3-3 Solving Multi-Step Equations

To solve multi-step equations use inverse operations going backwards from the order of operations.

Solve and check.

1) $\frac{x+7}{4} = 5$ If you knew the value of x, how would you simplify the LHS?

Add 7 and then divide by 4.

To solve, go backwards. So you have to take care of divide by 4 1st. The inverse operation of divide is multiply. So, multiply each side by 4.

$\left(\frac{x+7}{4}\right) = (5)$ Remember whenever you multiply both sides, use parentheses.

$\frac{4}{1}\bullet\left(\frac{x+7}{4}\right) = (5)\bullet 4$ On the LHS, write 4 as a fraction. It isn't necessary on the RHS.

$\frac{\cancel{4}}{1}\bullet\left(\frac{x+7}{\cancel{4}}\right) = 20$ LHS: The fours cancel. RHS: $5 \bullet 4 = 20$

$x + 7 = 20$ Now, subtract 7 from both sides.

$-7 \quad -7$

$x = 13$

The final answer is $\boxed{\{13\}}$.

Check x = 13.

$\frac{(\quad)+7}{4} = 5$ Rewrite the ORIGINAL equation using open parentheses for x.

$\frac{(13)+7}{4} = 5$ Replace the open parentheses with the solution

Simplify the RHS using the order of operations.

$\frac{20}{4} = 5$ As we side before, that would be Add 7

$5 = 5$ and then Divide by 4

Since the LHS = RHS, 15 is the solution!

2) $21 - 5x = 31$

If you knew the value of x, how would you simplify the LHS?

Multiply by –5 then add 21.

To solve, go backwards. So you have to take care of add 21 1st. The inverse operation of add is subtract. So, subtract each side by 21. Remember the sign of 21 is +. Do NOT look behind a term to determine it's sign.

$$\begin{array}{rl} 21 - 5x &= 31 \\ -\ 21 & \quad -\ 21 \\ \hline -5x &= 10 \\ -5 & \quad -5 \\ x &= -2 \end{array}$$

Now divide both sides by –5.

The final answer is $\boxed{\{-2\}}$.

Check x = -2.

$21 - 5(\quad) = 31$	Rewrite the ORIGINAL equation using open parentheses for x.
$21 - 5(-2) = 31$	Replace the open parentheses with the solution and simplify the RHS using the order of operations.
$21 - (-10) = 31$	Be very careful about the signs!
$21 + 10 = 31$	Subtraction Rule
$31 = 31$	Since the LHS = RHS, -2 is the solution!