

Solving Literal Equations

Use inverse operations to solve *literal equations* for a specified variable.

$$ax + by = 10$$

$$v = lwh$$

$$mx + b = y$$

$$E = I \cdot R$$

$$3a + 2c = 4m$$

Review Inverse Operations

$$\begin{array}{r} 5x - 2 = 8 \\ +2 \quad +2 \\ \hline \end{array}$$

To solve for x, we need to get rid of the 5 and the -2. Which one first? HOW?

Add 2 to both sides.

$$\begin{array}{r} 5x = 10 \\ \hline 5 \quad 5 \end{array}$$

Next, get rid of the 5. HOW?

Divide both sides by 5

$$x = 2$$

To solve literal equations:

--- Identify the variable for which you are solving...the one we want to isolate.

--- Use inverse operations to isolate that variable.

--- Combining like terms is not usually possible.

--- Add grouping symbols (i.e. parentheses) if needed to make sure the order of operations does not change.

Solve $m + a = p$ for m .

Identify the variable for which you need to solve.

$$\begin{array}{r} m + a = p \\ \underline{-a} \quad \underline{-a} \end{array}$$

We want to isolate the variable, m .

We need to get rid of the $+ a$.

Subtract a from both sides.

$$m = p - a$$

Since p and a are not like terms, we cannot combine them.

Solve $V = l \cdot w \cdot h$ for w .

$$\frac{V}{l \cdot h} = \frac{l \cdot w \cdot h}{l \cdot h}$$

$$\frac{V}{l \cdot h} = w$$

$$w = \frac{V}{l \cdot h}$$

Identify the variable for which you need to solve.

We want to isolate the variable, w .

Since w is multiplied times l , we need to get rid of it. How?

Divide both sides by l .

Since w is also multiplied times h , we need to get rid of it. How?

Divide both sides by h .

Write the equation with the isolated variable first.

Solve $3x + 6 = y$ for x .

$$\begin{array}{r} 3x + 6 = y \\ -6 \quad -6 \\ \hline 3x = y - 6 \\ \hline 3 \quad 3 \\ x = \frac{y - 6}{3} \end{array}$$

Subtract 6 from both sides.

Since y and -6 are not like terms, we cannot combine them.

Divide both sides by 3.

$$x = \frac{y}{3} - \frac{6}{3}$$

Since 6 is divisible by 3, we write that fraction as a whole number.

$$x = \frac{y}{3} - 2$$

Solve $\frac{x}{3} + 6y = 2$ for x .

$$\begin{array}{r} \frac{x}{3} + 6y = 2 \\ \underline{-6y} \quad \underline{-6y} \end{array}$$

Get rid of the + 6y first.

Subtract 6y from both sides.

$$\cancel{(3)} \frac{x}{3} = (2 - 6y) \cancel{3}$$

Next get rid of the 3.

Multiply both sides by 3.

*Add parentheses to keep the
2 - 6y grouped together.*

$$x = 6 - 18y$$

OR

$$x = -18y + 6$$

Solve $ax + b = y$ for x

$$ax + b = y$$

$$\begin{array}{r} -b \\ \hline \end{array} \quad \begin{array}{r} -b \\ \hline \end{array}$$

Subtract b from both sides.

$$\frac{ax}{a} = \frac{y - b}{a}$$

Since y and b are not like terms, we cannot combine them.

$$x = \frac{y - b}{a}$$

Divide both sides of the equation by a .

OR

$$x = \frac{y}{a} - \frac{b}{a}$$

Summary

- *Identify the variable for which you are solving...the one we want to isolate.*
- *Use inverse operations to isolate that variable.*
- *Combining like terms is not usually possible.*
- *Add grouping symbols (i.e. parentheses) if needed to make sure the order of operations does not change.*

STOP

Practice: Solving Literal Equations.

Solve for the specified variable in terms of the others.

1. $t + y = p$ for t

2. $abc = d$ for c

3. $n + m - a = d$ for m

4. $ax + by = c$ for x

5. $E = IR$ for R

6. $3m + 2n = 7$

7. $3x + y = T$ for T

8. $ab + c = d$ for b

9. $4a - 3 = D$ for a

10. $m = dh + rt$ for h

11. $tmp = 32$ for m

12. $ND + 3 = 7$ for N

13. $AM + PN = R + 7$ for A

14. $4x + 3y = 12$ for x

15. $15 = 5A + 6B$ for B

16. $y = x - 2A$ for x

17. $NP = BD + RT$ for P

18. $F + 7 = MN - 2$ for M

19. $AB + CD + P = 12$ for P

20. $RZ - 2 = FG + 2$ for F