

Grade 8 - Using Linear Models to Predict - Answer Key

Common Core 8.SP.A.3 · maths-pdf.fr/en/

This answer key gives a full worked solution for each of the 21 problems on the linear models for data worksheet (Common Core 8.SP.A.3). Compare each step with your own work, not only the final answer, and note any step where your method differed.

Grade 8 · Common Core State Standards: **8.SP.A.3**

Exercise 1 - Interpret the slope

The slope 3.2 is the change in height per week.

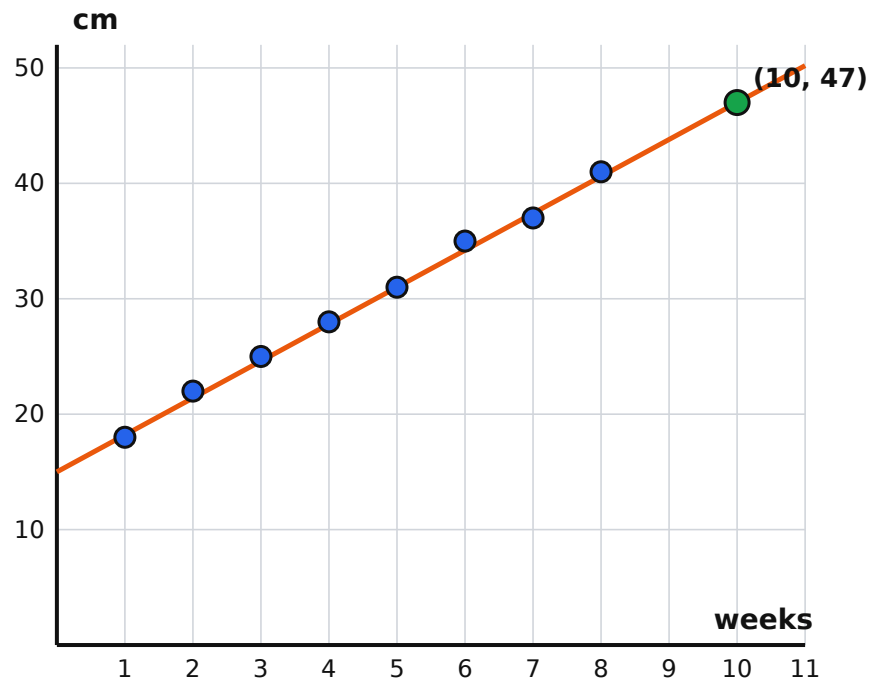
The plant grows about 3.2 cm each week

Exercise 2 - Interpret the intercept

The intercept is the height at $x=0$.

The plant was about 15 cm tall at week 0

Exercise 3 - Predict



At week 10 the line gives 47 cm.

$$y = 3.2 \cdot 10 + 15 = 47.$$

47 cm

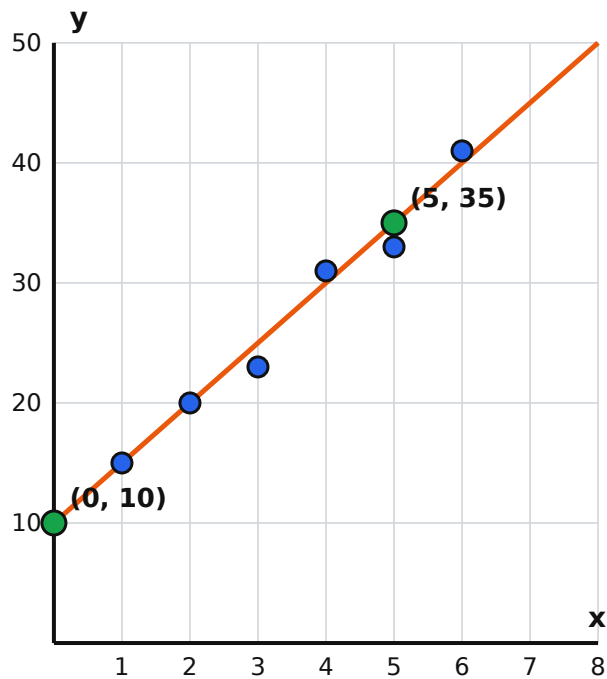
Exercise 4 - Equation from two points

$$m = \frac{55-25}{8-2} = 5.$$

$$25 = 5 \cdot 2 + b, \text{ so } b = 15.$$

$$y = 5x + 15$$

Exercise 5 - Equation from a graph



Slope 5, intercept 10.

$$b = 10. \quad m = \frac{35 - 10}{5 - 0} = 5.$$

$$y = 5x + 10$$

Exercise 6 - Predict from a graph

$$5 \cdot 7 + 10 = 45.$$

45

Exercise 7 - Solve for x

$$52 = 4x + 12, \text{ so } 4x = 40 \text{ and } x = 10.$$

10 students

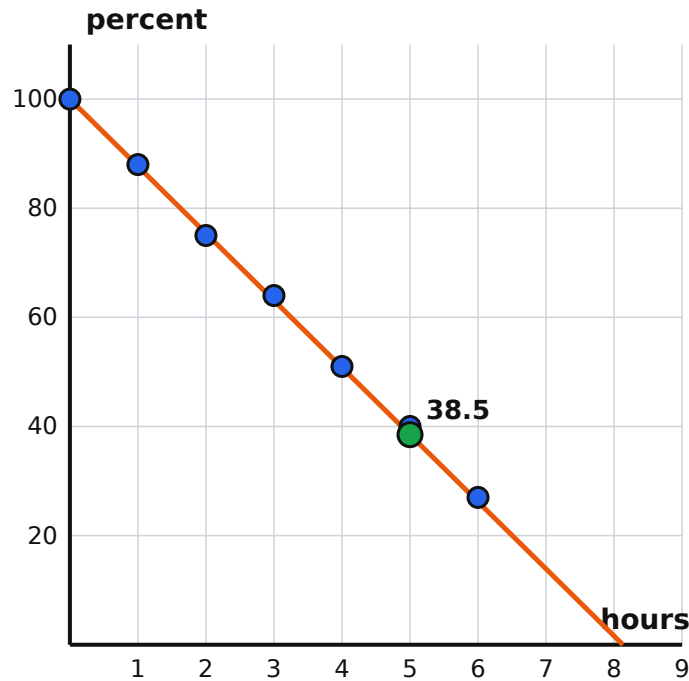
Exercise 8 - Interpret both

Slope 2.5: each extra mile costs \\$2.50. Intercept 6: the base fee is \\$6, even for 0 miles.

\\$2.50 per mile; \\$6 starting fee

Exercise 9 - Battery

The slope -12.3 means the battery loses about 12.3 percentage points per hour.



At 5 hours, about 38.5 percent remains.

$$y = -12.3 \cdot 5 + 100 = 38.5.$$

Loses 12.3 points per hour; about 38.5 percent

Exercise 10 - When is the battery empty

$$0 = -12.3x + 100, \text{ so } x = \frac{100}{12.3} \approx 8.1.$$

about 8.1 hours

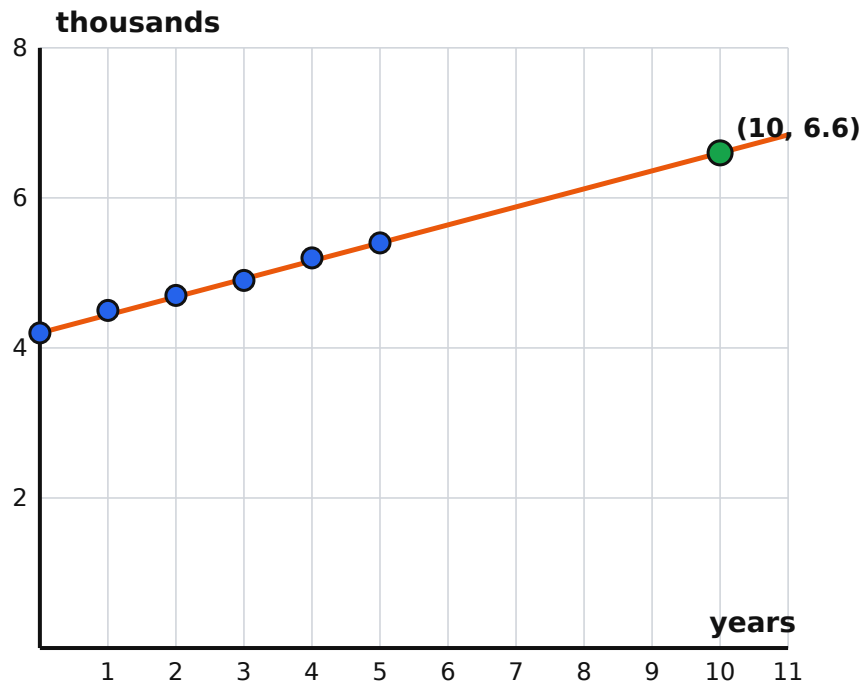
Exercise 11 - Interpolate or extrapolate

Week 6 is inside the data range: interpolation, so the prediction is reliable.

Week 30 is far outside: extrapolation, which is risky; $3.2 \cdot 30 + 15 = 111$ cm may be unrealistic.

Week 6: interpolation. Week 30: extrapolation.

Exercise 12 - Town population



At year 10 the model gives 6.6 thousand.

The slope 0.24 means the population grows by about 240 people per year.

2030: $x = 10$, $y = 0.24 \cdot 10 + 4.2 = 6.6$ thousand.

About 240 people per year; about 6,600 people in 2030

Exercise 13 - Population target

$$8 = 0.24x + 4.2, \text{ so } x = \frac{3.8}{0.24} \approx 15.8.$$

2020 + 15.8 is about 2036.

About 2036

Exercise 14 - Residual

Predicted: $3.2 \cdot 5 + 15 = 31$.

Difference: $33 - 31 = 2$.

Predicted 31 cm; the actual plant is 2 cm taller

Exercise 15 - Meaning of the x-intercept

$$0 = -2x + 30, \text{ so } x = 15.$$

After 15 days, the barrel is empty

Exercise 16 - Free throws

The slope 0.25 means one more free throw for each 4 minutes of practice.

$$0.25 \cdot 60 + 5.5 = 20.5, \text{ but the maximum is 20.}$$

1 more free throw per 4 minutes; the model gives 20.5, so at most 20

Exercise 17 - Two predictions

$$14x + 10 < 12x + 20, \text{ so } 2x < 10 \text{ and } x < 5.$$

For fewer than 5 pizzas

Exercise 18 - Make a model

$$m = \frac{21-9}{3-1} = 6. \quad 9 = 6 \cdot 1 + b, \text{ so } b = 3.$$

$$y = 6x + 3; \text{ \$6 per hour and a \$3 fee}$$

Exercise 19 - Is the intercept meaningful?

At $x = 0$, $y = -160$, a negative weight at height 0, which is impossible. The model is only meant for heights in the data range.

No, it has no real meaning

Exercise 20 - Choose the model

A downward pattern needs a negative slope.

$$y = -2x + 30$$

Exercise 21 - Explain a prediction

The score cannot exceed 100, so the model fails outside a limited range of hours. Models are only good where the data support them.

The model should not be used that far from the data