

Slope and Proportional Relationships on Graphs

Grade 8 math · Worksheet Answer Key · Standards: 8.EE.B.5, 8.EE.B.6

Every solution names the rise and the run or the quotient $y \div x$ that gives the unit rate. Graph figures are repeated with the slope triangle drawn. Final answers appear in bold.

Standards: 8.EE.B.5, 8.EE.B.6 · **Level:** Grade 8

Problem 1 Is the table proportional?

Table 1: $7 \div 2 = 3.5$, $14 \div 4 = 3.5$, $21 \div 6 = 3.5$: constant. Table 2: $5 \div 1 = 5$ but $9 \div 2 = 4.5$: not constant.

Table 1 is proportional with $k = 3.5$; Table 2 is not.

Problem 2 Hiking rate

$7.5 \div 3 = 2.5$ miles per hour. The distance is the rate times the time.

$y = 2.5x$

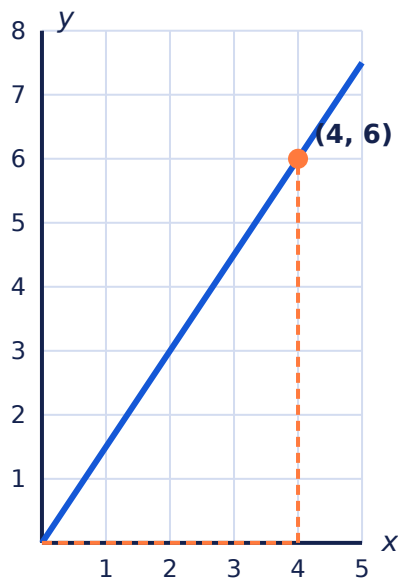
Problem 3 Slope from two points

(a) Rise = $12 - 3 = 9$ and run = $4 - 1 = 3$, so $9 \div 3 = 3$. (b) Rise = $7 - (-1) = 8$ and run = $6 - 2 = 4$, so $8 \div 4 = 2$.

(a) 3 (b) 2

Problem 4 Equation from a graph

The line passes through (4, 6). The unit rate is $6 \div 4 = 1.5$.



Run 4, rise 6.

$$y = 1.5x$$

Problem 5 Printer speed

$24 \div 4 = 6$ pages per minute, so the equation is $y = 6x$.

$$y = 6x$$

Problem 6 Read the slope

Slope = rise $\div$ run = $2 \div 5 = 0.4$. Both the rise and the run are measured left to right.

$$\text{Slope} = \frac{2}{5} = 0.4$$

Problem 7 Which machine is faster?

B: $10 \div 2 = 5$ gallons per minute, the same for each pair. A: 4.5 gallons per minute. The difference is $5 - 4.5 = 0.5$.

Machine B, by 0.5 gallon per minute

Problem 8 Graph versus equation

Graph: $10 \div 4 = 2.5$. Equation: 2.8. Since $2.8 > 2.5$, the equation is steeper.

The equation $y = 2.8x$ has the greater unit rate.

Problem 9 Similar slope triangles

Small: $2 \div 3$. Large: $6 \div 9 = 2 \div 3$. The triangles share the angle at the origin and each has a right angle, so they are similar, and corresponding sides are in the same ratio.

Both slopes equal $\frac{2}{3}$.

Problem 10 Finding missing coordinates

The equation is $y = \frac{3}{4}x$. When $x = 8$: $y = \frac{3}{4} \cdot 8 = 6$. When $y = 15$: $15 = \frac{3}{4}x$, so $x = 15 \cdot \frac{4}{3} = 20$.

$y = 6$; $x = 20$

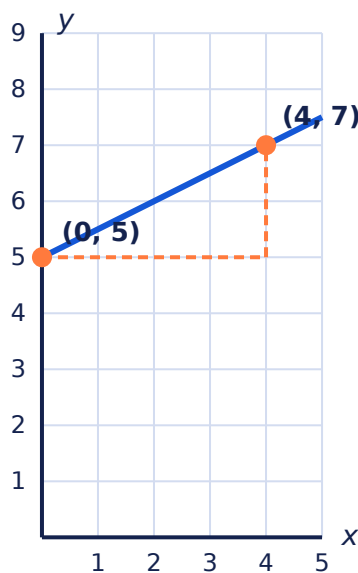
Problem 11 Slope and intercept

Compare each with $y = mx + b$. (a) $m = -6$, $b = 5$. (b) $m = \frac{2}{5}$, $b = -8$. (c) $m = 9$, $b = 0$.

(a) -6 and 5 (b) $\frac{2}{5}$ and -8 (c) 9 and 0

Problem 12 Write the equation from a graph

The line crosses the y -axis at $(0, 5)$, so $b = 5$. From $(0, 5)$ to $(4, 7)$: rise 2, run 4, slope $\frac{1}{2}$.



Slope triangle.

$y = \frac{1}{2}x + 5$

Problem 13 Negative slopes

(a) Rise = $-1 - 5 = -6$ and run = $4 - (-2) = 6$, so slope -1 . (b) Rise = $2 - 8 = -6$ and run = $7 - 3 = 4$, so $-6 \div 4 = -\frac{3}{2}$.

(a) -1 (b) $-\frac{3}{2}$

Problem 14 Zero and undefined slope

On $y = 4$ the rise between any two points is 0, so $0 \div \text{run} = 0$. On $x = 3$ the run is 0, and dividing by 0 is undefined.

Horizontal: slope 0. Vertical: slope undefined.

Problem 15 Smoothie mango

Unit rate: $1.5 \div 4 = 0.375$ cup per smoothie, so $y = 0.375x$. For 30 smoothies: $0.375 \cdot 30 = 11.25$.

$y = 0.375x$; 11.25 cups

Problem 16 Dog walkers

Eli: $42 \div 3 = 14$ and $70 \div 5 = 14$, so \$14 per hour. Dana: \$13.50. Difference: \$0.50 per hour, so $0.50 \cdot 8 = \$4.00$ in 8 hours.

Eli, by \$4.00 in 8 hours

Problem 17 Charity walk

Leo: the slope is $8.5 \div 4 = 2.125$ miles per hour. Zoe: 2.25 miles per hour. In 6 hours Zoe walks $2.25 \cdot 6 = 13.5$ miles and Leo walks $2.125 \cdot 6 = 12.75$ miles.

Zoe is faster, by 0.75 mile in 6 hours

Problem 18 Collinear points

Slope AB = $(5 - 2) \div (3 - 1) = \frac{3}{2}$. Slope BC = $(8 - 5) \div (5 - 3) = \frac{3}{2}$. The slope triangles on AB and BC are congruent, so the segments have the same steepness and meet at B: the three points are collinear.

Yes, all three points lie on one line (slope $\frac{3}{2}$).

Problem 19 Taxi fare

Fare: $y = 2.25x + 3.5$. For 8 miles: $2.25 \cdot 8 + 3.5 = 18 + 3.5 = 21.5$. At 0 miles the fare is \$3.50, not \$0, so the graph misses the origin.

$y = 2.25x + 3.5$; \$21.50; not proportional

Problem 20 Line through two points

Slope = $(13 - 5) \div (6 - 2) = 2$. Use $y = 2x + b$ with (2, 5): $5 = 4 + b$, so $b = 1$. At $x = 10$: $2 \cdot 10 + 1 = 21$.

Slope 2; $y = 2x + 1$; $y = 21$