include units. On a graph, the point (1, r) identifies the unit rate.

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.

r = 2 L/min; V = 2t.

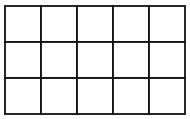


1. Practice

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.

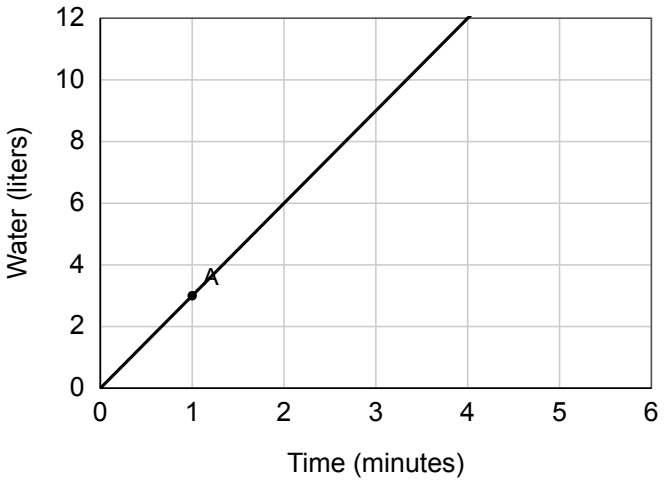
2. Practice

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.



3. Practice

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



4. Practice

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

5. Apply

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.

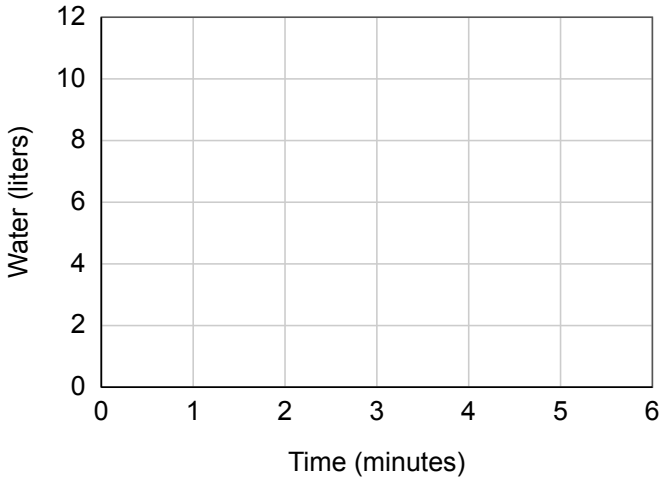
Packs	Cost ($)
3	12
5	20
8	32

6. Apply

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.

7. Challenge

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.



What to accept

Require units, correct scale use and equivalent values.

1. Practice

r = 3/4 L/min. V = (3/4) × 8 = 6 L.

2. Practice

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

3. Practice

Point A is (1, 3): 3 L/min. In 4 minutes, V = 3 × 4 = 12 L.

4. Practice

6 ÷ 8 = $0.75 per meter; 10 × 0.75 = $7.50.

5. Apply

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

12/3 = 20/5 = 32/8 = 4; 4 × 15 = 60.

6. Apply

6/4 = 1.5 L/min; 9 liters in 6 minutes.

V = 1.5t, so V = 1.5 × 6 = 9 L.

7. 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.

