

Proportion Power

Use tables, equations, and graphs to solve constant-rate relationships.

GRADE 7 • 7.PAR.4

7.PAR.4 "Recognize proportional relationships in relevant, mathematical problems; represent, solve, and explain these relationships with tables, graphs, and equations."

NAME _____

DATE _____

Connect the representations

A proportional relationship has $y = kx$. For $x \neq 0$, the ratio y/x is constant. Its graph lies on a straight line through $(0, 0)$. A constant rate over a continuous interval gives a connected graph; counts such as whole tickets give separate points.

t (min)	V (L)
0	0
1	4
3	12

Worked example

An empty tank fills at a constant rate. Use the table to write V in liters in terms of t in minutes and find V at 5 minutes.

For nonzero t , $V/t = 4/1 = 12/3 = 4$ liters per minute. The tank starts empty, so $V = 4t$. At $t = 5$, $V = 20$.

$V = 4t$; 20 liters after 5 minutes.

Show your reasoning. Use ratios, equations and graphs to explain whether a relationship is proportional.

1. Practice

A delivery service charges $C = 3d + 5$ dollars for d miles. Is cost proportional to distance? Explain using $d = 0$.

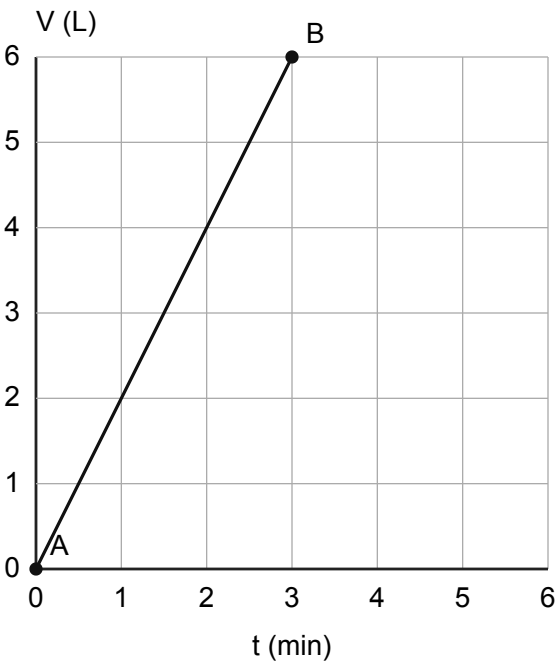
2. Practice

Do the table values fit a proportional relationship? Compare all nonzero ratios and write an equation if they do.

x	y
0	0
2	6
4	12
6	18

3. Practice

The graph shows water added to an empty tank over 0 to 3 minutes at a constant rate. Find k in liters per minute and write $V = kt$. Explain the role of $(0, 0)$.



4. Practice

The table shows a rental cost. Is cost proportional to hours? Compare ratios and explain.

Hours	Cost (\$)
1	7
2	10
3	13

5. Apply

Six tournament tickets cost \$42. Every ticket has the same price. Write C in terms of the whole-number ticket count t; find the cost of 10 tickets.

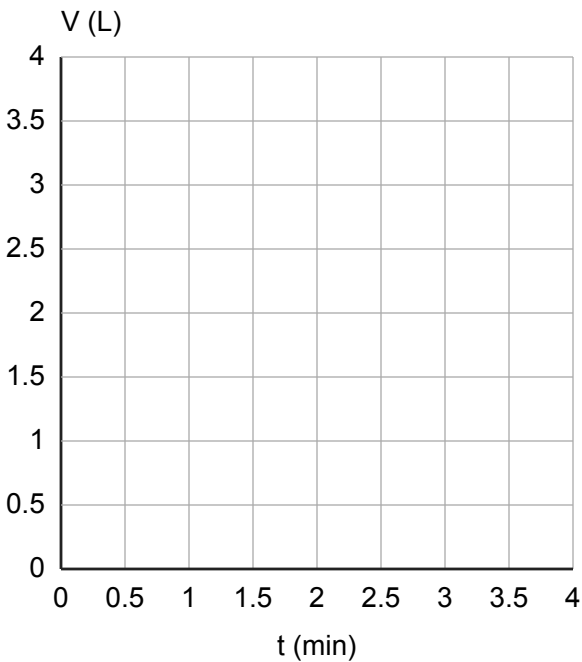
6. Apply

A runner covers 3 km every 2 hours at a constant speed. Complete the table and write d in terms of h. Use exact values.

h (hours)	d (km)
0	
1	
2	
4	

7. Challenge

An empty tank fills continuously at 1.5 liters per minute for exactly 2 minutes. Plot $V = 1.5t$ for $0 \leq t \leq 2$, including $t = 0, 1$ and 2 . Connect the points for that interval. Explain why the relationship is proportional.



Require units for rates. On the continuous tank task, connect the plotted points only over the stated interval. Accept equivalent equations and explanations.

Task 1

No. At $d = 0$, $C = 5$, so the relationship does not pass through $(0, 0)$ and is not $C = kd$.

Task 2

Yes: $6/2 = 12/4 = 18/6 = 3$; $y = 3x$.

Task 3

$k = 2$ L/min; $V = 2t$. $(0, 0)$ means no water has been added at the start.

Task 4

No. $7/1 = 7$ but $10/2 = 5$ and $13/3$ is different. There is no constant cost/hour ratio.

Task 5

$C = 7t$; 10 tickets cost \$70. $42 \div 6 = 7$ dollars per ticket; $7 \times 10 = 70$.

Task 6

Missing distances: 0, 1.5, 3, 6 km. $d = 1.5h$. Unit rate = $3/2 = 1.5$ km per hour; multiply each time by 1.5.

h (hours)	d (km)
0	0
1	1.5
2	3
4	6

Task 7

Plot $(0, 0)$, $(1, 1.5)$ and $(2, 3)$; connect with a segment from $t = 0$ to $t = 2$. $V/t = 1.5$ for $t > 0$ and the graph passes through $(0, 0)$.

