MATHEMATICS · GRADES 7-9

Literal equations

Difficulty level: Intermediate

Mathematics: Grades 7-9

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Overview of the concept

This is how you rearrange a formula to solve for whichever letter you need, like turning a distance formula around to find the time instead of the speed. A formula is useful only if you can solve it for the thing you do not know, and rearranging it is how you get there. You use it to find the time from a distance and a speed, the price before tax from the price you paid, or the interest rate from a loan payment.



Rule

Solve a literal equation the same way you solve a number equation: undo the operations one at a time until the letter you want is alone.

Letters you are not solving for are treated like numbers.

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Worked examples

EXAMPLE 1

Q Solve $2x + a = b$ for x

SOLUTION

We want x alone, so undo the operations one at a time. First undo the + a: take a away from both sides. $2x + a - a = b - a$, so $2x = b - a$

Then undo the × 2: divide both sides by 2. $2x \div 2 = (b - a) \div 2$, so $x = \frac{(b - a)}{2}$

So $x = \frac{(b - a)}{2}$

EXAMPLE 2

Q Solve $ax = c$ for x

SOLUTION

Only one thing is attached to x: the × a. Undo it by dividing both sides by a. $ax \div a = c \div a$, so $x = c \div a$

So $x = c \div a$

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Practice questions

1 Solve $x + a = b$ for x.

- **A** a - b
- **B** b - a
- **C** b + a
- **D** a × b

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2 Solve $3x + p = q$ for x.

- **A** (q + p) ÷ 3
- **B** (p - q) ÷ 3
- **C** (q - p) ÷ 3
- **D** 3(q - p)

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3 Which value of x makes $2x + 3 = 11$ true?

- **A** 3
- **B** 4
- **C** 5
- **D** 8

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4 Solve $x - m = n$ for x.

- **A** n - m
- **B** m - n
- **C** n + m
- **D** n × m

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5 Solve $2y = m + n$ for y.

A $m + \frac{n}{2}$

B $\frac{(m + n)}{2}$

C $\frac{(m - n)}{2}$

D $2(m + n)$

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6 Solve $a - x = b$ for x.

A $b - a$

B $a + b$

C $a - b$

D $a \times b$

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7 Solve $px = q$ for x.

- **A** $\frac{p}{q}$
- **B** pq
- **C** $q - p$
- **D** $\frac{q}{p}$

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8 Solve $x \div a = b$ for x.

- **A** $a \div b$
- **B** $a \times b$
- **C** $b \div a$
- **D** $a - b$

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9 Solve $y = kx$ for k.

- **A** $\frac{x}{y}$
- **B** xy
- **C** $y - x$
- **D** $\frac{y}{x}$

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10 A car travels $s = ut + v$ metres, where u is its speed in metres per second. If $s = 100$, $t = 4$ and $v = 20$, what is u?

- **A** 15
- **B** 20
- **C** 25
- **D** 30

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ANSWER KEY

1. b - a

2. (q - p) ÷ 3

3. 4

4. n + m

5. $\frac{(m + n)}{2}$

6. a - b

7. $\frac{q}{p}$

8. a × b

9. $\frac{y}{x}$

10. 20

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