

Writing Expressions and Formulae

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • 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 (1 mark)

Amy has x red pens and y blue pens.

Write down an expression, in terms of x and y , for the total number of pens Amy has.

Total = red pens + blue pens

$$= x + y$$

Answer: $x + y$

2 (3 marks)

Write down an expression, in terms of n , for

(a) 7 more than n

‘More than’ means add.

Add 7 to n .

Answer: $n + 7$

(b) 3 times n , minus 2

Multiply by 3 first: $3n$

Then subtract 2: $3n - 2$

Answer: $3n - 2$

(c) n squared

n squared means $n \times n$.

This is written n^2 .

Answer: n^2

3 (3 marks)

Oliver is x years old.

(a) Write down an expression, in terms of x , for Oliver's age in 5 years' time.

In 5 years he will be 5 years older.

So add 5.

Answer: $x + 5$

(b) Write down an expression, in terms of x , for Oliver's age 3 years ago.

3 years ago he was 3 years younger.

So subtract 3.

Answer: $x - 3$

Tip: 'Younger' or 'ago' means subtract: $x - 3$. Answers like $3x$ or $x + 3$ are common mistakes.

(c) Oliver's grandad is 6 times as old as Oliver is now.

Write down an expression, in terms of x , for the sum of their ages now.

Grandad's age is $6 \times x = 6x$.

Sum = $x + 6x = 7x$

Answer: $7x$

Tip: '6 times as old' means $6x$, not x^6 and not $x + 6$.

4 (2 marks)

A shop sells notebooks for n pence each.
It sells pencils for k pence each.

- (a) Write an expression for the total cost, in pence, of 4 notebooks and 6 pencils.

4 notebooks cost $4 \times n = 4n$ pence.

6 pencils cost $6 \times k = 6k$ pence.

Add them together.

Answer: $4n + 6k$

- (b) The total cost of 3 notebooks and 1 pencil is T pence.
Write a formula for T in terms of n and k .

3 notebooks cost $3n$ pence and 1 pencil costs k pence.

A formula starts with ' $T =$ '.

Answer: $T = 3n + k$

Tip: A formula needs ' $T =$ ' at the start. Do not 'simplify' $3n + k$ to $3nk$: the terms are unlike terms.

5 (2 marks)

A plumber charges £40 to call out, plus £30 for each hour she works.
The total charge for a job lasting h hours is £ C .

Write a formula for C in terms of h .

£30 for each of the h hours is $30 \times h = 30h$ pounds.

Add the £40 call-out charge.

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

Answer: $C = 40 + 30h$

Marks: 1 mark for $40 + 30h$. 1 mark for $C = 40 + 30h$ (or $C = 30h + 40$).

6 (2 marks)

A builder uses this rule to work out the number of bricks, B , needed for a wall of length L metres.

Multiply the length by 60, then add 10

Write a formula for B in terms of L .

Multiply the length by 60: $60L$

Then add 10: $60L + 10$

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

Answer: $B = 60L + 10$

Marks: 1 mark for $60L + 10$. 1 mark for $B = 60L + 10$.

7 (2 marks)

A rectangle has length $3x$ cm and width $(x + 2)$ cm.

The perimeter of the rectangle is P cm.

Write a formula for P in terms of x .

Give your answer in its simplest form.

A rectangle has two lengths and two widths.

$$P = 3x + (x + 2) + 3x + (x + 2)$$

$$\text{Collect the } x \text{ terms: } 3x + x + 3x + x = 8x$$

$$\text{Collect the numbers: } 2 + 2 = 4$$

$$P = 8x + 4$$

Answer: $P = 8x + 4$

Tip: Add all four sides. Adding just the length and width gives half the perimeter.

Marks: 1 mark for adding all four sides. 1 mark for $P = 8x + 4$.

8 (3 marks)

The sizes of the angles in a triangle are x° , $2x^\circ$ and $(x + 20)^\circ$.

- (a) Write an expression, in terms of x , for the sum of the angles.
Give your answer in its simplest form.

Add the three angles: $x + 2x + (x + 20)$

Collect the x terms: $x + 2x + x = 4x$

The number term is +20.

Answer: $4x + 20$

Marks: 1 mark for $x + 2x + x + 20$. 1 mark for $4x + 20$.

- (b) Explain why $4x + 20 = 180$

$4x + 20$ is the sum of the angles in the triangle.

The angles in a triangle add up to 180° .

Answer: Angles in a triangle add up to 180° .

9 (2 marks)

Laura has $\pounds m$.

She spends $\pounds 12$

She shares the rest of the money equally between herself and her sister.

Write an expression, in terms of m , for the amount each person gets.

After spending $\pounds 12$ she has $m - 12$ pounds left.

She shares this between 2 people (herself and her sister).

So each person gets $(m - 12) \div 2 = \frac{m - 12}{2}$

Answer: $\pounds \frac{m - 12}{2}$

Tip: The whole of $m - 12$ is divided by 2. Draw the fraction line under all of it, or use a bracket. $m - 12 \div 2$ would mean $m - 6$.

Marks: 1 mark for $m - 12$. 1 mark for $\frac{m - 12}{2}$ (or $\frac{1}{2}m - 6$).

10 (3 marks)

A large tin of paint holds x litres.

A small tin of paint holds 3 litres less than a large tin.

Kieran buys 2 large tins and 5 small tins.

Write an expression, in terms of x , for the total amount of paint Kieran buys.
Give your answer in its simplest form.

A small tin holds 3 litres less than a large tin: $x - 3$

2 large tins: $2x$

5 small tins: $5(x - 3) = 5x - 15$

Total = $2x + 5x - 15 = 7x - 15$

Answer: $(7x - 15)$ litres

Tip: Put $x - 3$ in a bracket before multiplying by 5. $5x - 3$ is a common mistake.

Marks: 1 mark for $x - 3$. 1 mark for $2x + 5(x - 3)$. 1 mark for $7x - 15$.

11 (2 marks)

(a) A train travels at x miles per hour for 3 hours.

Write down an expression for the distance it travels, in miles.

Distance = speed $\times$ time

$$= x \times 3 = 3x$$

Answer: $3x$

- (b) A car travels 150 miles in t hours.

Write down an expression for the average speed of the car, in miles per hour.

Speed = distance $\div$ time

$$= 150 \div t = \frac{150}{t}$$

Answer: $\frac{150}{t}$

Tip: Speed is distance *divided by* time. $150t$ would be multiplying.

12 (1 mark)

Write a formula for the number of seconds, s , in m minutes.

There are 60 seconds in a minute.

So m minutes is $60 \times m = 60m$ seconds.

A formula starts with ' $s =$ '.

Answer: $s = 60m$

13 (3 marks)

n is an integer, so $2n$ is an even number.

- (a) Write down expressions, in terms of n , for the next two even numbers after $2n$.

Even numbers go up in 2s.

$2n + 2$, then $2n + 4$

Answer: $2n + 2$ and $2n + 4$

- (b) Show that the mean of three consecutive even numbers is always equal to the middle number.

The three numbers are $2n$, $2n + 2$ and $2n + 4$

$$\text{Sum} = 2n + (2n + 2) + (2n + 4) = 6n + 6$$

$$\text{Mean} = \frac{6n + 6}{3} = 2n + 2$$

$2n + 2$ is the middle number, so the mean always equals the middle number.

Tip: Checking a few examples, such as 4, 6, 8, does not show it is *always* true. Use the algebra.

Marks: 1 mark for the sum $6n + 6$. 1 mark for dividing by 3 to get $2n + 2$ and saying this is the middle number.

14 (3 marks)

A school hall has r rows of chairs.

There are 18 chairs in each row.

There are also 30 chairs around the edge of the hall.

At a concert, every chair is used except for e empty chairs.

There are P people sitting on chairs.

Write a formula for P in terms of r and e .

r rows of 18 chairs is $18 \times r = 18r$ chairs.

Add the 30 chairs around the edge: $18r + 30$ chairs.

e chairs are empty, so take away e : $18r + 30 - e$

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

Answer: $P = 18r + 30 - e$

Tip: Don't combine $18r$ and 30 into $48r$: they are not like terms. Remember to subtract the empty chairs.

Marks: 1 mark for $18r$. 1 mark for $18r + 30 - e$. 1 mark for $P = 18r + 30 - e$.
