

Grade 8 · Proportional Relationships and Slope

· Worksheet Answer Key

Common Core 8.EE.B.5, 8.EE.B.6 · mathovore.fr

Every solution below shows the slope or unit rate step by step, and many include a check with a second point. Compare your method as well as your answer. Final answers are in bold.

Grade 8 Common Core: 8.EE.B.5 · 8.EE.B.6

Problem 1: Constant from a table

Divide distance by time: $\frac{110}{2} = 55$, $\frac{220}{4} = 55$, $\frac{330}{6} = 55$. The ratio is constant.

Constant of proportionality: 55. Equation: $y = 55x$.

Problem 2: Equation from a price

Unit price: $\frac{10}{4} = 2.5$ dollars per cupcake.

Equation: $y = 2.5x$. For 14 cupcakes: $y = 2.5(14) = 35$.

The cost is **\$35**.

Problem 3: Slope from a graph

Use the origin and (4,6): rise = 6, run = 4.

Slope $= \frac{6}{4} = \frac{3}{2}$. The line passes through the origin, so the equation is $y = \frac{3}{2}x$. Check with (2,3): $\frac{3}{2}(2) = 3$.

Problem 4: Negative slope

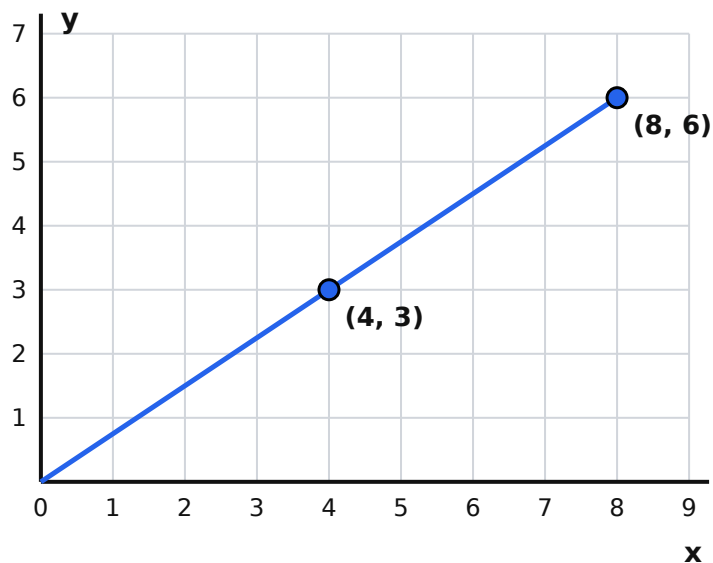
From (-3,2) to (3,-2): rise = $-2 - 2 = -4$, run = $3 - (-3) = 6$.

Slope $= \frac{-4}{6} = -\frac{2}{3}$. The line passes through the origin, so the equation is $y = -\frac{2}{3}x$.

Problem 5: Graph $y = mx$

$x = 0$: $y = 0$. $x = 4$: $y = \frac{3}{4}(4) = 3$. $x = 8$: $y = \frac{3}{4}(8) = 6$.

Points: $(0,0)$, $(4,3)$, $(8,6)$. Plot them and draw a line through them.



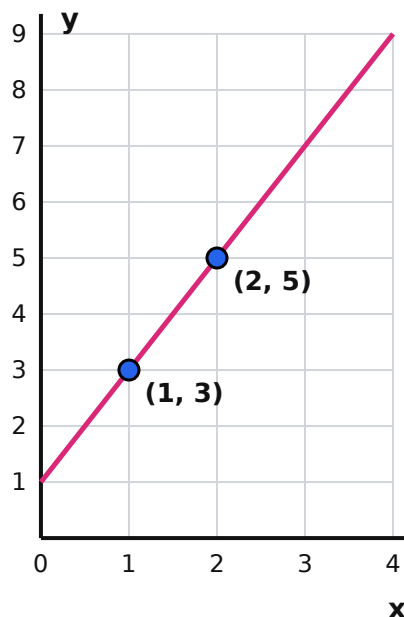
The graph of $y = \frac{3}{4}x$.

Problem 6: Slope and intercept

- a. Slope -2 , y -intercept **5**.
- b. Slope $\frac{1}{3}$, y -intercept -4 .
- c. Slope **4**, y -intercept **0**, because $y = 4x$ means $y = 4x + 0$.

Problem 7: Graph $y = mx + b$

The y -intercept is 1, so plot $(0,1)$. The slope is 2, which is $\frac{2}{1}$: go right 1 and up 2 to reach $(1,3)$, then again to reach $(2,5)$. Draw the line.



The graph of $y = 2x + 1$.

Problem 8: Similar triangles

Small triangle: $\frac{3}{2}$. The large triangle is a copy scaled by $\frac{6}{2} = 3$, so its rise is $3 \times 3 = 9$.

Large triangle: $\frac{9}{6} = \frac{3}{2}$. Rise: **9**. The triangles are similar, so rise to run is the same ratio, $\frac{3}{2}$, in both.

Triangle	Run	Rise	Rise/Run
Small	2	3	3/2
Large	6	9	3/2

Both rows give the same slope.

Problem 9: Table versus equation

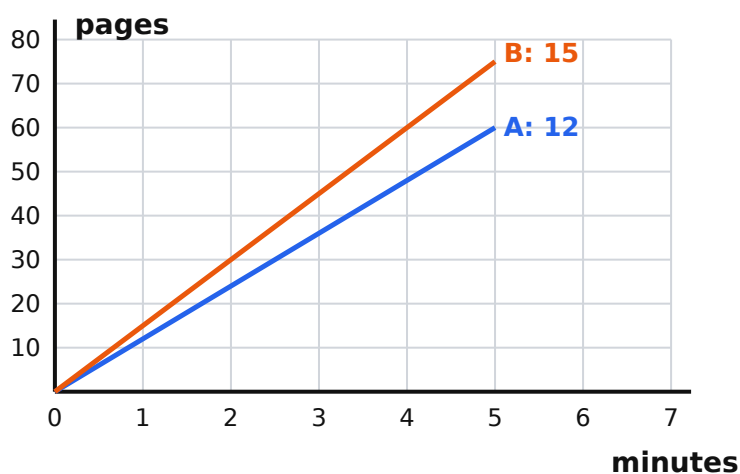
Bike A: unit rate 12 mph. Bike B: $\frac{28}{2} = \frac{42}{3} = \frac{70}{5} = 14$ mph.

Since $14 > 12$, **Bike B is faster**, by 2 mph.

Problem 10: Graph versus equation

Printer A: the point (5,60) gives $\frac{60}{5} = 12$ pages per minute.

Printer B: the slope is 15 pages per minute. Since $15 > 12$, **Printer B is faster by 3 pages per minute**.



Printer B is steeper than Printer A.

Problem 11: Compare with words

Noah: $\frac{18}{4} = 4.5$ gallons per minute.

Sofia: $\frac{84}{2} = 4.2$, $\frac{126}{3} = 4.2$, $\frac{21}{5} = 4.2$ gallons per minute.

Since $4.5 > 4.2$, **Noah's hose is faster by 0.3 gallon per minute.**

Problem 12: Slope from two points

$$\text{Slope} = \frac{11-3}{5-1} = \frac{8}{4} = 2.$$

Use (1,3): $3 = 2(1) + b$, so $b = 1$. Equation: $y = 2x + 1$. Check with (5,11): $2(5) + 1 = 11$.

Problem 13: Slope with negatives

$$\text{Rise} = -6 - 4 = -10. \text{ Run} = 3 - (-2) = 5.$$

$$\text{Slope} = \frac{-10}{5} = -2.$$

Problem 14: Proportional or not

The rate of change is constant: y goes up 3 each time x goes up 1. But when $x = 0$, $y = 2$, not 0.

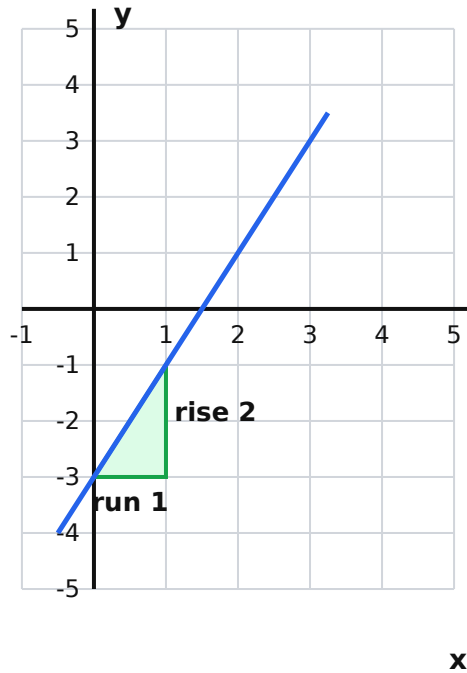
The line does not pass through the origin, so **it is not proportional**. The equation is $y = 3x + 2$.

Problem 15: Equation from a graph

The line crosses the y -axis at $(0, -3)$, so $b = -3$.

$$\text{From } (0, -3) \text{ to } (2, 1): \text{ slope} = \frac{1 - (-3)}{2 - 0} = \frac{4}{2} = 2.$$

$$\text{Equation: } y = 2x - 3. \text{ Check: } 2(2) - 3 = 1.$$



One step right, two steps up.

Problem 16: Missing coordinate

Slope $= \frac{9}{6} = \frac{3}{2}$, so $y = \frac{3}{2}x$.

If $x = 10$: $y = \frac{3}{2}(10) = 15$. If $y = 21$: $x = 21 \div \frac{3}{2} = 21 \times \frac{2}{3} = 14$.

Answers: $y = 15$ and $x = 14$.

Problem 17: Taxi fare

Equation: $y = 2x + 3$. The slope 2 is the cost per mile in dollars. The y -intercept 3 is the flat fee.

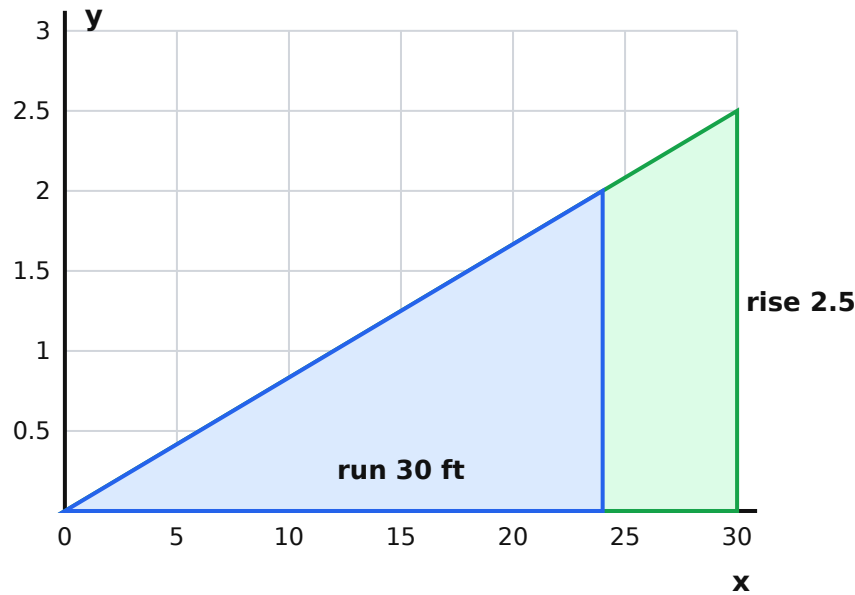
For 7 miles: $y = 2(7) + 3 = 17$. The ride costs **\$17**.

Problem 18: Ramp rise

Slope of the first ramp: $\frac{2}{24} = \frac{1}{12}$.

The ramps are similar triangles, so the second rise is $\frac{1}{12} \times 30 = \frac{30}{12} = 2.5$.

The rise is **2.5 feet**.



Same slope, so the rise grows with the run.

Problem 19: Gym plans

Gym A: $y = 5x + 20$. For 10 visits: $5(10) + 20 = 70$.

Gym B: $y = 9x$. For 10 visits: $9(10) = 90$.

Gym B is proportional because its graph passes through the origin. Gym A is not, because its y -intercept is 20.

Problem 20: Savings race

Diego: $\frac{45}{6} = 7.5$, so $y = 7.5x$. Aisha: $\frac{54}{6} = 9$, so $y = 9x$.

Difference: $9 - 7.5 = 1.5$. Aisha saves **\$1.50 more per week**.

Problem 21: Savings with a start

Rate: $\frac{90 - 50}{6 - 2} = \frac{40}{4} = 10$ dollars per week.

Use (2, 50): $50 = 10(2) + b$, so $b = 30$. Equation: $y = 10x + 30$. Mei started with **\$30**.

It is **not proportional**, because the line does not pass through the origin.

Week	Savings
0	\$30
2	\$50
6	\$90

The table fits $y = 10x + 30$.

Problem 22: Draining a tank

Equation: $y = -8x + 120$. The slope -8 means the water falls 8 gallons each minute. The y -intercept 120 is the starting amount.

Empty when $y = 0$: $-8x + 120 = 0$, so $x = 15$. The tank is empty after **15 minutes**.