



Using letters

- Distinguishing between equations, formulae and functions
- Identifying and using an identity
- Using the index laws in algebra

Keywords

You should know

explanation 1a

explanation 1b

explanation 1c

1 Is each of these an equation, a function or a formula?

Some parts may have more than one answer.

a $3x - 2 = 10$

b $5 + x = 17$

c $F = ma$, where F is the force, m is the mass and a is the acceleration.

d $y = 4x + 1$

e $2(x + 4) = -3$

f $C = 20 + 5n$, where C is the cost and n is the number of hours.

g $y = -\frac{4}{3}x + 5$

h $4y - 2 = y + 5$

i $V = IR$, where V is the voltage, I is the current and R is the resistance.

j $7x - 3 = y$

2 Two of the cards show equations that can be solved to find x .

A

$$3x = 12$$

B

$$y = 7x - 2$$

C

$$2x + 1 = 3$$

D

$$y = \frac{1}{2}x - 2$$

E

$v = \frac{x}{t}$, where v is the speed, x is the distance travelled and t is the time taken to travel this distance.



- a** Which are the equations?
- b** Solve them to find x in each case.

3 Solve each of these to find the value of y when $x = 2$.

a $y = x + 1$

b $y = 3x$

c $y = 5x - 1$

4 $p = 0.6q$, where p is the number of miles and q is the number of kilometres.

26 miles

a Work these out.

i the number of miles equivalent to 36 kilometres

ii the number of kilometres in 24 miles

b Is $p = 0.6q$ an equation, a function or a formula? How can you tell?

explanation 2

5 Check that $4(2x + 1) \equiv 8x + 4$ is true using these values of x .

a $x = 1$

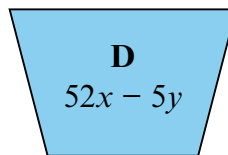
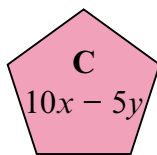
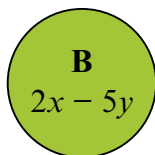
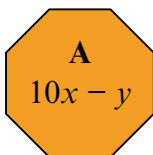
b $x = 10$

c $x = 4$

d $x = 0$

e $x = -1$

6 Which of these expressions is identically equal to $5(2x - y)$?
Check by substituting some values of x .



7 Is each of these true or false?
Check by substituting some values for the unknowns.

a $4(x - 1) \equiv 4x - 1$

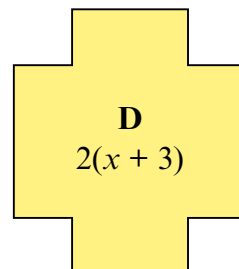
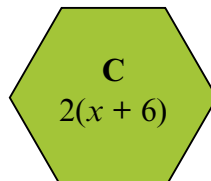
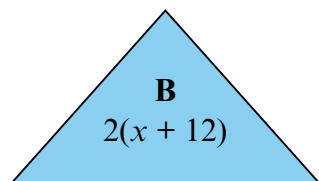
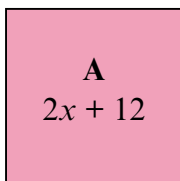
b $3a + 4 + 2a + 5 \equiv 5a + 9$

c $3m + 9 \equiv 3(m + 3)$

d $5(2x - 3y) \equiv 10x - 3y$

e $5c - 10d \equiv 8c - 15d - 3c + 5d$

8 Which of these expressions are identically equal?



explanation 3

9 Simplify these.

a $2 \times 3a$

b $2 \times 2c$

c $2 \times 4n$

d $-8 \times 3m$

e $4 \times 3b$

f $-4p \times 5$

g $8x \times 2$

h $4y \times -3$

i $9a^2 \times 3$

j $-2 \times 10n^6$

k $8 \times 2c^4$

l $4g^2 \times -4$

m $4n \div 2$

n $9t \div 3$

o $3g \div 3$

p $10b \div -5$

q $24y \div -8$

r $36z \div 18$

s $45g^2 \div 9$

t $9x^2 \div -3$

explanation 4

10 Is each of these true or false?

If you think an answer is false, write the correct answer.

a $m \times m \times m \times m = m^4$

b $b \times b \times b \times c \times c = b^3c^2$

c $x \times x \times x \times y \times y \times y \times y = 3x \times 4y$

d $5 \times p \times q \times q = 5p \times 2q$

e $3 \times s \times s \times s \times s \times t \times t = 3s^4t^2$

f $4 \times f \times f \times f \times 4 \times g \times g = 8f^3g^2$

g $7 \times r \times r \times r \times r \times 3 \times s \times s \times s = 21r^4s^3$

h $x \times x \times x \times x \times 4 \times y \times y \times 3 = 12x^4y^2$

11 Write these using indices.

a $d \times d \times d \times d \times e \times e$

b $g \times g \times g \times g \times h \times h \times h \times h \times h \times h$

c $4 \times p \times p \times p \times q \times q$

d $4 \times y \times y \times 5 \times z \times z \times z \times z$

e $6 \times a \times a \times 4 \times b \times b \times c \times c \times c$

f $4 \times m \times 4 \times n \times n \times n \times 2 \times p \times p \times p \times p$

explanation 5a

explanation 5b

12 Use the index laws to simplify these. The first one is done for you.

a $4^3 \times 4^2 = 4^{3+2} = 4^5$

b $6^3 \times 6^4$

c $8^3 \times 8^7$

d $9^5 \times 9^1$

e $3^{20} \times 3$

f $20^4 \times 20^5$

g $81^9 \times 81^3$

h $15^6 \times 15^4$

i $7^8 \times 7$

13 Use the index laws to simplify these. The first one is done for you.

a $8^5 \div 8^2 = 8^{5-2} = 8^3$

b $2^{13} \div 2^{11}$

c $8^{12} \div 8^8$

d $18^6 \div 18^2$

e $15^{15} \div 15^3$

f $8^3 \div 8$

g $\frac{10^{14}}{10^7}$

h $\frac{8^9}{8^2}$

i $\frac{6^{10}}{6^{10}}$

14 Write your own expression like those in question 12 to give each answer.

a 8^3

b 11^5

c 9^4

d 19^2

15 Use the index laws to simplify these.

a $m \times m^2$

b $b^2 \times b^2$

c $n^6 \times n^6$

d $r^7 \times r^2$

e $h^7 \times h^{10}$

f $g^5 \times g^2$

g $p^4 \times p^3$

h $y^8 \times y^3$

i $c^2 \times c^5$

j $b^7 \times b$

k $b^5 \div b^3$

l $n^6 \div n^2$

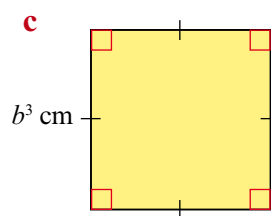
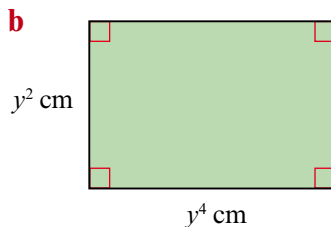
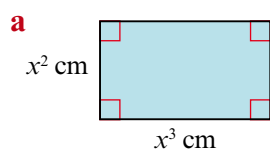
m $p^{12} \div p^3$

n $z^9 \div z^6$

o $d^9 \div d^3$

p $t^8 \div t^2$

16 Write an expression for the area of each shape. Simplify your expression.



17 Write an expression for the length of each red side. Simplify your expression.

