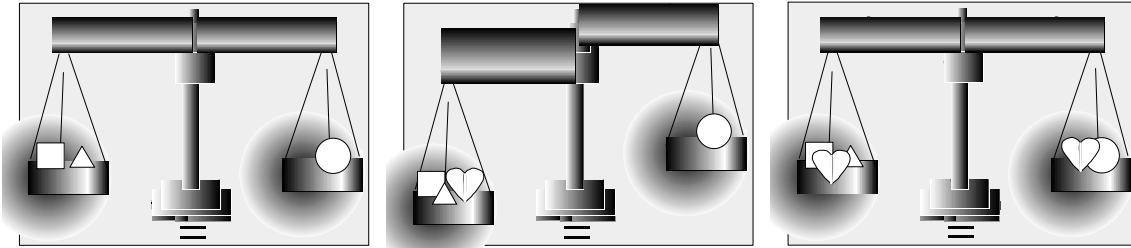


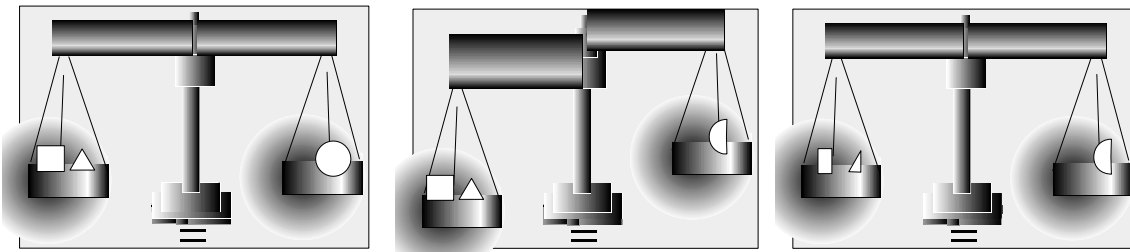
### 3-3-1 One step equations

Up to this point, variables have only been used in expressions. These expressions have been simplified. Sometimes the number represented by the variable was known and a value for the expression could be determined.

Now, with an equation, the value for a variable can sometimes be determined.



Think of an equation as a scale. If you add something to one side, you must add the same amount to the other side to make it balance.



If the items on one side of the balance are split in half then the items on the other side also need to be split to make it balance.

**The object of the puzzle is to get the x or other variable alone on one side of the equation.**

$$X + 245 = -986$$

$$\begin{array}{r} X + 245 = -986 \\ -245 \quad \underline{\hspace{1.5cm}} \\ X + 0 \end{array}$$

$$\begin{array}{r} X + 245 = -986 \\ -245 \quad -245 \quad \underline{\hspace{2.5cm}} \\ X = -1231 \end{array}$$

**Do the opposite.**—if something is added, subtract

**What is done to one side of the equation, do to the other.** This keeps the balance.

**The object of the puzzle is to get the variable by itself on one side of the equation.**

$$2 \frac{1}{3} = z - 4 \frac{1}{5}$$

$$\begin{array}{r} 2 \frac{1}{3} = z - 4 \frac{1}{5} \quad \text{What you do} \\ + 4 \frac{1}{5} \quad \leftarrow \text{here, do here.} \rightarrow \\ \hline z + 0 \end{array} \quad \begin{array}{r} 2 \frac{1}{3} = z - 4 \frac{1}{5} \\ + 4 \frac{1}{5} \quad + 4 \frac{1}{5} \\ \hline 6 \frac{8}{15} = z \end{array}$$

**Do the opposite.** —if something is subtracted, add.

**What is done to one side of the equation, do to the other.**

Fill in the blanks for the following. Follow the pattern. Write the number to be added or subtracted on both sides of the equation. Draw the lines. Do not just see it in your mind. Do the arithmetic by hand for the practice. **The object of the puzzle is to get the variable by itself on one side of the equation.**

**Do the opposite.**

**What is done to one side of the equation, do to the other.**

$$\begin{array}{r} W + 867 = 234 \\ -867 \quad -867 \\ \hline W = -633 \end{array}$$

$$\begin{array}{r} f - 23 = -41 \\ \hline f = \end{array}$$

$$\begin{array}{r} -342 = 256 + y \\ \hline = y \end{array}$$

$$\begin{array}{r} t - 98 = -786 \\ \hline t = \end{array}$$

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


---


$$m =$$

$$f - 2 \frac{1}{3} = -4 \frac{3}{4}$$


---


$$f =$$

$$-3 \frac{1}{2} = 6 \frac{2}{3} + y$$


---


$$= y$$

$$b - 9.8 = -0.87$$


---


$$b =$$

Practice: Solve the following one step equations.

- |   |                                       |                     |                                      |
|---|---------------------------------------|---------------------|--------------------------------------|
| a) $7 + s = 15$                         | $21 = 506 + x$                        | $R - 8 = 56$        | $34 = e - 97$                        |
| b) $a - \frac{3}{4} = \frac{5}{6}$      | $7 \frac{2}{3} + r = 5 \frac{1}{2}$   | $0.21 = 5.6 + p$    | $3 \frac{2}{5} + w = -6 \frac{1}{2}$ |
| c) $3 \frac{4}{5} = y - \frac{2}{5}$    | $f - 8 \frac{4}{9} = -5 \frac{5}{12}$ | $-0.21 = 0.023 + x$ | $e - 0.768 = 5$                      |
| d) $2 \frac{1}{2} = -3 \frac{2}{3} + b$ | $\frac{2}{3} = w + 9 \frac{2}{5}$     | $-3.4 = d - 9.7$    | $0.675 + v = 1.5$                    |

The object of the puzzle is to get the variable by itself on one side of the equation.  
 Do the opposite. -if multiplied, divide.  
 What is done to one side of the equation, do to the other.

The 5 is multiplied by the r so divide.  $5r = 510 \Rightarrow \frac{5r}{5} = \frac{510}{5} \Rightarrow \frac{\cancel{5}r}{\cancel{5}} = \frac{51\cancel{0}^{102}}{\cancel{5}_1} \Rightarrow r = 102$

$$3 \frac{1}{3}x = \frac{5}{8} \Rightarrow \frac{3 \frac{1}{3}x}{3 \frac{1}{3}} = \frac{\frac{5}{8}}{3 \frac{1}{3}}$$

$$15t = 54$$
$$t =$$

$$4 \frac{1}{2} = 3s$$

Do the fraction division for the practice.  
 Then look at the example for an easier way.

scratch work

$$\frac{5}{8} \div 3 \frac{1}{3} = \frac{5}{8} \div \frac{10}{3} = \frac{\cancel{5}^1}{8} \times \frac{3}{\cancel{10}_2} = \frac{3}{16}$$

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

$$\frac{e}{5} = 17$$

$$\frac{\cancel{5}e}{\cancel{5}} = 5 \cdot 17$$

$$e = 85$$

$$\frac{s}{8} = 14$$

$$3 \frac{1}{3}x = \frac{5}{8}$$

$$\frac{10}{3}x = \frac{5}{8}$$

$$\left(\frac{\cancel{3}}{\cancel{10}}\right) \frac{\cancel{10}}{\cancel{3}}x = \frac{\cancel{5}^1}{8} \left(\frac{3}{\cancel{10}_2}\right)$$

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

1. Change fractions to improper
2. Multiply both sides by the reciprocal.

Practice:

- |                         |                      |                       |                                |                                 |
|-------------------------|----------------------|-----------------------|--------------------------------|---------------------------------|
| a) $\frac{q}{6} = 18$   | $2814 = 7g$          | $3y = 159$            | $\frac{2}{3}s = 8$             | $14 = \frac{3}{5}x$             |
| b) $0.05y = 15$         | $15 = \frac{f}{3}$   | $27 = \frac{81}{4}x$  | $2 \frac{2}{5} = \frac{3}{4}g$ | $\frac{7}{18}s = \frac{21}{81}$ |
| c) $4 \frac{2}{3} = 7g$ | $\frac{21}{5}s = 14$ | $\frac{u}{6.8} = 1.8$ | $3y = 15$                      | $\frac{y}{2 \frac{1}{2}} = 10$  |

