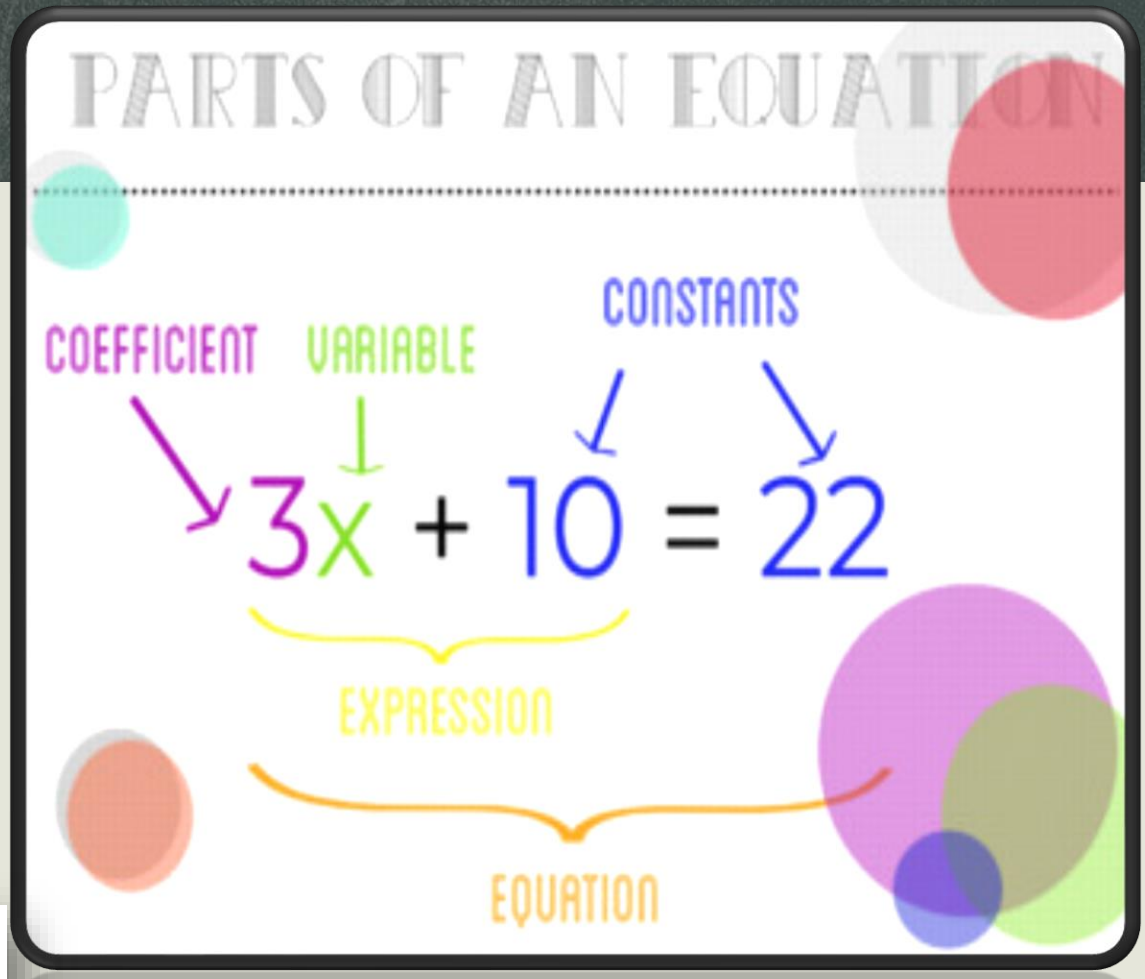
Linear Equations

Equations:

- **Objectives :**

Solve linear equations.

An equation contains an equals sign, the equals sign shows that the expressions on either side of it equal each other .



When solving equations it is important that whatever is done to one side of the equation is done to the other side

Example 1:

Get the variable by itself

Solve $x - 5 = 10$.

$x - 5 = 10$

$x - 5 + 5 = 10 + 5$ Add 5 to both sides

$\therefore x = 15$

Solve $13 + y = 27$

Subtract 13 from both sides

Solve $3m = -36$

Divide both sides by 3

Solve $\frac{x}{-2} = 4$

multiply each side by -2

Solving Two-Step Equations

$3x + 4 = -11$

- A 2-step equation is an equation that can be solved using 2 calculations.

- The first step is to remove the number that is added or subtracted to the variable.

When you add a number and its inverse you get zero.

- The second step is to get the variable on its own without any numbers in front of it.

Multiply or divide to solve for the variable.

Reminder: Undo any addition or subtraction first, then undo multiplication or division. Just remember that we never divide by zero.

Example:

$$3x+5=-16$$

$$-5 \quad -5 \qquad \text{Subtract}$$

$$3x=-21$$

$$\frac{3x}{3}=\frac{-21}{3} \qquad \text{Divide}$$

$$x=-7$$

$$3(-7)+5=-16 \qquad \text{Check}$$

$$\frac{x}{5} - 1 = 11$$

$$+1 \qquad +1$$

$$\times 5 \quad \frac{x}{5} = 12$$

$$\times 5$$

$$x = 60$$

https://www.onlinemathlearning.com/two-step-equations.html

$$\frac{x}{8} - 5 = 4$$

$+5$ $\quad$ $+5$

$$\frac{x}{8} = 9$$

$\times 8$ $\quad$ $\times 8$

$$x = 72$$

$$\frac{x}{4} + 7 = 14$$

-7 $\quad$ -7

$$\frac{x}{4} = 7$$

$\times 4$ $\quad$ $\times 4$

$$x = 28$$

Solving Equations with Brackets

Solve to find the value of x.

$$2(4x - 1) = 30$$

Expand Brackets

$$8x - 2 = 30$$

$+ 2$ $+ 2$

$$8x = 32$$

$\div 8$ $\div 8$

$$x = 4$$

How can we check the answer?

Solve to find the value of x.

$$3(2x + 5) = 45$$

Expand Brackets

$$6x + 15 = 45$$

$- 15$ $- 15$

$$6x = 30$$

$\div 6$ $\div 6$

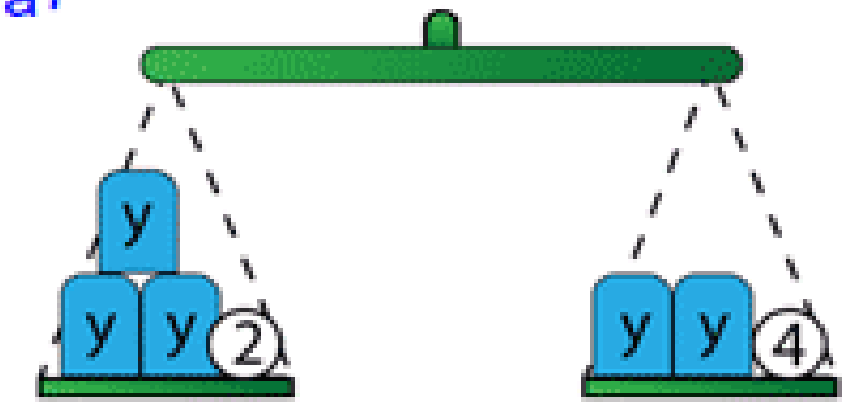
$$x = 5$$

Equations with the Unknown on Both Sides

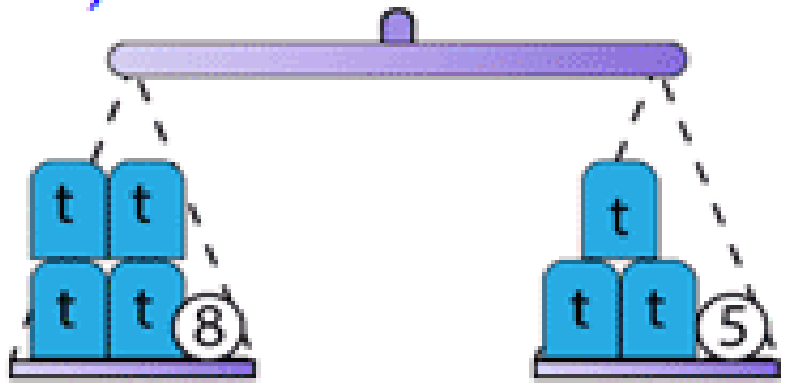
Learning Objective: Use algebraic methods to solve linear equations in one variable.

Write an equation for each balancing problem and solve it.

a)



b)



Use the balance method to solve these equations:

c) $4x + 1 = 3x + 7$

d) $7w + 3 = 2w + 18$

e) $5r - 3 = r - 1$

f) $20 - 3k = k + 12$

Solving Equations with the unknown on both sides

Solve the equations:

$$3x + 2 = 2x + 7$$
$$-2 \qquad -2$$
$$3x = 2x + 5$$
$$-2x \qquad -2x$$
$$x = 5$$

$$4 + x = 6x - 11$$
$$+11 \qquad +11$$
$$15 + x = 6x$$
$$-x \qquad -x$$
$$15 = 5x$$
$$\div 5 \qquad \div 5$$
$$3 = x$$

Revision

Solve for x:

$2x + 8 + x = 35$

$3(2x + 5) = 63$

$23 = \frac{x}{3} + 26$

Revision: solution

$$2x+8+x=35$$

$$3x+8=35$$

$$-8 \quad -8$$

$$\frac{3x}{3}=\frac{27}{3}$$

$$x=9$$

$$3(2x+5)=63$$

$$6x+15=63$$

$$-15 \quad -15$$

$$\frac{6x}{6}=\frac{48}{6}$$

$$x=8$$

$$23=\frac{x}{3}+26$$

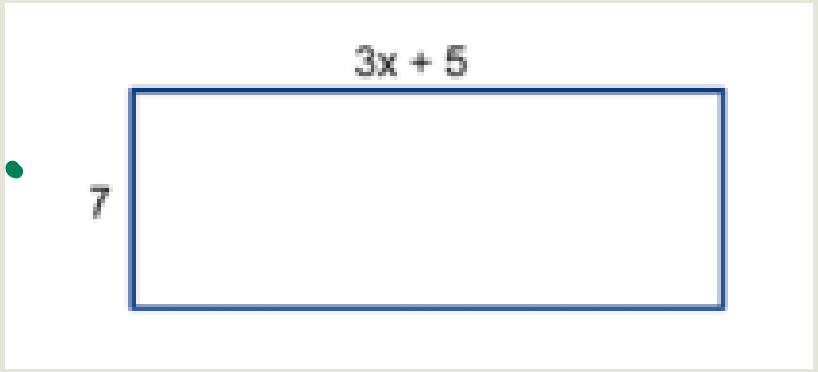
$$23-26=\frac{x}{3}+26-26$$

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

$$(-3)(3)=\left(\frac{x}{3}\right)(3)$$

$$-9=x$$

The are of the rectangle is 70 cm^2, write an equation and work out x .



$A = L * W$

$\frac{70}{7} = \frac{7}{7}(3x+5)$

$10 = 3x + 5$

$-5 \quad -5$

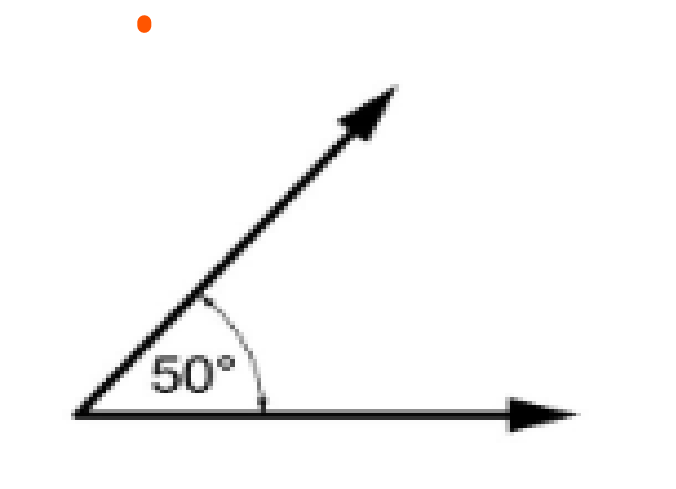
$5 = 3x$

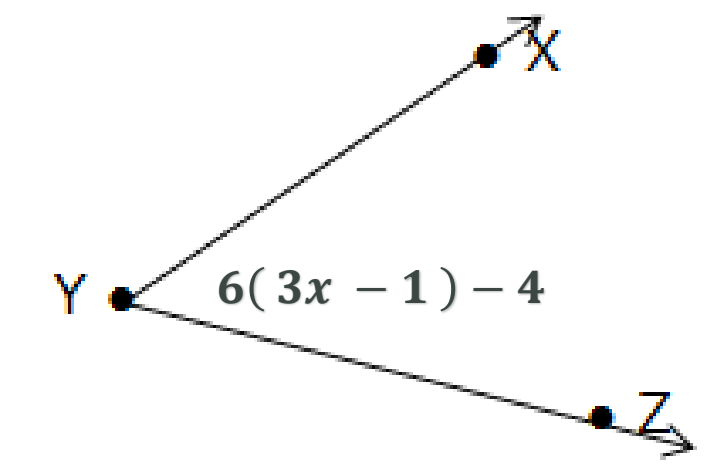
$\frac{5}{3} = x \rightsquigarrow x = 1\frac{2}{3}$

$x = 1.6$

These two angles have the same measurement, find the value of x .

$m_1 = m_2$





$4_1 = 4_2$

$6(3x-1)-4=50$

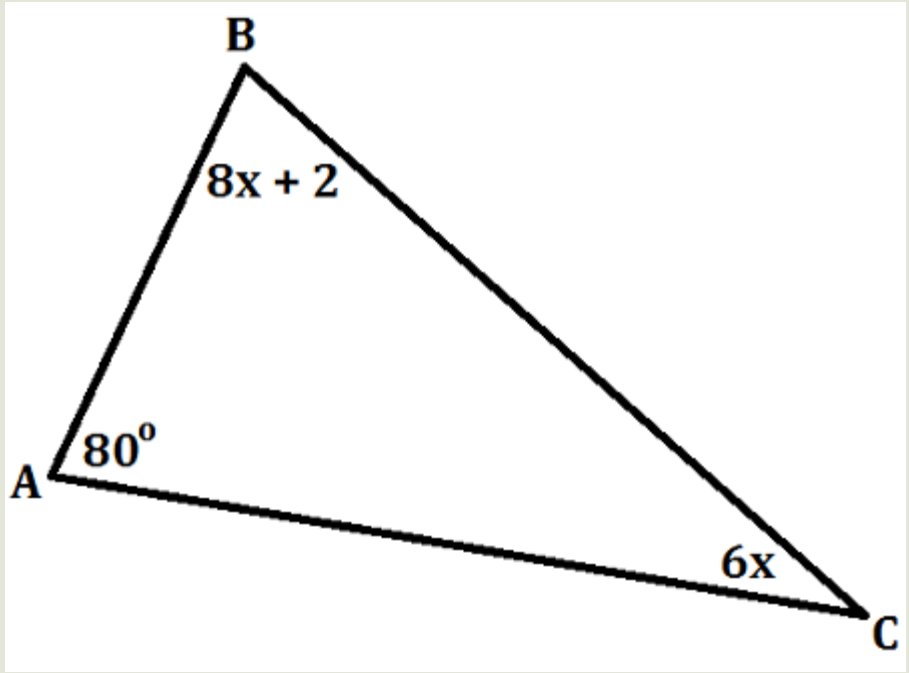
$\frac{6(3x-1)}{6} = \frac{54}{6}$

$3x-1=9$

$3x=10$

$x = \frac{10}{3} = 3\frac{1}{3}$

Write and solve the equations :



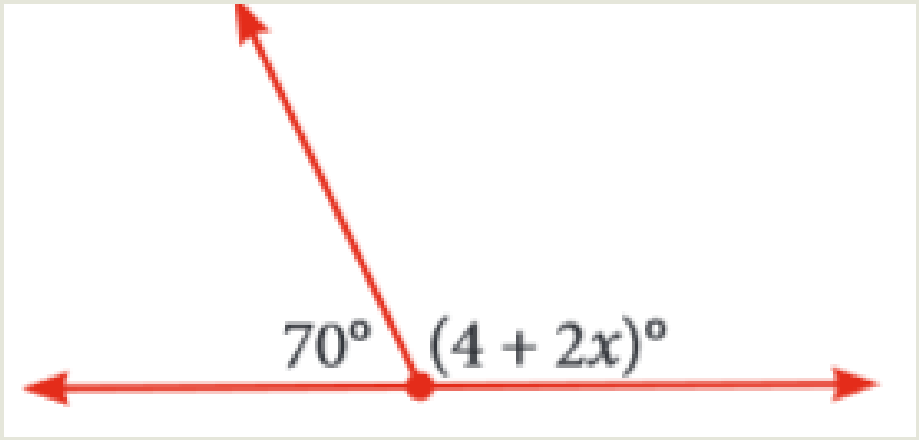
$$8x + 2 + 80 + 6x = 180$$

$$14x + 82 = 180$$

$$\frac{14x}{14} = \frac{98}{14}$$

$$x = 7$$

Supplementary Angles



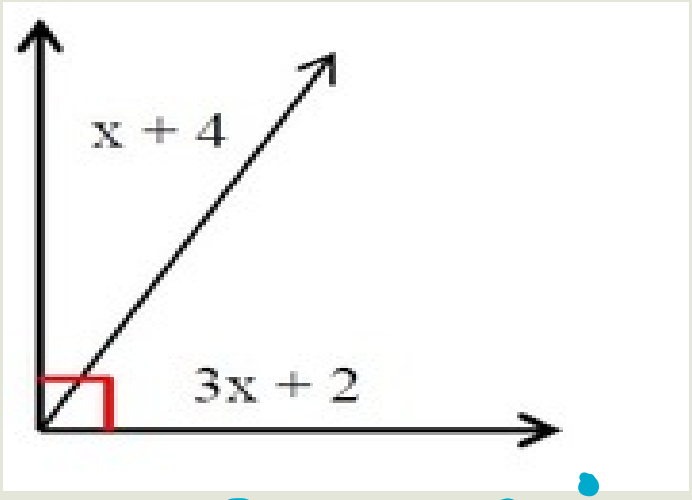
$70 + 4 + 2x = 180^\circ$

$74 + 2x = 180$

$2x = 106$

$x = 53$

Complementary Angles



$x + 4 + 3x + 2 = 90^\circ$

$4x + 6 = 90$

$4x = 84$

$x = 21$