

Simplifying Expressions and Collecting Like Terms

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)

Simplify $t + t + t + t + t + t$

Count the t 's: there are six of them.

Six lots of t is $6t$.

Answer: $6t$

Tip: Adding the same letter gives a number in front: $6t$. t^6 would mean $t \times t \times t \times t \times t \times t$.

2 (3 marks)

(a) Simplify $3 \times a \times 4$

Multiply the numbers: $3 \times 4 = 12$

Write the number in front of the letter, with no $\times$ sign.

Answer: $12a$

Tip: Do not leave any $\times$ signs in your answer. $12 \times a$ or $3 \times 4a$ is not simplified.

(b) Simplify $y \times y \times y$

y is multiplied by itself three times.

This is y cubed.

Answer: y^3

(c) Simplify $12p \div 4$

Divide the number by 4: $12 \div 4 = 3$

Keep the letter.

Answer: $3p$

3 (1 mark)

Simplify $8x - 3x + 2x$

All the terms are x terms.

Work out the numbers from left to right: $8 - 3 + 2 = 7$

Answer: $7x$

Tip: The minus sign only belongs to the $3x$. The $2x$ is still added: $8 - 3 + 2$, not $8 - 3 - 2$.

4 (2 marks)

Simplify $3d - 4e + 2d + e$

Collect the d terms: $3d + 2d = 5d$

Collect the e terms: $-4e + e = -3e$

Put them together: $5d - 3e$

Answer: $5d - 3e$

Tip: Keep each sign with its term: the e terms are $-4e$ and $+e$, which make $-3e$. Write $5d - 3e$, not $5d + -3e$.

Marks: 2 marks for $5d - 3e$. 1 mark for $5d$ or $-3e$.

5 (3 marks)

(a) Simplify $2c \times 3d$

Multiply the numbers: $2 \times 3 = 6$

Multiply the letters: $c \times d = cd$

Answer: $6cd$

Tip: Multiply the numbers, do not add them. The answer is $6cd$, not $5cd$.

(b) Simplify $17 + 5b + 4c - 7b + c$

Collect the b terms: $5b - 7b = -2b$

Collect the c terms: $4c + c = 5c$

The number 17 has no letter, so it stays as it is.

Answer: $17 - 2b + 5c$ (terms in any order)

Tip: The 17 cannot be combined with b or c terms. An answer like $22bc$ gets no marks.

Marks: 2 marks for the correct answer. 1 mark for two of 17, $-2b$ and $+5c$ in an expression.

6 (3 marks)

(a) Simplify $m \times m \times m \times m$

m is multiplied by itself four times.

This is m to the power 4.

Answer: m^4

- (b) Simplify $m^3 + m^3$

One m^3 plus another m^3 is two lots of m^3 .

We are adding, not multiplying, so the power stays the same.

Answer: $2m^3$

Tip: When you add like terms, the power does not change. $m^3 + m^3 = 2m^3$, not m^6 or $2m^6$.

- (c) Simplify $\frac{15a}{3}$

Divide the number by 3: $15 \div 3 = 5$

Keep the letter.

Answer: $5a$

7 (2 marks)

A pencil costs p pence.

A rubber costs r pence.

- (a) Write down an expression, in terms of p and r , for the total cost, in pence, of 5 pencils and 2 rubbers.

5 pencils cost $5 \times p = 5p$ pence.

2 rubbers cost $2 \times r = 2r$ pence.

Add them: $5p + 2r$

Answer: $5p + 2r$

Tip: $5p + 2r$ cannot be simplified to $7pr$, because p and r are different letters.

- (b) Kofi buys 3 pencils and 1 rubber.

He pays with a £1 coin.

Write down an expression, in terms of p and r , for the change, in pence, Kofi should get.

Kofi spends $3p + r$ pence.

£1 is 100 pence.

$$\text{Change} = 100 - (3p + r) = 100 - 3p - r$$

Answer: $100 - 3p - r$

Tip: Change the £1 to 100 pence first, and subtract **both** the pencils and the rubber: $100 - 3p + r$ is wrong.

8 (2 marks)

Simplify $5g - 2h - 8g + 6h$

Collect the g terms: $5g - 8g = -3g$

Collect the h terms: $-2h + 6h = 4h$

Put them together: $-3g + 4h$

Answer: $-3g + 4h$ (or $4h - 3g$)

Marks: 2 marks for the correct answer. 1 mark for $-3g$ or $+4h$.

9 (2 marks)

(a) Simplify $6k^2 + 9k^2 - 5k^2$

All the terms are k^2 terms.

Work out the numbers: $6 + 9 - 5 = 10$

The k^2 stays the same.

Answer: $10k^2$

(b) Simplify $(10w + 14w) \div 4$

Work out the bracket first: $10w + 14w = 24w$

Then divide by 4: $24w \div 4 = 6w$

Answer: $6w$

10 (2 marks)

The diagram shows a rectangle.

All measurements are in centimetres.

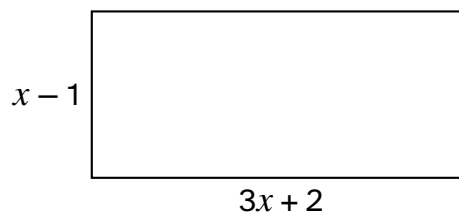


Diagram **NOT** accurately drawn

Find an expression, in terms of x , for the perimeter of the rectangle.

Give your answer in its simplest form.

A rectangle has two lengths and two widths.

$$\text{Perimeter} = (3x + 2) + (x - 1) + (3x + 2) + (x - 1)$$

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

$$\text{Collect the numbers: } 2 - 1 + 2 - 1 = 2$$

Answer: $8x + 2$ cm

Tip: Remember there are four sides, not just the two that are labelled. Adding only two sides gives half the perimeter.

Marks: 1 mark for adding all four sides (or $2(3x + 2) + 2(x - 1)$). 1 mark for $8x + 2$.

11 (2 marks)

Simplify $5x^2 + 3x - 2x^2 - 7x$

Collect the x^2 terms: $5x^2 - 2x^2 = 3x^2$

Collect the x terms: $3x - 7x = -4x$

x^2 and x are unlike terms, so the answer has two terms.

Answer: $3x^2 - 4x$

Marks: 2 marks for $3x^2 - 4x$. 1 mark for $3x^2$ or $-4x$.

12 (3 marks)

(a) Simplify $4y \times 2y$

Multiply the numbers: $4 \times 2 = 8$

Multiply the letters: $y \times y = y^2$

Answer: $8y^2$

(b) Simplify $2a \times 5b \times 3a$

Multiply the numbers: $2 \times 5 \times 3 = 30$

Multiply the letters: $a \times b \times a = a^2b$

Answer: $30a^2b$

(c) Simplify $3m \times m \times m + 3m$

Do the multiplying first: $3m \times m \times m = 3m^3$

m^3 and m are unlike terms.

So $3m^3$ cannot be added to $3m$.

Answer: $3m^3 + 3m$

13 (2 marks)

Amir is $2x + 10$ years old.

Beth is $3x - 5$ years old.

Cora is $x + 25$ years old.

Find an expression, in terms of x , for the total of their three ages.

Give your answer in its simplest form.

Add the three ages: $(2x + 10) + (3x - 5) + (x + 25)$

Collect the x terms: $2x + 3x + x = 6x$

Collect the numbers: $10 - 5 + 25 = 30$

Answer: $6x + 30$ years

Tip: Only the $-$ in front of the 5 is a subtraction. The 10 and 25 are added: $10 - 5 + 25 = 30$.

Marks: 1 mark for adding the three ages. 1 mark for $6x + 30$.

14 (1 mark)

Ali simplifies $4x + 3y - x$

He gets the answer $6xy$

Ali is wrong.

Explain why Ali is wrong.

$4x$ and $-x$ are like terms: $4x - x = 3x$

$3x$ and $3y$ are unlike terms, so they cannot be combined.

The correct answer is $3x + 3y$, not $6xy$.

Answer: x terms and y terms are unlike terms and cannot be added together; the answer should be $3x + 3y$.

Tip: When you explain a mistake, say what is wrong with the method, not just the correct answer.

15 (2 marks)

$ABCD$ is a straight line.

All measurements are in centimetres.

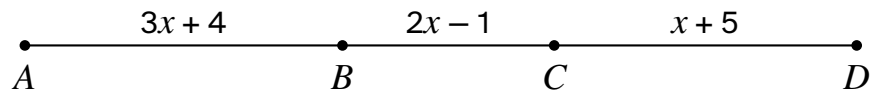


Diagram **NOT** accurately drawn

Find an expression, in terms of x , for the length AD .

Give your answer in its simplest form.

$$AD = AB + BC + CD$$

$$AD = (3x + 4) + (2x - 1) + (x + 5)$$

$$\text{Collect the } x \text{ terms: } 3x + 2x + x = 6x$$

$$\text{Collect the numbers: } 4 - 1 + 5 = 8$$

Answer: $6x + 8$ cm

Marks: 1 mark for $(3x + 4) + (2x - 1) + (x + 5)$. 1 mark for $6x + 8$.

16 (2 marks)

Simplify fully $3ab + 2a - ab + 4b - 5a$

$$\text{Collect the } ab \text{ terms: } 3ab - ab = 2ab$$

$$\text{Collect the } a \text{ terms: } 2a - 5a = -3a$$

$$\text{There is only one } b \text{ term: } +4b$$

Answer: $2ab - 3a + 4b$

Marks: 2 marks for the correct answer. 1 mark for two of $2ab$, $-3a$ and $+4b$.
