

Writing Expressions and Formulae

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (4 marks)

Write an expression for

(a) 5 more than n

'More than' means add.

Add 5 to n .

Answer: $n + 5$

(b) 4 less than n

'Less than' means subtract.

Start with n , then subtract 4.

Answer: $n - 4$

Tip: '4 less than n ' is $n - 4$, not $4 - n$. Test it: 4 less than 10 is 6, and $10 - 4 = 6$.

(c) n multiplied by 6

$n \times 6$

Write the number first, with no $\times$ sign.

Answer: $6n$

(d) n divided by 3

$n \div 3$

In algebra, division is written as a fraction.

Answer: $\frac{n}{3}$

2 (2 marks)

Ali is x years old.

His sister is 3 years older than Ali.

His mother is 4 times as old as Ali.

- (a) Write an expression, in terms of x , for his sister's age.

She is 3 years older, so add 3.

Answer: $x + 3$

Tip: '3 years older' means add 3: $x + 3$, not $3x$.

- (b) Write an expression, in terms of x , for his mother's age.

She is 4 times as old, so multiply by 4.

$$4 \times x = 4x$$

Answer: $4x$

3 (1 mark)

A cinema ticket costs £9

The total cost of n cinema tickets is C pounds.

Circle the correct formula.

Options: $C = n + 9$, $C = 9n$, $C = \frac{n}{9}$, $n = 9C$

Each ticket costs £9.

So n tickets cost $9 \times n = 9n$ pounds.

$$C = 9n$$

Answer: $C = 9n$

4 (3 marks)

A pen costs p pence.

A pencil costs q pence.

- (a) Write an expression for the total cost, in pence, of 4 pens and 3 pencils.

4 pens cost $4 \times p = 4p$ pence.

3 pencils cost $3 \times q = 3q$ pence.

Add them together.

Answer: $4p + 3q$

- (b) Sara buys 4 pens and 3 pencils.

She pays with a £5 note.

Write an expression for her change, in pence.

The prices are in pence, so change £5 into pence: £5 = 500 pence.

Change = 500 – cost

$$= 500 - (4p + 3q)$$

$$= 500 - 4p - 3q$$

Answer: $500 - 4p - 3q$

Tip: Use the same units. The prices are in pence, so use 500, not 5.

Marks: 1 mark for using 500 (pence). 1 mark for $500 - 4p - 3q$ (or $500 - (4p + 3q)$).

5 (2 marks)

A company prints T-shirts for a school.

It charges a set-up fee of £30 plus £4 for each T-shirt it prints.

The cost of printing n T-shirts is £ C .

Write a formula for C in terms of n .

£4 for each of the n T-shirts is $4 \times n = 4n$ pounds.

Add the set-up charge of £30.

A formula must start with ' $C =$ '.

Answer: $C = 30 + 4n$

Tip: Write $C = 30 + 4n$ with letters and numbers only: no £ signs, no words like 'T-shirts', and don't forget the ' $C =$ '.

Marks: 1 mark for $30 + 4n$. 1 mark for $C = 30 + 4n$ (or $C = 4n + 30$).

6 (2 marks)

An adult ticket for a zoo costs £ a .

A child ticket costs £ c .

Write a formula for T , the total cost in pounds of 2 adult tickets and 3 child tickets.

2 adult tickets cost $2 \times a = 2a$ pounds.

3 child tickets cost $3 \times c = 3c$ pounds.

The total is $2a + 3c$.

A formula must start with ' $T =$ '.

Answer: $T = 2a + 3c$

Marks: 1 mark for $2a + 3c$. 1 mark for $T = 2a + 3c$.

7 (2 marks)

An isosceles triangle has two sides of length $2y$ cm.
The third side has length $(y + 5)$ cm.

Work out an expression for the perimeter of the triangle.
Give your answer in its simplest form.

Add all three sides:

$$2y + 2y + (y + 5)$$

Collect the y terms: $2y + 2y + y = 5y$

So the perimeter is $5y + 5$

Answer: $5y + 5$ cm

Marks: 1 mark for $2y + 2y + y + 5$. 1 mark for $5y + 5$.

8 (3 marks)

n is an integer.

(a) Write an expression for the next integer after n .

Consecutive integers go up by 1.

So the next integer is $n + 1$.

Answer: $n + 1$

(b) Write an expression for the sum of n and the next two integers.
Give your answer in its simplest form.

The three integers are n , $n + 1$ and $n + 2$.

$$\text{Sum} = n + (n + 1) + (n + 2)$$

Collect the n terms: $n + n + n = 3n$

Collect the numbers: $1 + 2 = 3$

Answer: $3n + 3$

Marks: 1 mark for $n + n + 1 + n + 2$. 1 mark for $3n + 3$.

9 (2 marks)

Write an expression for

(a) the number of minutes in h hours

Each hour is 60 minutes.

So h hours is $60 \times h = 60h$ minutes.

Answer: $60h$

(b) the number of pence in $\pounds d$

Each pound is 100 pence.

So $\pounds d$ is $100 \times d = 100d$ pence.

Answer: $100d$

10 (3 marks)

Nina saves $\pounds n$ each week for 4 weeks.

Her brother Tariq saves $\pounds 3$ more than Nina each week.

Tariq saves for 6 weeks.

Work out an expression, in terms of n , for the total amount they save altogether.

Give your answer in its simplest form.

Nina saves $4 \times n = 4n$ pounds.

Each week Tariq saves $\pounds 3$ more than Nina: $n + 3$ pounds

In 6 weeks Tariq saves $6(n + 3) = 6n + 18$ pounds.

Total = $4n + 6n + 18$

Collect the n terms: $4n + 6n = 10n$

Answer: £($10n + 18$)

Tip: Tariq saves $n + 3$ every week, so put $n + 3$ in a bracket: $6(n + 3)$, not $6n + 3$.

Marks: 1 mark for $4n$ or $n + 3$. 1 mark for $6(n + 3)$ or $6n + 18$. 1 mark for $10n + 18$.

11 (2 marks)

A distance is m miles.

The same distance is k kilometres.

Use 5 miles = 8 km to write a formula for k in terms of m .

5 miles = 8 km

So 1 mile = $8 \div 5 = \frac{8}{5}$ km = 1.6 km.

So m miles = $1.6 \times m$ km.

$k = 1.6m$

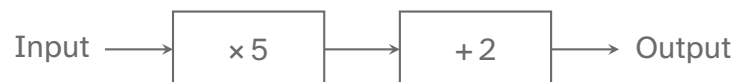
Answer: $k = \frac{8m}{5}$ (or $k = 1.6m$)

Tip: Check your formula with the fact you were given: $m = 5$ should give $k = 8$. $1.6 \times 5 = 8$ ✓

Marks: 1 mark for $\frac{8}{5}$ or 1.6. 1 mark for $k = \frac{8m}{5}$ (or $k = 1.6m$).

12 (3 marks)

Here is a number machine.



(a) Work out the output when the input is 6

Multiply by 5: $6 \times 5 = 30$

Then add 2: $30 + 2 = 32$

Answer: 32

- (b) The input is p and the output is q .
Work out a formula for q in terms of p .

Multiply p by 5: $5p$

Then add 2: $5p + 2$

A formula must start with ' $q =$ '.

Answer: $q = 5p + 2$

Tip: Follow the machine in order. If the adding came first, you would need a bracket, e.g. $5(p + 2)$.

Marks: 2 marks for $q = 5p + 2$. 1 mark for $5p + 2$ without ' $q =$ ', or for $q = 5p +$ another number.

13 (2 marks)

Sam has s sweets.

He gives 4 sweets to each of his 3 friends.

He then eats 2 sweets.

Write an expression for the number of sweets Sam has left.

Give your answer in its simplest form.

He gives 4 sweets to each of 3 friends: $3 \times 4 = 12$ sweets.

He then eats 2 sweets.

Sweets left = $s - 12 - 2$

= $s - 14$

Answer: $s - 14$

Marks: 1 mark for $s - 12 - 2$ (or similar). 1 mark for $s - 14$.

14 (1 mark)

Circle the expression for the mean of a , b and c .

Options: $a + b + \frac{c}{3}$, $\frac{a + b + c}{3}$, $3(a + b + c)$, $\frac{abc}{3}$

Mean = total $\div$ number of values

The total is $a + b + c$, and there are 3 values.

The whole total must be divided by 3.

Answer: $\frac{a + b + c}{3}$

15 (3 marks)

To hire a van costs £40 for each day plus 25p for each mile driven.

Write a formula for the total cost, C pounds, of hiring a van for d days and driving it m miles.

Daily charge: £40 for each of d days is $40d$ pounds.

Mileage: 25p = £0.25 for each mile.

So m miles cost $0.25m$ pounds.

C is in pounds, so both parts must be in pounds.

$$C = 40d + 0.25m$$

Answer: $C = 40d + 0.25m$

Tip: Don't mix pounds and pence. $C = 40d + 25m$ is wrong, because the 40 is pounds but the 25 is pence.

Marks: 1 mark for $40d$. 1 mark for $0.25m$ (or $\frac{m}{4}$). 1 mark for $C = 40d + 0.25m$.
