MATHEMATICS · GRADES 10-12

Linear regression

Difficulty level: Advanced

Mathematics: Grades 10-12

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Overview of the concept

This is how you draw the best straight line through scattered points to make a prediction, like guessing a house price from its size. Real data never sits in a perfect line, it scatters around one, and regression finds the line that fits best through the middle of that scatter. You use it to predict a house price from its size, to guess a test score from hours studied, or to see whether two things are really linked before you bet money on it.



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Worked examples

EXAMPLE 1

Q **Points (0, 1) and (2, 5) lie exactly on a line. Find the regression line.**

SOLUTION

Slope = $\frac{(5 - 1)}{(2 - 0)} = 2$

Intercept: at $x = 0$, $y = 1$.

Regression line: $y = 2x + 1$

EXAMPLE 2

Q **Use $y = 2x + 1$ to predict y when $x = 4$.**

SOLUTION

Put $x = 4$ into the line: $y = 2 \times 4 + 1$.

$2 \times 4 + 1 = 8 + 1 = 9$

Predicted $y = 9$

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Practice questions

1 Points (0, 2) and (2, 6) lie exactly on a line. Find the regression line.

- **A** y = 2x - 2
- **B** y = 2x + 2
- **C** y = 3x + 2
- **D** y = x + 2

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2 Points (0, 4) and (1, 6) lie exactly on a line. Find the regression line.

- **A** y = 2x - 4
- **B** y = 3x + 4
- **C** y = 2x + 4
- **D** y = x + 4

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3 **Points (0, 5) and (2, 9) lie exactly on a line. Find the regression line.**

- **A** y = 2x - 5
- **B** y = 3x + 5
- **C** y = x + 5
- **D** y = 2x + 5

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4 **Points (1, 3) and (3, 9) lie exactly on a line. Find the regression line.**

- **A** y = 3x
- **B** y = 4x
- **C** y = 2x
- **D** y = -3x

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5 Use the regression line $y = 3x + 2$ to predict y when $x = 7$.

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6 Use the regression line $y = 2x + 10$ to predict y when $x = 3$.

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7 Use $y = 2x + 1$ to predict y when $x = 8$.

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8 Use the regression line $y = 4x$ to predict y when $x = 3.5$.

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9 Use $y = 2x + 3$ to predict y when $x = 9$.

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10 Use the regression line $y = 5x + 1$ to predict y when $x = 10$.

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ANSWER KEY

1. $y = 2x + 2$

2. $y = 2x + 4$

3. $y = 2x + 5$

4. $y = 3x$

5. 23

6. 16

7. 17

8. 14

9. 21

10. 51

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