

Fitting Lines to Data and Making Predictions

Grade 8 math · Worksheet Answer Key · Standards: 8.SP.A.2, 8.SP.A.3

Each solution shows the equation, the substitution, and the interpretation in words. Compare your slope sentence with the key: it must name the units, such as points per hour, and say whether the quantity grows or shrinks.

Standards: 8.SP.A.2, 8.SP.A.3 · **Level:** Grade 8

Problem 1 Predict with a line

$$y = 3 \cdot 6 + 10 = 18 + 10.$$

$$y = 28$$

Problem 2 Plant model

The slope 2.5 means the plant grows about 2.5 cm per week.

The intercept 12 is the height at $x = 0$, the first measurement.

Slope: 2.5 cm per week; intercept: 12 cm at the start

Problem 3 Which line fits?

Line A is $y = 2x + 5$. It gives 7, 9, 11, 13, 15, 17, 19, 21, close to the data with points on both sides.

Line B is $y = x + 9$. It gives 10 to 17, and the points on the right sit far above it.

Line A fits better

Problem 4 Equation from two points

$$\text{Slope: } (23 - 11) \div (6 - 2) = 12 \div 4 = 3.$$

$$\text{Use } (2, 11): 11 = 3 \cdot 2 + b, \text{ so } b = 5.$$

$$y = 3x + 5$$

Problem 5 Draining pool

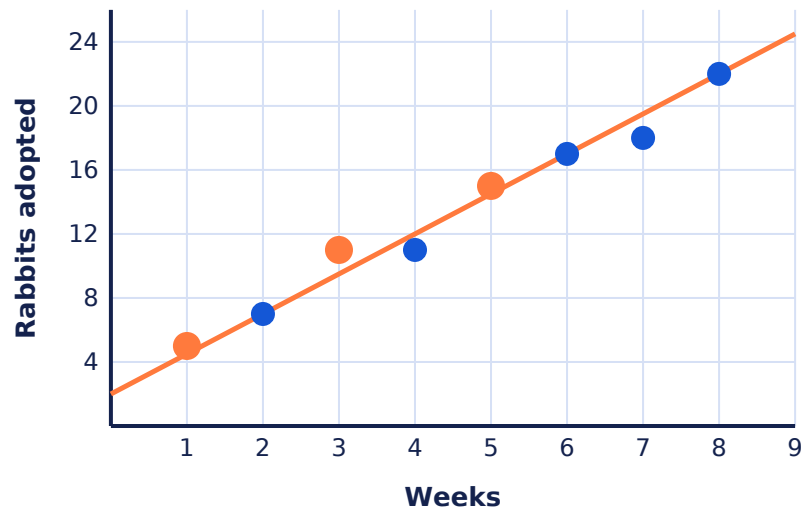
$$y = -4 \cdot 7 + 90 = -28 + 90.$$

62 gallons

Problem 6 Count the points

The line gives 4.5, 7, 9.5, 12, 14.5, 17, 19.5, 22 for $x = 1$ to 8.

Above the line: (1, 5), (3, 11), (5, 15). Below: (4, 11), (7, 18). On the line: (2, 7), (6, 17), (8, 22).



Orange points lie above the line.

3 above, 2 below, 3 on the line: a good fit

Problem 7 Used car model

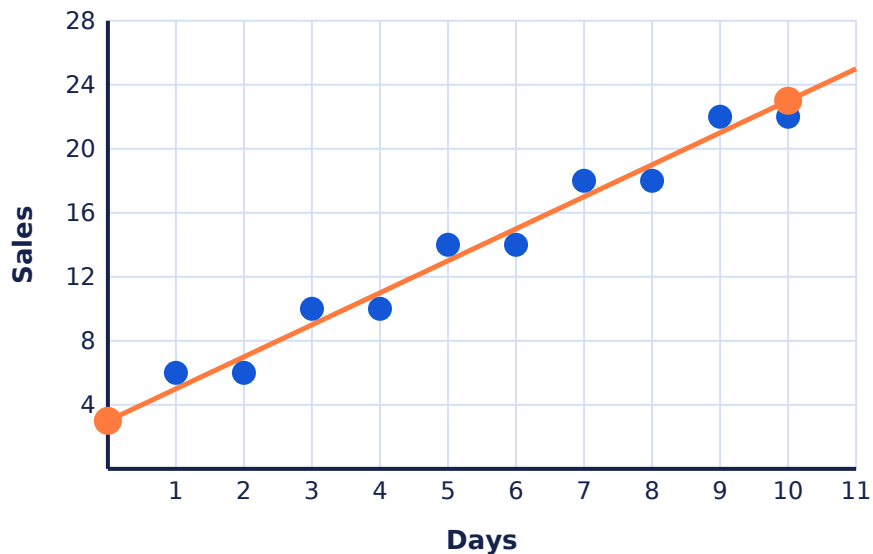
The slope -1.7 means the car loses about 1.7 thousand dollars of value each year.

The intercept 20.6 is the value at age 0, when the car is new.

Loses about \$1,700 per year; new value about \$20,600

Problem 8 Equation from a graph

Slope: $(23 - 3) \div (10 - 0) = 2$. The line meets the vertical axis at 3.



$\text{Slope} = (23 - 3) \div 10 = 2$; $y\text{-intercept} = 3$.

$$y = 2x + 3$$

Problem 9 Predict from the model

$$y = 2 \cdot 7.5 + 3 = 15 + 3.$$

18

Problem 10 Reach a target

$$2x + 3 = 21, \text{ so } 2x = 18.$$

$x = 9$

Problem 11 Prediction error

$$\text{Predicted: } 5 \cdot 4 + 51 = 71.$$

$$\text{Actual minus predicted: } 70 - 71 = -1.$$

The actual score is 1 point below the prediction

Problem 12 Is the prediction safe?

$$3.5 \text{ hours: } 5 \cdot 3.5 + 51 = 68.5, \text{ inside the data range.}$$

$$20 \text{ hours: } 5 \cdot 20 + 51 = 151, \text{ outside the range and above the maximum score of 100.}$$

68.5 is reasonable; 151 is not

Problem 13 Handle the outlier

The line should follow the overall trend of the ten points. One point that is far from the pattern should not pull the line toward it.

First check whether it is a mistake or an unusual case; then draw the line for the main trend.

No, the line should follow the ten points, not the outlier

Problem 14 Equation from a table

Slope: $(17 - 9) \div (3 - 1) = 4$. Then $9 = 4 \cdot 1 + b$, so $b = 5$.

Equation: $y = 4x + 5$. For $x = 12$: $4 \cdot 12 + 5 = 53$.

$y = 4x + 5$; at $x = 12$, $y = 53$

Problem 15 Bike rental

Slope 14: each hour costs \$14. Intercept 30: a flat \$30 fee before any hours.

$y = 14 \cdot 5.5 + 30 = 77 + 30 = 107$.

\$14 per hour, \$30 flat fee; 5.5 hours cost \$107

Problem 16 Battery life

After 5.5 hours: $-12 \cdot 5.5 + 100 = -66 + 100 = 34$.

For 20%: $-12x + 100 = 20$, so $-12x = -80$ and $x = 80 \div 12 \approx 6.7$.

34% after 5.5 hours; 20% at about 6.7 hours

Problem 17 Candle burning

After 10 hours: $-0.8 \cdot 10 + 24 = 16$.

Burns out when $y = 0$: $-0.8x + 24 = 0$, so $x = 24 \div 0.8 = 30$.

16 inches after 10 hours; burns out after 30 hours

Problem 18 Savings plan

$12x + 85 = 300$, so $12x = 215$ and $x = 215 \div 12 \approx 17.9$.

At 17 weeks: $12 \cdot 17 + 85 = 289$, which is under \$300. At 18 weeks: $12 \cdot 18 + 85 = 301$.

Week 18

Problem 19 Compare two models

Model A gives 13.8, 24, 34.2. Differences: 0.2, 1.0, 0.2. Total 1.4.

Model B gives 14, 23, 32. Differences: 0, 0, 2. Total 2.

Model A is closer overall (total difference 1.4 versus 2)

Problem 20 Babysitting earnings

Slope: $(62 - 10) \div 8 = 6.5$. Intercept: 10. Equation: $y = 6.5x + 10$.

The slope means about \$6.50 earned per hour; the intercept means a \$10 starting amount, such as a bonus.

For 10 hours: $6.5 \cdot 10 + 10 = 75$.

$y = 6.5x + 10$; \$75 for 10 hours