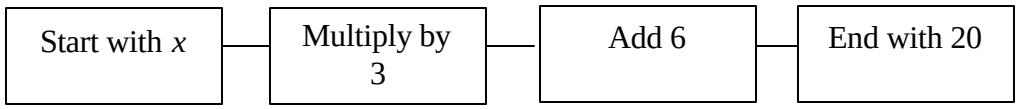
Solving equations Solutions NAME:

The point of solving an equation is to find the value(s) of the variable that make the equation true. This worksheet focuses on undoing what was done to the variable in order to uncover it.

For instance, let's say we want to solve the equation $3x + 6 = 20$. The verbal model that describes this equation is the following.



So if we undo these operations (in reverse order) we should be able to uncover the x. Remember we'll do these reverse operations to both sides of the equation. While we uncover the x on the left side, the solution will form on the right. The solution is written explicitly below.

$3x + 6 = 20$

(subtract 6 from both sides)

$3x = 14$

(divide both sides by 3)

$x = 14/3$

Check this answer by putting it back into the original equation and seeing if the equation is true. Below I show this with the fraction or the decimal equivalent. Choose whichever you like.

$3(14/3) + 6 \overset{?}{=} 20$ or $3 * 4.67 + 6 \overset{?}{=} 20$

Does it work?

Yes! For the form on the left, the 3's on the first term cancel out because it is a factor on top and bottom. So it reduces to "14 + 6", which is indeed 20. Likewise, if you follow the order of operations on the right equation, you'll see it is true.

Remember this worked because "subtracting 6" undid the "plus 6" of $3x + 6 = 20$. Likewise "dividing by 3" undid the "3 times" of $3x = 14$.

For each equation, write in words what is happening to the variable x. Then solve the equation. Notice to solve it, you are undoing what was done to x. Circle your solution.

1.) $4x-7=16$

Start with x	⟶	Multiply by 4	⟶	Subtract 7	⟶	End with 16

To solve, undo these operations in reverse order.

$$4x-7=16$$
$$+7 \quad +7$$
$$4x = 23$$
$$\frac{4x}{4} = \frac{23}{4}$$
$$x = 5.75$$

Add 7.

Divide by 4.

End with x.

2.) $10-5x=25$

It may help to see it as 10 + -5*x* = 25.

Start with x	⟶	Multiply by -5	⟶	Add 10	⟶	End with 25

$$10-5x=25$$
$$-10 \quad -10$$
$$-5x=15$$
$$\frac{-5x}{-5} = \frac{15}{-5}$$
$$x=-3$$

Subtract 10.

Divide by -5.

End with x.

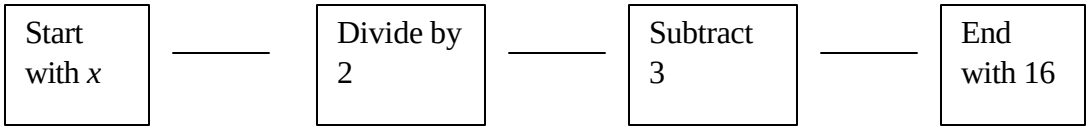
3.) $3x^2+4=31$

Start with x	⟶	Square it	⟶	Multiply by 3	⟶	Add 4	⟶	End with 31

$$3x^2+4=31$$
$$3x^2=27$$
$$x^2=9$$
$$x=\pm 3$$

Subtract 4.
Divide by 3.
Square root both sides.
Remember the $\pm$.
End with x.

4.) $16 = \frac{x}{2} - 3$



$16 = \frac{x}{2} - 3$

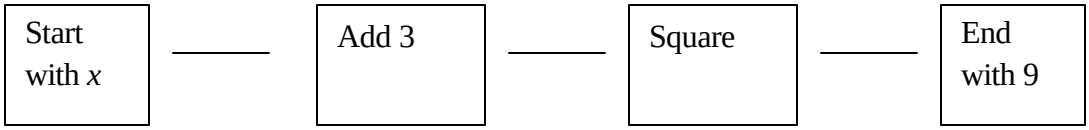
$19 = \frac{x}{2}$

$38 = x$

$x = 38$

Add 3.
Multiply by 2.
End with x.

5.) $(x+3)^2 = 9$



$(x+3)^2 = 9$

$\sqrt{(x+3)^2} = \sqrt{9}$

$x + 3 = \pm 3$

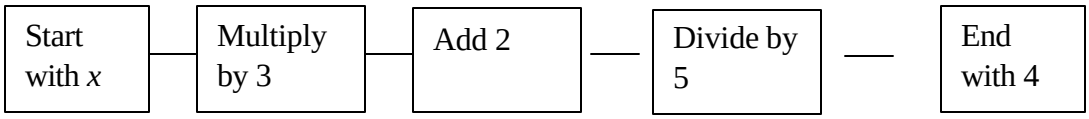
$x = \pm 3 - 3$

$x = 0, -6$

Square root both sides.
Remember the $\pm$.

Subtract 3.
End with x.

6.) $\frac{3x+2}{5} = 4$



$\frac{3x+2}{5} = 4$

$3x + 2 = 20$

$3x = 18$

$x = 6$

Multiply by 5.
Subtract 2.
Divide by 3.
End with x.