Solving Two-Step Equations

Goal: Get the variable on one side of the equation by itself.

Steps to solving a two-step equation:
1. Do the inverse operation for addition or subtraction.
2. Do the inverse operation for multiplication or division.
3. Check your answer

1) $4x - 8 = 16$

$$\underline{+8 = +8}$$

$$\frac{4x}{4} = \frac{24}{4}$$

$$\boxed{x = 6}$$

2) $\frac{y}{12} - 5 = 11$

$$\underline{+5 = +5}$$

$$(12)\frac{y}{12} = 16(12)$$

$$\boxed{y = 192}$$

3) $3.2x + 2.6 = -23$

$$\underline{-2.6 = -2.6}$$

$$\frac{3.2x}{3.2} = \frac{^-25.6}{3.2}$$

$$\boxed{x = ^-8}$$

4) $-6.85 + \frac{m}{4} = -11$

$$\underline{+6.85 = +6.85}$$

$$(4)\frac{m}{4} = ^-4.15(4)$$

$$\boxed{m = ^-16.6}$$

Two-Step Equation Practice
Solve and check the equations below. Show all your work.

1.) $\frac{x}{4}+10=1$ $\quad -10 = -10$ $(4)\frac{x}{4} = -9(4)$ $\boxed{x = -36}$	2.) $0.7t-3.2=1.7$ $\quad +3.2 = +3.2$ $\frac{0.7t = 4.9}{0.7 \quad 0.7}$ $\boxed{t = 7}$	3.) $10-5m=45$ $\quad -10 = -10$ $\frac{-5m = 35}{-5 \quad -5}$ $\boxed{m = -7}$
4.) $3x+9=27$ $\quad -9 = -9$ $\frac{3x}{3} = \frac{18}{3}$ $\boxed{x=6}$	5.) $-5.6=\frac{h}{5}+12.2$ $\quad -12.2 = -12.2$ $(5)-17.8 = \frac{h}{5}(5)$ $\boxed{-89 = h}$	6.) $-3x-10=-46$ $\quad +10 = +10$ $\frac{-3x = -36}{-3 \quad -3}$ $\boxed{x = 12}$
7.) $174=48n-18$ $\quad +18 = +18$ $\frac{192}{48} = \frac{48n}{48}$ $\boxed{4 = n}$	8.) $-61=7y-26$ $\quad +26 = +26$ $\frac{-35}{7} = \frac{7y}{7}$ $\boxed{-5 = y}$	9.) $\frac{y}{5}-9=11$ $\quad +9 = +9$ $(5)\frac{y}{5} = 20(5)$ $\boxed{y = 100}$

Solve each equation below. Show all necessary work

O. $4y - 9 = 15$ $+9 = +9$ $\overline{}$ $\dfrac{4y}{4} = \dfrac{24}{4}$ $\boxed{y = 6}$	A. $6x + 7 = -5$ $-7 = -7$ $\overline{}$ $\dfrac{6x}{6} = \dfrac{-12}{6}$ $\boxed{x = {}^-2}$
S. $-9t + 2 = 56$ $-2 = -2$ $\overline{}$ $\dfrac{-9t}{-9} = \dfrac{54}{-9}$ $\boxed{t = {}^-6}$	P. $-69 = 7v - 6$ $+6 = +6$ $\overline{}$ $\dfrac{-63}{7} = \dfrac{7v}{7}$ $\boxed{{}^-9 = v}$
Y. $35 = -2x - 15$ $+15 +15$ $\overline{}$ $\dfrac{50}{-2} = \dfrac{-2x}{-2}$ $\boxed{-25 = x}$	I. $4 - 3n = 43$ $-4 -4$ $\overline{}$ $\dfrac{-3n}{-3} = \dfrac{39}{-3}$ $\boxed{n = {}^-13}$
N. $12 - 5u = -48$ $-12 -12$ $\overline{}$ $\dfrac{-5u}{-5} = \dfrac{-60}{-5}$ $\boxed{u = 12}$	C. $-27 + 20w = 73$ $+27 +27$ $\overline{}$ $\dfrac{20w}{20} = \dfrac{100}{20}$ $\boxed{w = 5}$
E. $13 = 5 - 8m$ $-5 -5$ $\overline{}$ $\dfrac{8}{-8} = \dfrac{-8m}{-8}$ $\boxed{-1 = m}$	K. $11r + 60 = 16$ $-60 -60$ $\overline{}$ $\dfrac{11r}{11} = \dfrac{-44}{11}$ $\boxed{r = {}^-4}$

Solve each equation below. Show all necessary work

U. $y - 24 = -7$ $\underline{+24 = +24}$ $\boxed{y = 17}$	J. $23 - x = 13$ $\underline{-23 = -23}$ $\dfrac{-x}{-1} = \dfrac{-10}{-1}$ $\boxed{x = 10}$
V. $-67 = 6x - 1$ $\underline{+1 = +1}$ $\dfrac{-66}{6} = \dfrac{6x}{6}$ $\boxed{-11 = x}$	M. $-4e - 9 = 19$ $\underline{+9 = +9}$ $\dfrac{-4e}{-4} = \dfrac{28}{-4}$ $\boxed{e = -7}$
D. $-8 = 32 - 5q$ $\underline{-32 - 32}$ $\dfrac{-40}{-5} = \dfrac{-5q}{-5}$ $\boxed{8 = q}$	H. $6 + 10k = 256$ $\underline{-6 \quad\quad -6}$ $\dfrac{10k}{10} = \dfrac{250}{10}$ $\boxed{k = 25}$
T. $-100 = 12t - 4$ $\underline{+4 \quad\quad +4}$ $\dfrac{-96}{12} = \dfrac{12t}{12}$ $\boxed{-8 = t}$	L. $36 - x = -36$ $\underline{-36 \quad\quad -36}$ $\dfrac{-x}{-1} = \dfrac{-72}{-1}$ $\boxed{x = 72}$

Steps to solving two-step word problems:
1. Read the problem carefully. Underline any key information.
2. Write a let statement.
3. Write an equation.
4. Solve the equation.
5. Check your answer

Example 1:

Nick opens a savings account with $50. Each week after, he deposits $15. In how many weeks will he have saved $500?

Step 1: Underline any key information

Step 2: Write a let statement. What does our variable represent?

$$\text{Let } x = \text{\# of weeks}$$

Step 3: Write an equation:

$$50 + 15x = 500$$

Step 4: Solve the equation:

$$
\begin{aligned}
50 + 15x &= 500 \\
-50 \quad\quad &= \quad -50 \\
\hline
15x &= 450 \\
\frac{15x}{15} &= \frac{450}{15} \\
\hline
\boxed{x = 30 \text{ weeks}}
\end{aligned}
$$

Step 5: Re-read the question. Does your answer make sense?

Example 2

Alex rents a car for <u>one day</u>. The charge is <u>$18 plus $0.12 per mile</u>. Alex wants to spend <u>exactly $30</u>. How <u>many miles</u> can he drive?

Step 1: Underline any key information

Step 2: Write a let statement. What does our variable represent?

$$\text{Let } m = \text{\# of miles}$$

Step 3: Write an equation:

$$18 + 0.12m = 30$$

Step 4: Solve the equation:

$$18 + 0.12m = 30$$
$$-18 \qquad = \quad -18$$
$$\overline{\qquad\qquad\qquad}$$
$$0.12m = 12$$
$$\frac{0.12}{0.12} \qquad \frac{}{0.12}$$
$$\boxed{m = 100 \text{ miles}}$$

Step 5: Re-read the question. Does your answer make sense?

Example 3:
Katie wants to buy a bicycle that costs $129. This is $24 more than 3 times what she saved last month. How much did she save last month?

Let x = amount saved last month

$$129 = 24 + 3x$$
$$\underline{-24 = -24}$$
$$\frac{105}{3} = \frac{3x}{3}$$
$$\boxed{\$35 = x}$$