Formulae

- Substituting values into expressions and formulae
- Deriving simple formulae

Keywords

You should know

explanation 1a explanation 1b online

1 $p = 2$, $q = 3$ and $r = -4$. Find the value of s for each formula.

a $s = 2p + q$ **b** $s = 2p + 3q$ **c** $s = 3q - r$

d $s = p + q + 2r$ **e** $s = 4r - 3q + p$ **f** $s = 2(q + r)$

g $s = 4(2q - r)$ **h** $s = 5(2p - q)$ **i** $s = 4(3p - 2q)$

j $s = \frac{4}{q}$ **k** $s = \frac{2p + q}{r}$ **l** $s = \frac{r + 1}{r - 1}$

explanation 2 online

2 $x = 2$, $y = 3$ and $z = 5$. Find the value of w for each formula.

a $w = y^2 + x$ **b** $w = y + z^2$ **c** $w = x^3 + y^2$

d $w = 2y^2 + z$ **e** $w = 3x^2 - 2y$ **f** $w = z^2 - 2x^3$

g $w = 2z^2 + y^2$ **h** $w = x^2 + y^2 + z^2$ **i** $w = x^3 - y^2 - z$

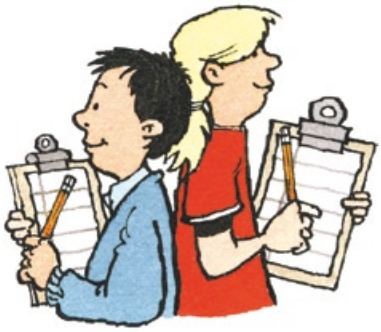
3 The cost (C pence) of hiring a minicab is given by the formula $C = 200 + 25d$, where d is the number of kilometres travelled.
Calculate C for these values of d.

a $d = 5$ **b** $d = 10$ **c** $d = 20$

4 The cost (P pounds) of calling out an emergency plumber is given by the formula $P = 60 + 40t$, where t is the number of hours the job takes to complete.
Calculate P for these values of t.

a $t = 1$ **b** $t = 3$ **c** $t = 8$

5 Zoe and Tim investigated how long it took pupils to get to school. They found that the time taken (T minutes) could be approximately calculated using the formula $T = 15a + 3b$.



a is the distance in kilometres from their home to the bus stop and b is the distance in kilometres from the bus stop to the school.

Calculate T for these values of a and b.

a $a = 1, b = 6$ **b** $a = 2, b = 4$ **c** $a = 3, b = 12$

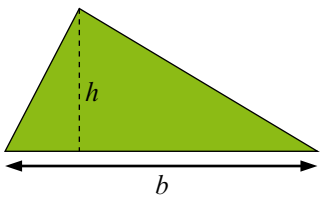
6 The velocity of a car can be calculated using the formula $v = u + at$.
v is the final velocity of the car in metres per second.
u is the initial velocity of the car in metres per second.
a is the acceleration of the car in metres per second per second.
t is the time spent accelerating in seconds.

Calculate v for these values of u, a, and t.

a $u = 5, a = 1, t = 5$ **b** $u = 6, a = 2, t = 3$ **c** $u = 0, a = 2, t = 10$

7 The area of a triangle is given by the formula $A = \frac{1}{2}bh$, where b is the length of the base of the triangle and h is its height.

Calculate the area of the triangle for these values of b and h.



a $b = 6\,\text{cm}, h = 3\,\text{cm}$

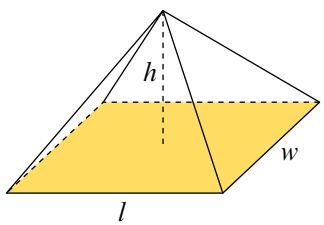
b $b = 12\,\text{cm}, h = 5\,\text{cm}$

c $b = 1\,\text{cm}, h = 8\,\text{cm}$

d $b = 7\,\text{cm}, h = 4\,\text{cm}$

8 The volume of a rectangular-based pyramid is given by the formula $V = \frac{1}{3}lwh$, where l is the length of the base, w is the width of the base and h is the height of the pyramid.

Calculate the volume of the pyramid for these values of l, w and h.



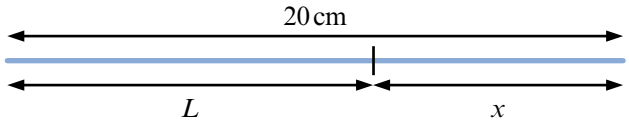
a $l = 2\,\text{cm}, w = 3\,\text{cm}, h = 5\,\text{cm}$

b $l = 6\,\text{cm}, w = 5\,\text{cm}, h = 2\,\text{cm}$

c $l = 6\,\text{cm}, w = 8\,\text{cm}, h = 4\,\text{cm}$

explanation 3

9 A piece of string is 20 cm long. A piece of length x cm is cut from it.



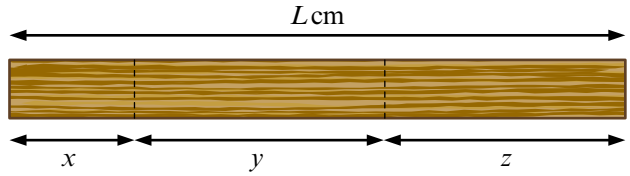
a Write a formula for calculating the length, L cm, of the string that is left.

b Calculate L when $x = 6$ cm.

c Calculate x when $L = 18$ cm.

Write a formula for calculating the length, x cm, that is cut off.

10 A plank of length L cm is cut into three sections, x cm, y cm and z cm long.



a Write a formula for the length x in terms of L, y, and z.

b The total length, L cm, of the plank is 120 cm.

i Calculate x when $y = 50$ and $z = 30$.

ii Calculate y when $x = 40$ and $z = 75$.

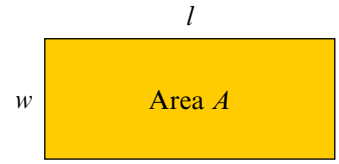
iii Calculate z when $x = 32$ and $y = 56$.

11 A rectangle has length l cm and width w cm. Its area is A cm^2.

a Write a formula for the area of the rectangle.

b Calculate A when $l = 6$ and $w = 8$.

c Calculate A when $l = 9$ and $w = 7$.



12 A rectangle has length a cm and width b cm.

a Write a formula for the perimeter (P cm) of the rectangle.

b Calculate P when $a = 3$ and $b = 4$.

c Calculate P when $a = 6$ and $b = 5$.

d Calculate a when $P = 20$ and $b = 1$.

e Calculate b when $P = 52$ and $a = 11$.

Write formulae for calculating a and b.