

GCSE Maths

Mixed Algebra Practice *2nd Edition*

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

Mark Scheme
Available here:



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

Name:

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	/7
4	/7
5	/9
6	/8
7	/8
8	/6
9	/8
10	/7

Challenge Questions

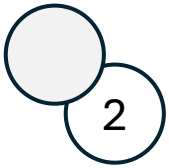
11	/4
12	/4

Mixed Algebra Practice

1. a) Expand and Simplify:

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

$$15x - 5 + 8 - 20x \checkmark$$
$$= \underline{3 - 5x} \checkmark$$

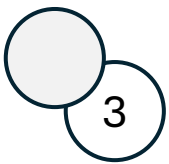


b) i) Factorise: $x^2 + 9x + 20$

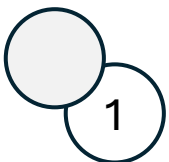
$$(x + 4)(x + 5) \checkmark$$

ii) Hence solve: $x^2 + 9x + 21 = 1$

$$x^2 + 9x + 20 = 0$$
$$(x + 4)(x + 5) = 0 \checkmark$$
$$x = -4 \quad x = -5 \checkmark$$



c) Simplify fully: $\frac{a^9 \times a^3}{a} = \frac{a^{12}}{a^1} = a^{11} \checkmark$

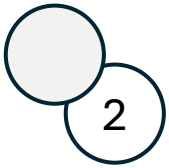


Mixed Algebra Practice

2. a) Evaluate:

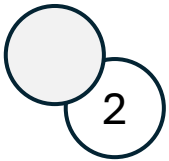
$$\pi^0 = 1 \quad \checkmark$$

$$\sqrt{\frac{64}{9}} = \frac{8}{3} \quad \checkmark$$



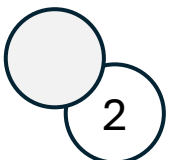
b) Factorise fully:

$$24a^7b - 40a^2b^8 =$$
$$8a^2b(3a^5 - 5b^7) \quad \checkmark$$



c) Simplify fully $(3x^3y^2z)^4 =$

$$81x^{12}y^8z^4 \quad \checkmark$$

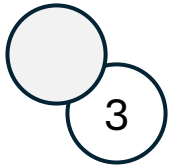


Mixed Algebra Practice

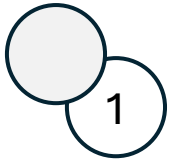
3. a) Expand:

$$(5x + 3y^4)(2y^2 - 3x^3) =$$

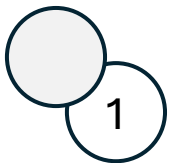
$$\underline{10xy^2} - \underline{15x^4} + \underline{6y^6} - \underline{9x^3y^4}$$



b) Factorise: $c^2 - 36 = (c - 6)(c + 6)$

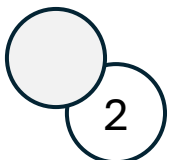


c) Simplify fully: $(5a - 3b)^0 = 1$



d) Solve $\frac{4x+2}{5} < 10$

$$\begin{aligned} 4x+2 &< 50 \\ 4x &< 48 \\ x &< 12 \end{aligned}$$

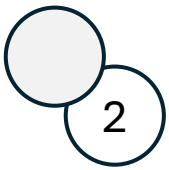


Mixed Algebra Practice

4. a) Expand and Simplify:

$$9x(x - 2) - 2x(5 - 3x) =$$

$$9x^2 - 18x - 10x + 6x^2$$
$$= 15x^2 - 28x$$



b) i) Factorise: $x^2 + x - 6$

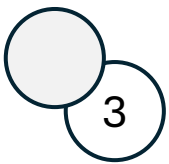
$$(x+3)(x-2)$$

ii) Hence solve: $x^2 + x = 6$

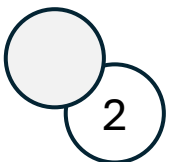
$$x^2 + x - 6 = 0$$

$$(x+3)(x-2) = 0$$

$$x = -3 \quad x = 2$$



c) Simplify fully: $\frac{(c^6)^5}{c^3 \times c^1} = \frac{c^{30}}{c^4} = c^{26}$

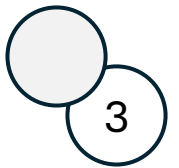


Mixed Algebra Practice

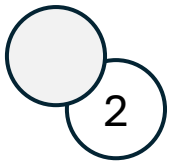
5. a) Expand:

$$(4x - 5y^2)(x^3 - 10y^2) =$$

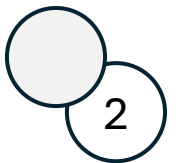
$$\underline{4x^4} - \underline{40xy^2} - \underline{5x^3y^2} + \underline{50y^4}$$



b) Factorise: $144 - e^2 = \underline{(12 - e)}\underline{(12 + e)}$



c) Simplify fully: $\sqrt{25a^8b^{120}} = \underline{5a^4}\underline{b^{60}}$

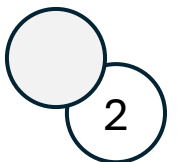


d) Solve: $\frac{x}{4} + \frac{x}{6} = 200$

$$\frac{3x}{12} + \frac{2x}{12} = \frac{5x}{12} = 200$$

$$\frac{x}{12} = 40$$

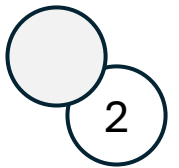
$$x = 480$$



Mixed Algebra Practice

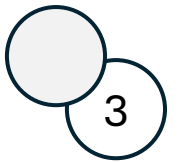
6. a) Simplify fully:

$$\sqrt{\frac{80y^{11}}{5x^8y^5}} = \sqrt{\frac{16y^6}{x^8}} = \frac{4y^3}{x^2}$$

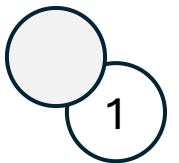


b) Expand fully: $7x(10 - 3x)(x - 8) =$

$$\begin{aligned} &7x[10x - 80 - 3x^2 + 24x] \\ &7x[34x - 3x^2 - 80] \\ &238x^2 - 21x^3 - 560x \end{aligned}$$

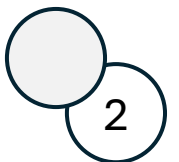


c) Simplify fully: $(4m^7y)^2 = 16m^{14}y^2$



d) Solve: $9 - (5 - 2x) = -6$

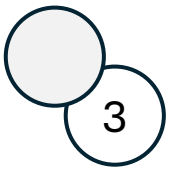
$$\begin{aligned} 9 - 5 + 2x &= -6 \\ 4 + 2x &= -6 \\ 2x &= -10 \\ x &= -5 \end{aligned}$$



Mixed Algebra Practice

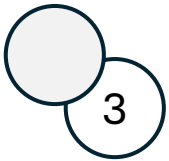
7. a) Expand and Simplify:

$$(b - 5)^3 = \underline{b^3} - \underline{15b^2} + \underline{75b} - \underline{125}$$



b) i) Factorise: $y^2 + 7y + 10 = (y+2)(y+5)$

ii) Hence, simplify fully: $\frac{y^3 + 7y^2 + 10y}{2y + 4} = \frac{\cancel{y}(y+2)(y+5)}{2\cancel{(y+2)}} = \frac{y(y+5)}{2}$

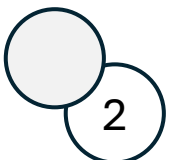


c) Look at the following equation:

$$\frac{2^4 \times 16}{\sqrt{2}} = 4^{x-1}$$

What is the value of n ?

$$\begin{aligned} \frac{2^4 \times 2^4}{2^{1/2}} &= (2^2)^{x-1} \\ 2^{7.5} &= 2^{2x-1} \\ 7.5 &= 2x-1 \\ 8.5 &= 2x \\ 4.25 &= x \end{aligned}$$



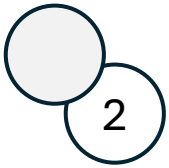
Mixed Algebra Practice

8. a) Expand and Simplify:

$$6b(7b^2 - 5x) - 2x(b - 2) =$$

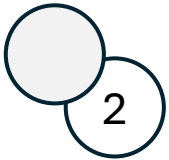
$$42b^3 - 30bx - 2bx + 4x \quad \checkmark$$

$$= 42b^3 - 32bx + 4x \quad \checkmark$$



b) i) Factorise: $m^2 - \frac{16}{9} =$

$$\left(m - \frac{4}{3}\right)\left(m + \frac{4}{3}\right)$$



c) List the positive integers which satisfy:

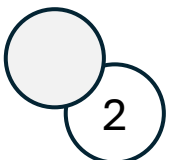
$$\frac{8 - 3x}{7} > -3$$

$$8 - 3x > -21$$

$$-3x > -29$$

$$x < \frac{29}{3} \quad \checkmark \quad (9.6)$$

$$\underline{1, 2, 3, 4, 5, 6, 7, 8, 9} \quad \checkmark$$



Mixed Algebra Practice

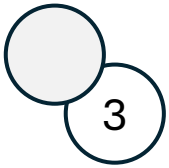
9. a) Solve: $\frac{3x-5}{8} - \frac{x}{3} = 10$

$$\frac{9x-15}{24} - \frac{8x}{24} = 10$$

$$\frac{x-15}{24} = 10$$

$$x-15 = 240$$

$$x = 255$$

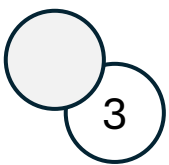


b) i) Factorise: $10x^2 - 13x - 3 =$

$$(5x+1)(2x-3)$$

ii) Hence, simplify fully:

$$\frac{15x+3}{10x^2-13x-3} = \frac{3(5x+1)}{(5x+1)(2x-3)}$$
$$= \frac{3}{2x-3}$$



c) Look at the following equation:

$$\frac{3^{20} \times 27^2}{3\sqrt{3}} = 9^n$$

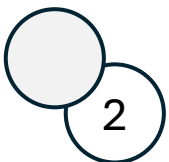
What is the value of n ?

$$\frac{3^{20} \times 3^6}{3^{1.5}} = 3^{2n}$$

$$3^{24.5} = 3^{2n}$$

$$24.5 = 2n$$

$$12.25 = n$$



Mixed Algebra Practice

10. a) Simplify: $\frac{50x^3y^5}{2x^8y} = \frac{25y^4}{x^5}$

b) i) Factorise: $16y^2 - 100 = (4y - 10)(4y + 10)$
 $= 2(2y - 5)2(2y + 5)$
 $= 4(2y - 5)(2y + 5)$

ii) Hence, simplify fully: $\frac{16y^2 - 100}{8y + 20} = \frac{(4y - 10)(4y + 10)}{2(4y + 10)}$
 $= \frac{4y - 10}{2} = 2y - 5$

c) The even numbers between 6 to 31 are raised to the power zero and added together.

What is the value of the sum?

$$6^0 + 8^0 + 10^0 + \dots + 30^0 =$$
$$\underbrace{1 + 1 + 1 + \dots + 1}_{13 \text{ numbers}} = 13$$

Challenge Questions!

11. Simplify fully:

$$\frac{x^3 - 9x}{x^2 + 3x} \times \frac{x}{x^2 - 6x + 9} =$$
$$\frac{x(x-3)(x+3)}{x(x+3)} \times \frac{x}{(x-3)(x-3)}$$
$$= \frac{x}{x-3}$$

12. Expand and simplify:

$$(x - 9)(x - 5)^2 - (2x - 3)^2 =$$
$$(x - 9)(x^2 - 10x + 25) - [4x^2 - 12x + 9]$$
$$x^3 - 10x^2 + 25x - 9x^2 + 90x - 225 - 4x^2 + 12x - 9$$
$$= x^3 - 23x^2 + 127x - 234$$

