

Do NowSolve the following. DON'T CHECK.

1) $6(x + 3) = 48$

$$\boxed{6x} + 18 = 48$$
$$\underline{-18 \quad -18}$$

$$\frac{6x}{6} = \frac{30}{6}$$

$$x = 5$$

2) $-7(-x - 2) = 70$

$$\boxed{7x} + 14 = 70$$
$$\underline{-14 \quad -14}$$

$$\frac{7x}{7} = \frac{56}{7}$$

$$x = 8$$

Lesson #57 - Solving Multi-Step Equations and Rational Number Equations

We can put together everything we've learned about expressions and equations to solve multi-step equations.

Example 1) Solve and Check: $5x + 3(x + 4) = 28$

① Distribute

$$\boxed{5x} + \boxed{3x} + 12 = 28$$

② CLT

$$\boxed{8x} + 12 = 28$$
$$\underline{-12 \quad -12}$$

③ Solve the 2-step equation

$$\frac{8x}{8} = \frac{16}{8}$$

$$x = 2$$

$$5x + 3(x + 4) = 28$$

$$\underline{5(2)} + 3(\underline{2+4}) = 28$$

$$10 + 3(6) = 28$$

$$10 + 18 = 28$$

$$28 = 28 \checkmark$$

Example 2) Solve and Check: $3(4x - 5) - 2(-11 + 2x) = 43$

$$\boxed{12x} - \boxed{15} + \boxed{22} - \boxed{4x} = 43$$

$$8x + 7 = 43$$

$$\underline{-7 \quad -7}$$

$$\frac{8x}{8} = \frac{36}{8}$$

$$x = 4.5$$

Now, You Try!

Solve and Check the following equations. - Check Evens

3) $3(x - 2) = 12$

$$\begin{array}{r} 3x - 6 = 12 \\ \underline{ - 6} \\ 3x = 18 \\ 18 \div 3 = 6 \\ \hline x = 6 \end{array}$$

4) $2(x + 7) + x = 20$

$$\begin{array}{r} 2x + 14 + x = 20 \\ 3x + 14 = 20 \\ \underline{-14 \quad -14} \\ 3x = 6 \\ \underline{ } \\ 3 \quad 3 \\ \hline x = 2 \end{array}$$

$2(x+7) + x = 20$
 $2(2+7) + 2 = 20$
 $2(9) + 2 = 20$
 $18 + 2 = 20$
 $20 = 20 \checkmark$

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5) $x + 4(2x + 3) = 15$

$$\begin{array}{r} x + 8x + 12 = 15 \\ 9x + 12 = 15 \\ \underline{-12 \quad -12} \\ 9x = 3 \\ \underline{ } \\ 9 \quad 9 \\ \hline x = 0.3333333333 \end{array}$$

$x = 0.\overline{3}$

6) $2(2x + 3) - 2 = 5$

$$\begin{array}{r} 4x + 6 - 2 = 5 \\ 4x + 4 = 5 \\ \underline{-4 \quad -4} \\ 4x = 1 \\ 4 \div 1 = 2.5 \\ \hline x = 0.25 \end{array}$$

7) $4(x + 2) - 2x = 0$

$$\begin{array}{r} 4x + 8 - 2x = 0 \\ 2x + 8 = 0 \\ 2x = -8 \\ \hline x = -4 \end{array}$$

8) $2(3x - 1) - 2(-4x - 5) = 8$

$$\begin{array}{r} 6x - 2 + 8x + 10 = 8 \\ 14x + 8 = 8 \\ \underline{-8 \quad -8} \\ 14x = 0 \\ \underline{ } \\ 14 \quad 14 \\ \hline x = 0 \end{array}$$

Equations with **rational numbers** as constants and coefficients can also be solved.

Example 9) Solve the following equation: $\frac{7}{8}x + 2 = 16$

$$\begin{aligned} \frac{7}{8}x + 2 &= 16 \\ -2 &-2 \\ \hline \frac{7}{8}x &= 14 \\ \frac{8}{8} &\frac{8}{8} \\ \hline x &= 16 \end{aligned}$$

Example 10) Solve the following equation: $\frac{1}{2}x + \frac{1}{3}x - 20 = -10$

$$\begin{aligned} \frac{1}{2}x + \frac{1}{3}x - 20 &= -10 \\ \frac{5}{6}x - 20 &= -10 \\ +20 &+20 \\ \hline \frac{5}{6}x &= 10 \\ \frac{6}{5} &\frac{6}{5} \\ \hline x &= 12 \end{aligned}$$

Now, You Try!

Solve each equation. Round your answer to the nearest hundredth if necessary.

<p>11) $x - \frac{7}{5} = \frac{8}{5}$</p> $\begin{aligned} x - \frac{7}{5} &= \frac{8}{5} \\ +\frac{7}{5} &+\frac{7}{5} \\ \hline x &= \frac{15}{5} \\ x &= 3 \end{aligned}$	<p>12) $0.75(2x + 1) = 2$</p> $\begin{aligned} 1.5x + 0.75 &= 2 \\ -0.75 &-0.75 \\ \hline 1.5x &= 1.25 \\ \frac{1}{1.5} &\frac{1}{1.5} \\ \hline x &= 0.83 \end{aligned}$
<p>13) $\frac{2}{5}x - \frac{4}{5} = -3$</p> $\begin{aligned} \frac{2}{5}x - \frac{4}{5} &= -3 \\ +\frac{4}{5} &+\frac{4}{5} \\ \hline \frac{2}{5}x &= -\frac{16}{5} \\ \frac{5}{2} &\frac{5}{2} \\ \hline x &= -5 \frac{1}{2} \end{aligned}$	<p>14) $9.4x + 0.8 = 18.24$</p> $\begin{aligned} 9.4x + 0.8 &= 18.24 \\ -0.8 &-0.8 \\ \hline 9.4x &= 17.44 \\ \frac{9.4}{9.4} &\frac{9.4}{9.4} \\ \hline x &= 1.86 \end{aligned}$
<p>15) $\frac{3}{2}x - 2 = 7$</p> $\begin{aligned} \frac{3}{2}x - 2 &= 7 \\ +2 &+2 \\ \hline \frac{3}{2}x &= 9 \\ \frac{2}{3} &\frac{2}{3} \\ \hline x &= 6 \end{aligned}$	<p>16) $3.5x + 2.7 - 1.4x = 17.4$</p> $\begin{aligned} 3.5x + 2.7 - 1.4x &= 17.4 \\ 2.1x + 2.7 &= 17.4 \\ -2.7 &-2.7 \\ \hline 2.1x &= 14.7 \\ \frac{2.1}{2.1} &\frac{2.1}{2.1} \\ \hline x &= 7 \end{aligned}$