

Line Model Lab

Connect rates, equations, and graph stories.

GRADE 8 • 8.PAR.4

8.PAR.4 "Show and explain the connections between proportional and non-proportional relationships, lines, and linear equations; create and interpret graphical mathematical models and use the graphical..."

NAME _____

DATE _____

THE BIG IDEA

A proportional relationship has a constant rate and its graph goes through the origin, so its equation has the form $y = kx$. A non-proportional linear relationship also has a constant rate, but it has a starting amount, so its equation has the form $y = mx + b$. On a graph, m shows how y changes when x changes, and b shows the starting amount.

WORKED EXAMPLE

A table shows x values 2 and 4 with y values 18 and 36. Is the relationship proportional? Write an equation.

1. Find the unit rate: $18/2 = 9$.
2. Check the other pair: $36/4 = 9$.
3. The constant rate is 9, so $y = 9x$.
4. The relationship is proportional because its graph goes through the origin.

Answer: Proportional; $y = 9x$

PRACTICE 6 problems

- 1** For x values 5, 7, and 8, the y values are 15, 21, and 24. Is the relationship proportional? Write an equation.

ANSWER _____

- 2** Is $y = 6x + 5$ proportional or non-proportional? State why.

ANSWER _____

- 3** A line passes through (3,14) and (7,26). Write its equation.

ANSWER _____

- 4** A graph is modeled by $y = -5x + 30$. State the slope and y -intercept. Then describe what happens to y when x increases by 1.

ANSWER _____

- 5** For $y = 5x - 7$, find y when $x = 6$.

ANSWER _____

- 6** Which equation represents a proportional relationship: $y = 8x - 3$, $y = 5x$, or $y = -6x + 7$? Explain.

ANSWER _____

APPLY IT Show your work

- 1** A game tournament gives 7 points for each round a player wins. Let x be the number of rounds won and y be the total points. A graph of the relationship includes (3,21) and (8,56). Write an equation, decide whether the relationship is proportional, and find the points earned after 6 rounds.

WORK SPACE

ANSWER _____

- 2** A music streaming service charges a \$6 sign-up fee and \$5 each month. Let x be the number of months and y be the total cost. Write an equation, decide whether the relationship is proportional, explain the starting amount, and find the cost after 7 months.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Graph A includes the points (3,15) and (8,40). Graph B includes the points (3,25) and (8,55). Write an equation for each graph. Which relationship is proportional? Explain your reasoning using the equations.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	For x values 5, 7, and 8, the y values are 15, 21, and 24. Is the relationship proportional? Write an equation.	Proportional; $y = 3x$
2	Is $y = 6x + 5$ proportional or non-proportional? State why.	Non-proportional; the +5 is a starting amount, so the graph does not go through the origin.
3	A line passes through (3,14) and (7,26). Write its equation.	$y = 3x + 5$
4	A graph is modeled by $y = -5x + 30$. State the slope and y-intercept. Then describe what happens to y when x increases by 1.	Slope: -5. y-intercept: 30. When x increases by 1, y decreases by 5.
5	For $y = 5x - 7$, find y when $x = 6$.	23
6	Which equation represents a proportional relationship: $y = 8x - 3$, $y = 5x$, or $y = -6x + 7$? Explain.	$y = 5x$; it has the form $y = kx$ with no added starting amount.

PART 2 • APPLY IT

- $y = 7x$; proportional; 42 points after 6 rounds.** The constant rate is 7 points per round, and there is no starting amount. Substitute $x = 6$ into $y = 7x$.
- $y = 5x + 6$; non-proportional; the \$6 is the sign-up fee, or starting amount; \$41 after 7 months.** The monthly rate is 5 and the initial fee is 6, so use $y = 5x + 6$. Substitute $x = 7$ to get 41.

CHALLENGE

Graph A: $y = 5x$. Graph B: $y = 6x + 7$. Graph A is proportional because it has no starting amount. Graph B is non-proportional because it starts at 7.

For explanations, accept wording that identifies a proportional graph as passing through the origin or having no starting amount. Accept correct verbal descriptions of slope and y-intercept.