

Two-step problems

Two-step problems are problems in which we need to solve an equation for the value of a variable, but then also use the solution to evaluate some other expression that depends on that variable.

In other words, we'll start by solving one equation like we normally would, using order of operations, keeping the equation balanced, etc. This will be our first of the two steps.

Then our second step will be to take the solution from that equation and plug it into a different expression, in order to find the value of that expression at the solution of the first equation.

Let's do an example so that we can see these two steps together.

Example

If $6x - 4 = 8$, what is $x + 3$?

First, solve the equation $6x - 4 = 8$ using order of operations.

$$6x - 4 + 4 = 8 + 4$$

$$6x = 12$$

Divide both sides by 6.

$$\frac{6x}{6} = \frac{12}{6}$$



$$x = 2$$

This is where we would normally stop, because we found the solution to the first equation. But we're not done! We've been asked to find the value of $x + 3$. We now know $x = 2$, so we need to substitute $x = 2$ into the second expression.

$$x + 3$$

$$2 + 3$$

$$5$$

So we know that the value of $x + 3$ must be 5, because we were able to find $x = 2$ from the first equation.

Let's try one more example of a two-step problem.

Example

If $-2(3x + 5) = -34$, what is $6x - 7$?

Solve the first equation using order of operations.

$$-2(3x + 5) = -34$$

$$\frac{-2(3x + 5)}{-2} = \frac{-34}{-2}$$



$$3x + 5 = 17$$

Subtract 5 from both sides.

$$3x + 5 - 5 = 17 - 5$$

$$3x = 12$$

Divide both sides by 3.

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

We could have also found this value by distributing the -2 across the parentheses first, instead of starting by dividing by -2 .

$$-2(3x + 5) = -34$$

$$-6x - 10 = -34$$

$$-6x = -24$$

$$x = 4$$

Either way, we've finished the first step, now our second step is to plug this solution into the expression $6x - 7$.

$$6x - 7$$

$$6(4) - 7$$

$$24 - 7$$



17

Since we were able to determine that $x = 4$, we know the value of $6x - 7$ must be 17.

