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:

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

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

2
2

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

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

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

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

$x=-2, \quad x=-5$

3
3

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

1
1

Mixed Algebra Practice

2. a) Evaluate:

$5.6^0 =$ 1 ✓

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

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

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

1 / 3

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

$x=7,\ x=-6$ ✓

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:

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

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

3 | 3

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

2 | 2

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

2 | 1

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

$\frac{3x}{6} + \frac{2x}{6} = 20$ ✓

$\frac{5x}{6} = 20$ $\quad 5x = 120$ ✓

$x = 24$

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:

$(a+2)^3 = (a+2)(a+2)(a+2)$

$= (a+2)(a^2+4a+4)$ ✓

$= a^3+4a^2+4a+2a^2+8a+8$

$= a^3+6a^2+12a+8$ ✓ ✓

3 3

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

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

$= \frac{b-2}{2}$ ✓

3 3

c) Look at the following equation:

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

What is the value of n ?

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

$\frac{2^8}{2^{\frac{1}{2}}} = 2^{2n}$ ✓

$2^{7.5} = 2^{2n}$

$7.5 = 2n$

$n = 3.75$ ✓

2 2

Mixed Algebra Practice

8. a) Expand and Simplify:

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

$12b^3 - 5ab - 2ab + 4a$

$= 12b^3 - 7ab + 4a$ ✓ ✓

2 2

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

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

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 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 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 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: $\frac{9y^2 - 25}{6y + 10} =$ $\frac{(3y-5)(3y+5)}{2(3y+5)}$

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

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?

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

$\underbrace{1 + 1 + 1 + \ldots + 1 + 1}_{26 \times 1} = 26$

2

2

Mixed Algebra Practice

Challenge Questions!

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

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

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

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

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

4

12. Expand and simplify:

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

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

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

$$= x^3 - 5x^2 + 7x - 25$$

4

End of Sheet