

GCSE Maths

Mixed Algebra Practice

Simplifying
Expanding and Factorising
Laws of Indices
Solving Equations
Algebraic Fractions
Surds
Inequalities

Mark Scheme
Available here:



www.addvancemaths.com/gcse-maths/mixed-algebra-practice/

Name:

Mark Scheme

Score:

Time:

Instructions

- Use black or blue ball-point pen.
- Answer all the questions in the spaces provided.

Information

- The marks for each question are shown in the circles.
- You are allowed a calculator for this test.
We recommend the Casio Classwiz model.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Q	Score
1	/6
2	/6
3	/9
4	/7
5	/9
6	/8
7	/8
8	/6
9	/8
10	/7

Challenge Questions

11	/4
12	/4

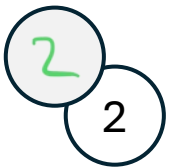
Mixed Algebra Practice



1. a) Expand and Simplify:

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

$$6x - 6 + 12 - 4x = 2x + 8$$

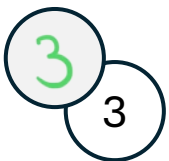


b) i) Factorise: $x^2 + 7x + 10$

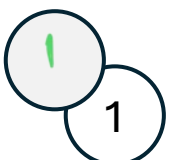
$$= (x+2)(x+5)$$

ii) Hence solve: $x^2 + 7x + 11 = 1$

$$(x+2)(x+5) = 0$$
$$x = -2, x = -5$$



c) Simplify fully: $\frac{x^5 \times x^3}{x} = \frac{x^8}{x^1} = x^7$



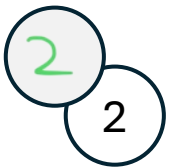
Mixed Algebra Practice



2. a) Evaluate:

$$5.6^0 = 1 \quad \checkmark$$

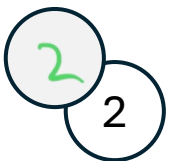
$$\sqrt{\frac{49}{4}} = \frac{7}{2} \quad \checkmark$$



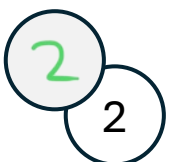
b) Factorise fully:

$$18a^3b - 30a^5b^3 =$$

$$6a^3b(3 - 5a^2b^2) \quad \checkmark \quad \checkmark$$



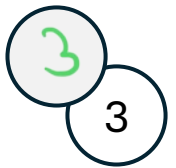
c) Simplify fully $(5xy^4)^3 = 125x^3y^{12}$ $\checkmark \quad \checkmark$



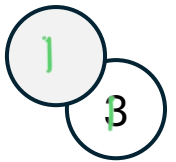
Mixed Algebra Practice

3. a) Expand:

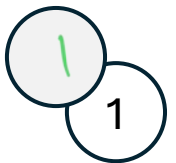
$$(3x + 2y^3)(5y^2 - 2x^5) =$$
$$15xy^2 - 6x^6 + 10y^5 - 4x^5y^3$$



b) Factorise: $a^2 - 25 = (a-5)(a+5)$

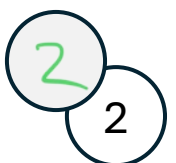


c) Simplify fully: $(3xy^2 + 1)^0 = 1$



d) Solve $\frac{2x+8}{5} < 10$

$$2x + 8 < 50$$
$$2x < 42 \quad \checkmark$$
$$x < 21 \quad \checkmark$$



Mixed Algebra Practice

4. a) Expand and Simplify:

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

$$12x^2 - 20x - 2 + 4x = 12x^2 - 16x - 2$$

2
2

b) i) Factorise: $x^2 - x - 42$

$$= (x - 7)(x + 6)$$

ii) Hence solve: $x^2 - x - 42 = 0$

$$x = 7, x = -6$$

3
3

c) Simplify fully: $\frac{(b^3)^{10}}{b^3 \times b^8} = \frac{b^{30}}{b^{11}} = b^{19}$

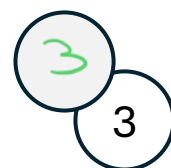
2
2

Mixed Algebra Practice



5. a) Expand:

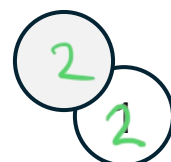
$$(2a - 4b^2)(b^3 - 10a^2) =$$
$$2ab^3 - 20a^3 - 4b^5 + 40a^2b^2$$



b) Factorise: $100 - e^2 = (10 - e)(10 + e)$



c) Simplify fully: $\sqrt{16x^6y^{30}} = 4x^3y^{15}$



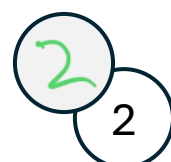
d) Solve: $\frac{x}{2} + \frac{x}{3} = 20$

$$\frac{3x}{6} + \frac{2x}{6} = 20$$

$$\frac{5x}{6} = 20$$

$$5x = 120$$

$$x = 24$$



Mixed Algebra Practice



6. a) Simplify fully:

$$\sqrt{\frac{75y^9}{3x^4y^3}} = \sqrt{\frac{25y^6}{x^4}} = \frac{5y^3}{x^2}$$

2
2

b) Expand fully: $3x(9 - 2x)(x + 5) =$

$$\begin{aligned} &= 3x(9x + 45 - 2x^2 - 10x) \\ &= 3x(45 - x - 2x^2) \\ &= 135x - 3x^2 - 6x^3 \end{aligned}$$

3
3

c) Simplify fully: $(3m^2x^4)^3 = 27m^6x^{12}$

1
1

d) Solve: $1 - (4 - 2x) = -13$

$$\begin{aligned} 1 - 4 + 2x &= -13 \\ -3 + 2x &= -13 \\ 2x &= -10 \\ x &= -5 \end{aligned}$$

2
2

Mixed Algebra Practice

7. a) Expand and Simplify:

$$\begin{aligned}(a+2)^3 &= (a+2)(a+2)(a+2) \\ &= (a+2)(a^2+4a+4) \checkmark \\ &= a^3+4a^2+4a+2a^2+8a+8 \\ &= a^3+6a^2+12a+8 \checkmark\end{aligned}$$

3
3

b) i) Factorise: $b^2 + 3b - 10 = (b+5)(b-2) \checkmark$

ii) Hence, simplify fully: $\frac{b^3 + 3b - 10}{2b + 10} = \frac{(b+5)(b-2)}{2(b+5)} \checkmark$

$$= \frac{b-2}{2} \checkmark$$

3
3

c) Look at the following equation:

$$\frac{2^5 \times 8}{\sqrt{2}} = 4^n$$

What is the value of n ?

$$\begin{aligned}\frac{2^5 \times 2^3}{2^{\frac{1}{2}}} &= (2^2)^n & 2^{7.5} &= 2^{2n} \\ \frac{2^8}{2^{\frac{1}{2}}} &= 2^{2n} \checkmark & 7.5 &= 2n \\ & & \underline{n = 3.75} & \checkmark\end{aligned}$$

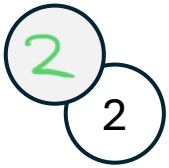
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Mixed Algebra Practice

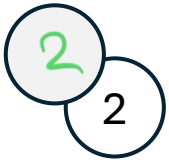


8. a) Expand and Simplify:

$$\begin{aligned} 4b(3b^2 - 5a) - 2a(b - 2) &= \\ 12b^3 - 5ab - 2ab + 4a &= \\ 12b^3 - 7ab + 4a & \end{aligned}$$

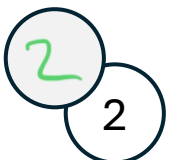


b) i) Factorise: $y^2 - \frac{9}{4} = (y + \frac{3}{2})(y - \frac{3}{2})$



c) List the positive integers which satisfy:

$$\begin{aligned} \frac{4 - 2x}{6} &> -1 \\ 4 - 2x &> -6 \quad \checkmark \\ -2x &> -10 \\ \text{Switch Sign} \quad \swarrow & \quad -x > -5 \\ x &< 5 \quad \checkmark \end{aligned}$$



Mixed Algebra Practice

9. a) Solve: $\frac{2x+1}{3} - \frac{x}{2} = 2$

$$\frac{4x+2}{6} - \frac{3x}{6} = 2$$

$$\frac{x+2}{6} = 2$$

$$x+2=12$$

$$x=10$$

3

b) i) Factorise: $3y^2 + 13y - 10 =$

$$(3y-2)(y+5)$$

ii) Hence, simplify fully: $\frac{9y-6}{3y^2 + 13y - 10} = \frac{3(3y-2)}{(3y-2)(y+5)} = \frac{3}{y+5}$

3

c) Look at the following equation:

$$\frac{3^7 \times 27}{3\sqrt{3}} = 9^n$$

What is the value of n ?

$$\frac{3^7 \times 3^3}{3 \times 3^{1/2}} = (3^2)^n$$

$$\frac{3^{10}}{3^{1.5}} = 3^{2n}$$

$$3^{8.5} = 3^{2n}$$

$$8.5 = 2n$$

$$n = 4.25$$

2

Mixed Algebra Practice



10. a) Simplify: $\frac{20x^4y^2}{5x^7y} = \frac{4y}{x^3}$

2
2

b) i) Factorise: $9y^2 - 25 = (3y - 5)(3y + 5)$

ii) Hence, simplify fully: $\frac{9y^2 - 25}{6y + 10} = \frac{(3y - 5)\cancel{(3y + 5)}}{2\cancel{(3y + 5)}} = \frac{3y - 5}{2}$

3
3

c) The integers between 3 to 28 are raised to the power zero and added together.

What is the value of the sum?

$$3^0 + 4^0 + 5^0 + \dots + 27^0 + 28^0 = 1 + 1 + 1 + \dots + 1 + 1 = 26$$

26×1

2
2

Challenge Questions!

11. Simplify, writing your answer in the form $ax + b$, where a and b are integers:

$$\begin{aligned}\frac{x^2 - x}{x^2 + 3x - 4} \div \frac{x}{2x^2 - 32} &= \frac{\cancel{x}(x-1)}{(x+4)\cancel{(x-1)}} \div \frac{x}{2(x-4)(x+4)} \\ &= \frac{\cancel{x}}{\cancel{x}+4} \times \frac{2(x-4)\cancel{(x+4)}}{\cancel{x}} \\ &= 2(x-4) = \underline{\underline{2x - 8}}\end{aligned}$$

4
4

12. Expand and simplify:

$$\begin{aligned}(x+2)(x-3)^2 - (x-5)^2 &= \\ &= (x+2)(x^2-6x+9) - (x^2-10x+25) \\ &= x^3-6x^2+9x+2x^2-12x+18-x^2+10x-25 \\ &= x^3-5x^2+7x-25\end{aligned}$$

4
4