SIMPLE EQUATIONS: ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION

We will examine equations in which we apply the algebraic process to solve them. Equations are written to compare two equal quantities; thus, both sides of the equals sign represent the same amount. We may apply math operations to one side of the equation, but must remember to apply the same math operation to the other side to keep the two equations in balance. First we will look at the algebraic process to solve simple equations using addition and subtraction and then we will look at solving simple equations using multiplication and division. Print out the "chips" to aid in solving the equations.

Modeling Simple Equations

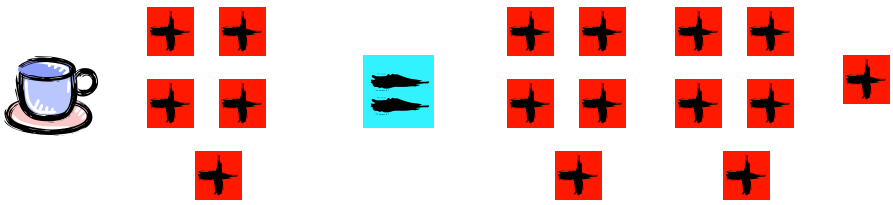
Addition and Subtraction

You need a cup to represent the variable, the unknown quantity for the equation. You need some chips
to represent the numbers in the equation.

Rule for equations: **Equations are balanced on the equals sign, so what is done to one side of the equation must also be done to the other side of the equation.**

Example 1

Let's solve $x + 5 = 11$ (remember the cup represents x)



To solve the model algebraically, **remove** the same amount of pluses from both sides of the equals sign.

Therefore $x = 6$

Here are the steps written using math symbols.

$$\begin{aligned} x + 5 &= 11 \\ x + 5 - 5 &= 11 - 5 \\ x &= 6 \end{aligned}$$

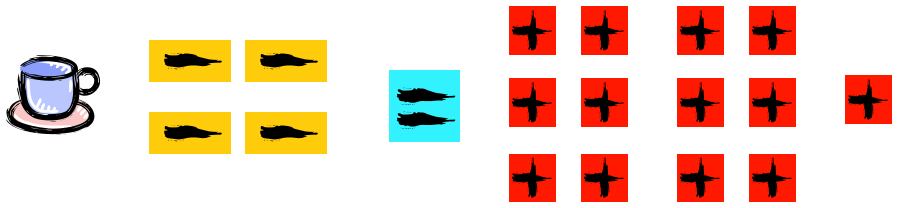
Check: $x + 5 = 11$

$6 + 5 = 11$ *Replace x with the answer for x which is 6.*

$11 = 11$

Example 2

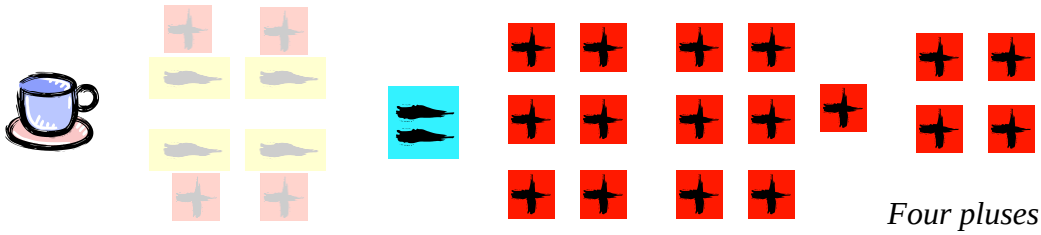
Let's solve $x - 4 = 13$ (remember the cup represents x)



Four pluses must be added to the left side to **cancel out** the four minuses that are there.

Rule for equations: **Equations are balanced on the equals sign, so what is done to one side of the equation must also be done to the other side of the equation.**

Thus **four pluses** are needed on the right side to balance out the equation.



Four pluses added to thirteen pluses makes 17 pluses.

Therefore $x = 17$

Here are the steps written using math symbols.

$$\begin{aligned} x - 4 &= 13 \\ x - 4 + 4 &= 13 + 4 \\ x &= 17 \end{aligned}$$

Check: $x - 4 = 13$

$17 - 4 = 13$ *Replace x with the answer for x which is 6.*

$13 = 13$

Modeling Simple Equations

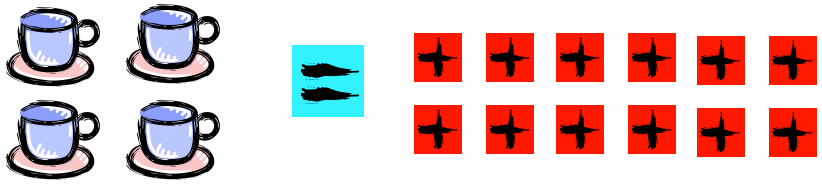
Multiplication and Division

You need a cup to represent the variable, the unknown quantity for the equation.
You need some chips to represent the numbers in the equation.

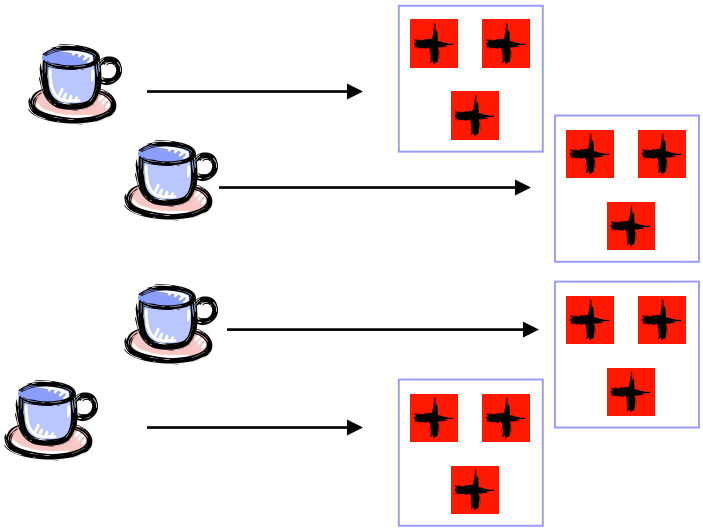
Rule for equations: **Equations are balanced on the equals sign, so what is done to one side of the equation must also be done to the other side of the equation.**

Example 1

4*m* **=** **12** (We need four cups to represent 4 m's)



To solve for the value of one cup, divide both sides of the equation by 4. Show the division by grouping the 12 pluses into groups of 4.



Therefore 1*m* = 3, which we state as *m* = 3.

Here are the steps written using math symbols.

4*m*	=	12
4*m* ÷ 4	=	12 ÷ 4
m	=	3

Check: 4*m*= 12
4 × 3 = 12 *Replace m with the answer for m which is 3.*
12 = 12

Example 2

$$\frac{1}{4}x = 9$$

We'll solve this equation by using the equation rule.

Rule for equations: **Equations are balanced on the equals sign, so what is done to one side of the equation must also be done to the other side of the equation.**

To undo the multiplication of *x* by $\frac{1}{4}$, we will multiply by the reciprocal of $\frac{1}{4}$, $\frac{4}{1}$, on both sides of the equals sign.

$$\frac{1}{4}x = 9$$

$$\frac{4}{1}\times\frac{1}{4}x = 9\times\frac{4}{1} \quad (9\times 4 = 36)$$

$$1x = 36$$

$$x = 36$$

Check: $\frac{1}{4}x = 9$

$\frac{1}{4}x36 = 9$ *Replace x with the answer for x which is 36.*

$9 = 9$

Example 3

$$\frac{y}{7} = 8$$

We'll solve this equation by using the equation rule.

Rule for equations: **Equations are balanced on the equals sign, so what is done to one side of the equation must also be done to the other side of the equation.**

To undo the division of *x* by $7,$ we will multiply by 7 on both sides of the equals sign.

$$\frac{y}{7} = 8$$

(*y* divided by 7 times 7 equals *y*) $\frac{y}{7} \times 7 = 8 \times 7$ (8 times 7 equals 56)

$$y = 56$$

Check: $\frac{y}{7} = 56$

$\frac{56}{7} = 8$ *Replace y with the answer for y which is 56.*

$8 = 8$

Chips for Hands-On Equations