

⋮

3-5 Solving Equations and Formulas

Objectives:

- A.4a Solve literal equations (formulas) for a specified variable
- A.4f Apply these skills to solve practical problems

Definitions:

- An equation is a mathematical sentence that contains an equal sign ($=$).
 - Ex: $x = yz$ What do x , y , and z stand for?
- A formula is an equation that states a rule for the relationship between certain quantities.
 - Ex: $A = lw$ What do A , l , and w stand for?

What it means to solve:

- To solve for x would mean to get x by itself on one side of the equation, with no x 's on the other side. ($x = \underline{\quad}$)
- Similarly, to solve for y would mean to get y by itself on one side of the equation, with no y 's on the other side. ($y = \underline{\quad}$)

The DO-UNDO chart

1) Solve the equation $-5x + y = -56$ for x .

Ask yourself:

- What is the first thing being done to x , the variable being solved for?

– x is being multiplied by -5 .

DO	UNDO
$\cdot -5$	$- y$
$+ y$	$\div(-5)$

- What is being done next?
– y is being added to $-5x$.

Show all of your work!

- First, subtract y from both sides of the equation.

$$\begin{array}{r} \text{Ex: } -5x + y = -56 \\ \quad \quad \quad \cancel{y} \quad \quad \quad \cancel{-y} \\ \hline \quad \quad \quad \cancel{-5x} = \frac{-56 - y}{-5} \end{array}$$

- Next, divide by -5 .
- This process actually requires **LESS WORK** than solving equations in one variable 😊

$$x = \frac{-56 - y}{-5} = \frac{56 + y}{5}$$

Let's try another:

Complete the do-undo chart.

DO	UNDO
• $\cdot 2$	$+ 4y$
• $- 4y$	$\div 2$

To solve for x:

- First add $4y$
- Then divide by 2

Ex: Solve $2x - 4y = 7$ for x.

$$\begin{array}{r} 2x - 4y = 7 \\ \quad \quad \quad \underline{+4y \quad +4y} \\ \quad \quad \quad \underline{2x = 7 + 4y} \\ \quad \quad \quad \frac{2x}{2} = \frac{7 + 4y}{2} \end{array}$$

$$x = \frac{7 + 4y}{2}$$

- This fraction cannot be simplified unless both terms in the numerator are divisible by 2.

•
•
•

Another example:

- Solve $a(y + 1) = b$ for y .

DO UNDO

+ 1 ÷ a

· a - 1

To solve for y :

- First divide by a
- Then subtract 1

$$\frac{a(y + 1)}{a} = \frac{b}{a}$$

$$y + 1 = \frac{b}{a}$$

$$\frac{-1 \quad -1}{y = \frac{b}{a} - 1}$$

Here's a tricky one!

Solve $3ax - b = d - 4cx$ for x .

- First, we must get all terms with x together on one side.
 - Add $4cx$ to both sides
 - Add b to both sides
- Next, use the distributive property to factor x out of the two terms on the left.
- Now, x is being multiplied by $(3a + 4c)$. To undo this, divide both sides by $(3a + 4c)$.

$$3ax - b = d - 4cx$$

$$\begin{array}{r} +4cx \qquad \qquad +4cx \\ \hline \end{array}$$

$$3ax - b + 4cx = d$$

$$\begin{array}{r} \qquad \qquad +b \qquad \qquad +b \\ \hline \end{array}$$

$$3ax + 4cx = d + b$$

$$x(3a + 4c) = d + b$$

$$\begin{array}{r} (3a + 4c) \qquad (3a + 4c) \\ \hline \end{array}$$

$$x = \frac{d + b}{(3a + 4c)}$$

⋮

Try a few on your own.

- Solve $P = \frac{1.2W}{H^2}$ for W .
- Solve $P = 2l + 2w$ for l .
- Solve $4x - 3m = 2mx - 5$ for x .

•
•
•

The answers:

DO	UNDO
• $\cdot 1.2$	• $\cdot H^2$
• $\div H^2$	• $\div 1.2$

DO	UNDO
• $\cdot 2$	• $-2w$
• $+2w$	• $\div 2$

- $W = \frac{PH^2}{1.2}$

- $1 = \frac{P - 2w}{2}$

- Subtract $2mx$, then
- Add $3m$ to get
- $4x - 2mx = 3m - 5$
- $x(4 - 2m) = 3m - 5$
- Divide by $(4 - 2m)$
- $x = \frac{3m - 5}{4 - 2m}$