GCSE Maths

Mixed Algebra Practice

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

Name:	*Mark Scheme*
Score:	
Time:	

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**

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.

Mixed Algebra Practice

1. a) Expand and Simplify:

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

$$6x - 6 + 12 - 4x = 2x + 6 ✓ ✓$$

2 2

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

$$= (x+2)(x+5) ✓ ✓$$

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

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

3 3

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

1 1

Mixed Algebra Practice

2. a) Evaluate:

$5.6^0 = $ 1 ✓

$\sqrt{\dfrac{49}{4}} = \dfrac{7}{2}$ ✓

2 2

b) Factorise fully:

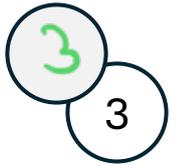$$18a^3b - 30a^5b^3 =$$

$6a^3b(3 - 5a^2b^2)$ ✓ ✓

2 2

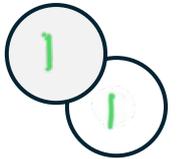c) Simplify fully $(5xy^4)^3 = $ $125x^3y^{12}$ ✓ ✓
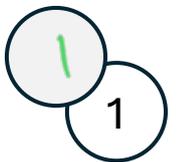
2 2

Mixed Algebra Practice

3. a) Expand:

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

$$15xy^2 - 6x^6 + 10y^5 - 4x^5y^3$$ ✓ ✓ ✓
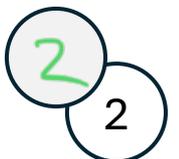
3 3

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

1 1

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

1 1

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

$$2x + 8 < 50$$
$$2x < 42 ✓$$
$$x < 21 ✓$$

2 2

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: $x^2 - x - 42 = 0$

$x = 7, \quad x = -6$ ✓

3 / 3

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

2 / 2

Mixed Algebra Practice

5. a) Expand:

$(2a - 4b^2)(b^3 - 10a^2) =$

$2ab^3 - 20a^3 - 4b^5 + 40a^2b^2$

3
3

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

2
2

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

2
2

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

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

$\frac{5x}{6} = 20 \qquad 5x = 120$

$\qquad\qquad x = 24$

2
2

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

$$= 3x(9x + 45 - 2x^2 - 10x)$$ ✓

$$= 3x(45 - x - 2x^2)$$

$$= 135x - 3x^2 - 6x^3$$ ✓ ✓

3 3

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

1 1

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

$$1 - 4 + 2x = -13$$

$$-3 + 2x = -13$$ ✓

$$2x = -10$$

$$x = -5$$ ✓

2 2

Mixed Algebra Practice

7. a) Expand and Simplify:

$$(a + 2)^3 = (a+2)(a+2)(a+2)$$
$$= (a+2)(a^2 + 4a + 4) \checkmark$$
$$= a^3 + 4a^2 + 4a + 2a^2 + 8a + 8$$
$$= a^3 + 6a^2 + 12a + 8 \checkmark$$

3 / 3

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

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

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

3 / 3

c) Look at the following equation:

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

What is the value of n ?

$\dfrac{2^5 \times 2^3}{2^{\frac{1}{2}}} = (2^2)^n$ $2^{7.5} = 2^{2n}$

$\dfrac{2^8}{2^{\frac{1}{2}}} = 2^{2n} \checkmark$ $7.5 = 2n$

$n = 3.75 \checkmark$

2 / 2

8. a) Expand and Simplify:

$$4b(3b^2 - 5a) - 2a(b - 2) =$$

$12b^3 - 20ab - 2ab + 4a$

$= 12b^3 - 22ab + 4a$ ✓ ✓

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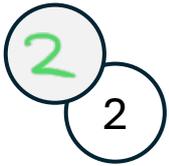
b) i) Factorise: $y^2 - \frac{9}{4} = \left(y + \frac{3}{2}\right)\left(y - \frac{3}{2}\right)$ ✓ ✓

2 2
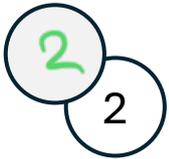
c) List the positive integers which satisfy:

$$\frac{4 - 2x}{6} > -1$$

$4 - 2x > -6$ ✓

$-2x > -10$

switch sign → $-x > -5$

$x < 5$ ✓

2 2
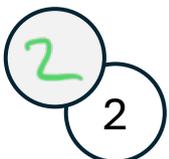
Mixed Algebra Practice

Addvance

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

$\overset{\times 2}{}$ $\overset{\wedge 3}{}$

$\overset{\times 2}{}$ $\overset{\wedge 3}{}$

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

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

$x+2=12$ ✓

$x=10$ ✓

3 3

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

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

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

$= \dfrac{3}{y+5}$

3 3

c) Look at the following equation:

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

What is the value of n?

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

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

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

$8.5 = 2n$ $n = 4.25$ ✓

2 2

10

Mixed Algebra Practice

10.

a) Simplify: $\dfrac{20x^4y^2}{5x^7y} = $ $\dfrac{4\,y}{x^3}$ ✓

2
2

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

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

$= \dfrac{3y-5}{2}$

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?

$$3^0 + 4^0 + 5^0 + \cdots + 27^0 + 28^0 =$$

$1 + 1 + 1 + \ldots + 1 + 1 = 26$ ✓

26×1

2
2

Mixed Algebra Practice

Challenge Questions!

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

$$\frac{x^2 - x}{x^2 + 3x - 4} \div \frac{x}{2x^2 - 32} = \frac{x(x-1)}{(x+4)(x-1)} \div \frac{x}{2(x-4)(x+4)}$$

$$= \frac{x}{x+4} \times \frac{2(x-4)(x+4)}{x}$$

$$= 2(x-4) = 2x - 8 \checkmark$$

4 · 4

12. Expand and simplify:

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

$$= (x+2)(x^2-6x+9) - (x^2-10x+25)$$

$$= x^3 - 6x^2 + 9x + 2x^2 - 12x + 18 - x^2 + 10x - 25$$

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

4 · 4

End of Sheet