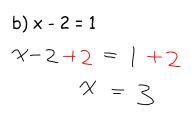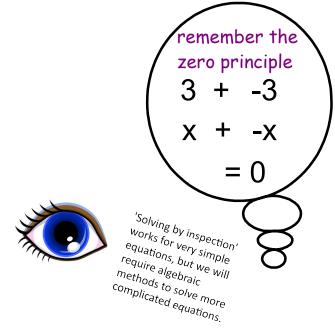# 2.6 Solve Simple Equations

- To <u>solve</u> an equation means to find the value of the variable for which the equation is <u>true</u>.

- Think of an equation as being like a <u>balance</u> with the equal sign as the centre. Whatever you do to one side, you also have to do to the other.
- You can do anything to it! As long as you do it to both sides.

Ex1

a) $x+5=9$

$$x+5 \; -5 = 9-5$$
$$x+0 \;\; = 4$$
$$x = 4$$

remember the zero principle

$$3 + -3$$
$$x + -x$$
$$= 0$$

'Solving by inspection' works for very simple equations, but we will require algebraic methods to solve more complicated equations.

b) x - 2 = 1

$$x-2+2 = 1+2$$
$$x = 3$$

c) 3x-2=4

$$3x-2+2 = 4+2$$
$$3x = 6$$
$$\frac{3x}{3} = \frac{6}{3}$$
$$x = 2$$

To ISOLATE a variable you need to apply *opposite operations*.

Undo addition & subtraction first
then multiplication and division.

∴ BEDMAS becomes... SAMDEB

What is the opposite of each operation?

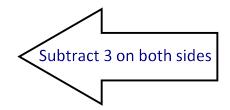addition   multiplication   exponent 2

subtraction   division   square root

Ex. 2 Solve.

a) $m + 3 = 4$

$-3 \quad -3$

$m = 1$

Subtract 3 on both sides

⭐ Communication⭐
Keep equal signs aligned,
one per line.

b) $x - 2 = 6$

$x - 2 + 2 = 6 + 2$

$x = 8$

Add 2 to both sides

c) $\dfrac{4x}{4} = \dfrac{20}{4}$

$x = 5$

Divide both sides by 4

d) $\dfrac{x}{3} = 12$

$3\left(\dfrac{x}{3}\right) = 3(12)$

$x = 36$

Multiply both sides by 3

e) $x^2 = 36$

$\sqrt{x^2} = \sqrt{36}$

$x = 6$

Take the square root of
both sides

f) $2x - 11 = 27$

$2x - 11 + 11 = 27 + 11$

$2x = 38$

$\dfrac{2x}{2} = \dfrac{38}{2}$

$x = 19$

"Formal Check"

LS	RS
$2x - 11$	27

$x = 19$

$2(19) - 11$

$= 38 - 11$

$= 27$

$\therefore LS = RS$

$\therefore QED$

"Thus it is proven"

Check your solution to example 2 f).

<u>Checking a solution</u>
Substitute the root (the answer) into the right and left side of the equation. Both sides must be equal.

<u>Communication</u>
You **must** separate the Left Side (LS) from the Right Side (RS) of the equation.

OR

$5 - \dfrac{x}{2} = 3$

$5 - \dfrac{x}{2} + \dfrac{x}{2} = 3 + \dfrac{x}{2}$

$5 = 3 + \dfrac{x}{2}$

$5 - 3 = 3 + \dfrac{x}{2} - 3$

$(2)\, 2 = \dfrac{x}{2}(2)$

$4 = x$

g) $5 - \dfrac{x}{2} = 3$

$5 - \dfrac{x}{2} - 5 = 3 - 5$

$(-2)\left(-\dfrac{x}{2}\right) = (-2)(-2)$

$x = 4$

h) $3x + \dfrac{2}{5} = -4$

$3x + \dfrac{2}{5} - \dfrac{2}{5} = -4 - \dfrac{2}{5}$

$3x = -4 - \dfrac{2}{5}$

$3x = \dfrac{-20}{5} - \dfrac{2}{5}$

$3x = -\dfrac{22}{5}$

$\dfrac{3x}{3} = \dfrac{-22}{5}\left(\dfrac{1}{3}\right)$

$x = \dfrac{-22}{15}$

i) $5m \cdot \dfrac{4}{3} = 2$

$\div \dfrac{2}{3}$

$\hookrightarrow \times \dfrac{3}{2}$

$\div 3$

$\hookrightarrow \times \dfrac{1}{3}$

Ex. 3 At a computer store, USB's sell for $15 each. A customer buys $120 worth of USB's. <u>Write</u> and <u>solve</u> an equation to find the number of packages of USB's that were bought.

$$15x = 120$$

$$\frac{15x}{15} = \frac{120}{15}$$

$$x = 8$$

∴ They bought 8 packages

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$$x + 2 = 5$$
$$x = 3$$

Baloo

"Just a darn minute — yesterday you said that X equals **two!**"

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