MATHEMATICS · GRADES 7-9

The Equation y = mx + b

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you write a straight line rule in one short form, like a taxi fare with a starting fee plus a charge per kilometre, so you can read the starting value and the rate straight from the equation. The starting value is what you pay before you have gone anywhere, and the rate is what each extra kilometre adds. With those two numbers in the equation, you can work out the cost for any distance, or read the rule straight off a graph. That is the form behind every straight line charge, from a taxi fare to a phone plan with a monthly fee.



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Rule

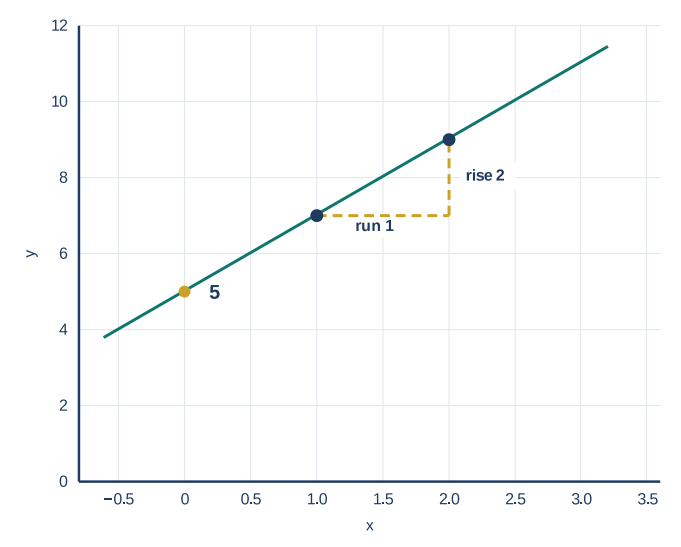
The equation y = mx + b: m is the slope and b is the y-intercept, the value of y when x is 0.

In y = mx + b, the number with x is the slope and the number on its own is the y-intercept.

Worked examples

EXAMPLE 1

Q Write y = mx + b for slope 2 and y-intercept 5



SOLUTION

m is the slope, so m = 2.

b is the y-intercept, so b = 5.

The equation is y = 2x + 5.

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EXAMPLE 2

Q In y = - 3x + 1, what are m and b?

SOLUTION

The number with x is m, so m = - 3.

The number on its own is b, so b = 1.

Slope - 3, y-intercept 1

Practice questions

1 A taxi fare has a starting fee of $4 and charges $3 per kilometre. Write the equation in the form y = mx + b.

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

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2 For the line $y = 5x - 2$, what are m and b?

- **A** m = -2, b = 5
- **B** m = 5, b = 2
- **C** m = 5, b = -2
- **D** m = -5, b = -2

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3 In $y = 4x + 3$, what is y when $x = 2$?

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4 In $y = x - 2$, what is x when $y = 5$?

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5 A line rises 2 units for every 1 unit across. What is its slope?

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6 A graph shows a line through (0, 5) with slope 2. Write its equation in the form $y = mx + b$.

A. $y = 2x + 5$

B. $y = 5x + 2$

C. $y = 2x - 5$

D. $y = 5x - 2$

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7 What is the slope of a flat (horizontal) line?

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8 Does the point $(3, -6)$ lie on the line $y = -2x$?

- **A** Yes
- **B** No

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9 Which line is steeper?

- **A** $y = \frac{1}{2}x$
- **B** $y = 2x$
- **C** They are equally steep

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10 The line $y = -x + 5$ crosses the y-axis at which point?

A (0, 5)

B (5, 0)

C (0, –1)

D (–1, 5)

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ANSWER KEY

1. $y = 3x + 4$

2. $m = 5, b = -2$

3. 11

4. 7

5. 2

6. $y = 2x + 5$

7. 0

8. Yes

9. $y = 2x$

10. (0, 5)

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