

A. Writing an expression

An expression is a mathematical phrase.
It **does not** contain an equals sign.

An equation is a mathematical statement that two things are equal.
It consists of two expressions, one on each side of an equals sign.

A formula is a rule that shows how quantities are relate to each other.
Like an equation it must contain an equals sign.
eg $C = \pi d$ or $v = u + at$

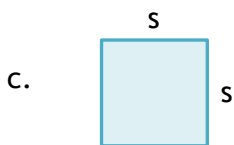
- a. 6 more than x is $x + 6$ b. 3 less than t is $t - 3$ c. k less than 2 is $2 - k$
 d. t added to w is $w + t$ e. m multiplied by 4 is $4m$ f. a multiplied by b is ab
 g. h multiplied by itself is h^2 h. x divided by 2 is $\frac{x}{2}$ i. 5 divided by c is $\frac{5}{c}$
 j. Chocolate costs 40 pence a bag, mints cost 54 pence a pack.
 Helen buys t bags of chocolate and h packs of mints, and she pays with a £5 note.

- The cost of the chocolate is $40t$
- The total cost of her sweets is $40t + 54h$
- Her change from £5 is $500 - (40t + 54h)$ or $500 - 40t - 54h$

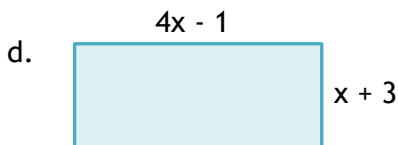
The units must be the same. Here all pence.

B. Writing formulae

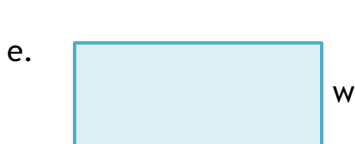
- a. Sue buys h apples costing 30 pence each and pays with a £2 coin
- The formula for the total cost, T, of her apples is $T = 30h$
 - The formula for her change, C, is $C = 200 - 30h$
- b. Bananas cost n pence each and oranges cost v pence. Peter buys 6 bananas and 4 oranges.
- The formula for the total cost, T, of his fruit is $T = 6n + 4v$



- The formula for the perimeter, P, of the square is $P = s + s + s + s$ $P = 4s$
- The formula for the area, A, of the square is $A = s \times s$ $A = s^2$



- The formula for the perimeter, P, of the rectangle is $P = 4x - 1 + x + 3 + 4x - 1 + x + 3$ $P = 10x + 4$
- The formula for the area, A, of the rectangle is $A = (4x - 1)(x + 3)$



The length of a rectangle is 5 less than twice it's width, w.

Length = $2w - 5$

- The formula for the perimeter, P, of the rectangle is $P = w + w + 2w - 5 + 2w - 5$ $P = 6w - 10$

C. Substitution

Remember BIDMAS tells us the correct order to evaluate arithmetic.
Always use BIDMAS

B: Brackets
I: Indices or powers
DM: Division and Multiplication
AS: Addition and Subtraction

You must know the difference between $2r^2$ and $(2r)^2$
Indices before multiplication

Evaluate thy expressions when $p = 4$, $q = -3$ and $r = 5$

a. $4r - 3 = 20 - 3 = \underline{17}$

b. $p^2 = 4^2 = 4 \times 4 = \underline{16}$

c. $2r^2 = 2 \times 5^2 = 2 \times 25 = \underline{50}$

You must not leave double signs

d. $(2r)^2 = 10^2 = \underline{100}$

e. $2p + 3r = 8 + 15 = \underline{23}$

f. $5r + 3q = 25 + -9 = 25 - 9 = \underline{16}$

g. $3r + q^2 = 15 + 9 = \underline{24}$

$-3 \times -3 = +9$

h. $3q + 2p^2 = -9 + 2 \times 16$
 $= -9 + 32 = \underline{23}$

i. $(2q)^2 = -6^2 = -6 \times -6 = \underline{36}$

j. $2p(r^2 - 2q^2) = 8(25 - 2 \times 9)$
 $= 8 \times (25 - 18)$
 $= 8 \times 7 = \underline{56}$

k. $\frac{4r + 2p}{p - q} = \frac{20 + 8}{4 - -3} = \frac{28}{7} = \underline{4}$

l. $\frac{\sqrt{6p - 4q}}{2q + p} = \frac{\sqrt{(24 - -12)}}{-6 + 4}$
 $= \frac{\sqrt{36}}{-2} = \frac{6}{-2}$ or $\frac{-6}{-2}$
 $= \underline{-3}$ or $\underline{3}$

D. Substitution and formulae

a) Heron's formula can be used to find the area of a triangle with side lengths a, b and c

$$A = \sqrt{s(s - a)(s - b)(s - c)} \text{ where } s = \frac{a + b + c}{2}$$

Use Heron's formula to find the area of a triangle with side lengths of 5cm, 7cm and 10cm

$$s = \frac{5 + 7 + 10}{2} \quad s = \frac{22}{2} \quad s = 11$$

$$A = \sqrt{s(s - a)(s - b)(s - c)}$$

$$A = \sqrt{11(11 - 5)(11 - 7)(11 - 10)}$$

$$A = \sqrt{11 \times 6 \times 4 \times 1}$$

$$A = \sqrt{264}$$

$$A = \underline{16.25 \text{ cm}^2} \text{ (2dp)}$$

b) The perimeter of a rectangle can be found using $P = 2l + 2w$

(i) Find P when l is 24 cm and w is 5 cm

$$P = 2l + 2w$$

$$P = 48 + 10$$

$$P = \underline{58 \text{ cm}}$$

(ii) Find w when P is 25 cm and l is 8 cm

$$P = 2l + 2w$$

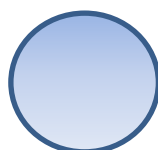
$$25 = 16 + 2w$$

$$2w = 9$$

$$w = \frac{9}{2} \quad \underline{w = 4.5 \text{ cm}}$$

c) The volume of a sphere can be found using

the rule $V = \frac{4}{3}\pi r^3$



Find the volume when the radius is 8cm

$$V = \frac{4}{3} \times \pi \times 8^3$$

$$V = \frac{4}{3} \times \pi \times 8^3$$

$$V = \frac{4}{3} \times \pi \times 512$$

$$V = \underline{2144.7 \text{ cm}^3} \text{ (1dp)}$$