

Algebraic Expressions

Question Paper, Set 07

Time: 1 hour 30 minutes

Maximum marks: 50

Name: _____ Class: _____ Date: _____

1. Answer all 20 questions. The marks for each question are shown in brackets.
2. Show your working for the 2, 3 and 5 mark questions.
3. The key sheet and worked solutions are at the end of this paper.

1. Write in symbolic form: 7 times a . [1 mark]
2. Write the terms of the expression $4bc + \frac{c^3}{6} - 3b^2 + 7c$ and state the number of terms. [1 mark]
3. From the terms $3zy^2$, $6y^2z$, $-7yz$, $\frac{4y^2z}{3}$, $6yz^2$, write the like terms. [1 mark]
4. Simplify: $9y - 4y + 9y + 6z - 7z$ [2 marks]
5. Is $-7t^3 - 9n^2t - 4nt$ a monomial, a binomial or a trinomial? [1 mark]
6. Find the degree of $6xy^2t$. [1 mark]
7. Find the degree of the polynomial $-2q^5 + 4q^2r^3 + 5q^2r + 8q^5r^3$. [2 marks]
8. Find the value of $3x - 6y - 8$ when $x = -1$ and $y = 2$. [2 marks]
9. Add $\frac{5}{6}a^2 + \frac{1}{4}ab + 3b^2$ and $\frac{5}{3}a^2 - \frac{5}{6}ab + \frac{1}{3}b^2$. [3 marks]
10. Add $-8m + 5p$, $6m - 6n$ and $-8n - 9p$ by the vertical method. [3 marks]
11. Subtract $7x + z$ from $5x - 8z$. [2 marks]
12. If $A = 5a^2 - \frac{4}{3}ab + 5b^2$ and $B = 7a^2 - \frac{1}{3}ab - \frac{1}{2}b^2$, find (i) $3A - 2B$ (ii) $2B - A$. [5 marks]
13. Subtract $4x^3 + 3y^3 - 5xy - 8$ from $4x^3 + 4y^3 + 3$ by the vertical method. [3 marks]
14. Find $9b \times (-7b^3cz)$. [1 mark]
15. Multiply: $4x(-5x^2y - 6z + 8y^2)$ [2 marks]
16. Multiply: $(4q - 2)(q + 1)$ [3 marks]
17. Simplify: $(z - 5)(z^2 - 2z + 2) - z(z + 3)$ [5 marks]
18. Subtract $4pq(3p - q)$ from $3pq(3p + q)$. [2 marks]
19. Simplify: $6bc(2b + 2c) - 5bc(2b + c) - 6b^2(c - c^2) - 6c(2b^2 - 2bc)$ [5 marks]
20. Simplify: $6x + [5z - \{4y + (3z - 5y)\}]$ [5 marks]

Key sheet

Q	Answer
1	$7a$
2	$4bc, \frac{c^3}{6}, -3b^2, 7c$; 4 terms
3	$3zy^2, 6y^2z, \frac{4y^2z}{3}$
4	$14y - z$
5	Trinomial
6	4
7	8
8	-23
9	$\frac{5}{2}a^2 - \frac{7}{12}ab + \frac{10}{3}b^2$
10	$-2m - 4p - 14n$
11	$-2x - 9z$
12	(i) $a^2 - \frac{10}{3}ab + 16b^2$ (ii) $9a^2 + \frac{2}{3}ab - 6b^2$
13	$y^3 + 11 + 5xy$
14	$-63b^4cz$
15	$-20x^3y - 24xz + 32xy^2$
16	$4q^2 + 2q - 2$
17	$z^3 - 8z^2 + 9z - 10$
18	$-3p^2q + 7pq^2$
19	$-16b^2c + 19bc^2 + 6b^2c^2$
20	$6x + 2z + y$

Solutions

1. Write in symbolic form: 7 times a . [1]

Times means multiply: $7 \times a = 7a$.

Symbolic form: $7a$

Ans: $7a$

2. Write the terms of the expression $4bc + \frac{c^3}{6} - 3b^2 + 7c$ and state the number of terms. [1]

Terms are separated by the $+$ and $-$ signs.

The terms are $4bc$, $\frac{c^3}{6}$, $-3b^2$, $7c$.

Number of terms = 4

Ans: $4bc$, $\frac{c^3}{6}$, $-3b^2$, $7c$; 4 terms

3. From the terms $3zy^2$, $6y^2z$, $-7yz$, $\frac{4y^2z}{3}$, $6yz^2$, write the like terms. [1]

Like terms have the same literal factors.

$3zy^2$, $6y^2z$, $\frac{4y^2z}{3}$ all have the literal factors y^2z (note $zy^2 = y^2z$).

$-7yz$ and $6yz^2$ have different literal factors, so they are unlike.

Like terms: $3zy^2$, $6y^2z$, $\frac{4y^2z}{3}$

Ans: $3zy^2$, $6y^2z$, $\frac{4y^2z}{3}$

4. Simplify: $9y - 4y + 9y + 6z - 7z$ [2]

$$9y - 4y + 9y + 6z - 7z$$

$$= (9 - 4 + 9)y + (6 - 7)z$$

$$= 14y - z$$

Ans: $14y - z$

5. Is $-7t^3 - 9n^2t - 4nt$ a monomial, a binomial or a trinomial? [1]

The terms are $-7t^3$, $-9n^2t$, $-4nt$; each is a monomial (whole number powers).

Three monomials, so it is a trinomial.

Ans: Trinomial

6. Find the degree of $6xy^2t$. [1]

Degree of a monomial = sum of the powers of its variables.

$$1 + 2 + 1 = 4$$

So the degree of $6xy^2t$ is 4.

Ans: 4

7. Find the degree of the polynomial $-2q^5 + 4q^2r^3 + 5q^2r + 8q^5r^3$. [2]

Degrees of the terms: $-2q^5$: 5, $4q^2r^3$: 5, $5q^2r$: 3, $8q^5r^3$: 8.

Greatest among $\{5, 5, 3, 8\}$ is 8.

So the degree of the polynomial is 8.

Ans: 8

8. Find the value of $3x - 6y - 8$ when $x = -1$ and $y = 2$. [2]

Put $x = -1$ and $y = 2$:

$$3(-1) - 6(2) - 8$$

$$= -3 - 12 - 8$$

$$= -23$$

Ans: -23

9. Add $\frac{5}{6}a^2 + \frac{1}{4}ab + 3b^2$ and $\frac{5}{3}a^2 - \frac{5}{6}ab + \frac{1}{3}b^2$. [3]

$$\frac{5}{6}a^2 + \frac{1}{4}ab + 3b^2 + \frac{5}{3}a^2 - \frac{5}{6}ab + \frac{1}{3}b^2$$

$$= (\frac{5}{6} + \frac{5}{3})a^2 + (\frac{1}{4} - \frac{5}{6})ab + (3 + \frac{1}{3})b^2$$

$$\text{For } a^2: \frac{5}{6} + \frac{5}{3} = \frac{5+10}{6} = \frac{15}{6} = \frac{5}{2}$$

$$\text{For } ab: \frac{1}{4} - \frac{5}{6} = \frac{3-10}{12} = -\frac{7}{12}$$

$$\text{For } b^2: 3 + \frac{1}{3} = \frac{9+1}{3} = \frac{10}{3}$$

$$= \frac{5}{2}a^2 - \frac{7}{12}ab + \frac{10}{3}b^2$$

$$\text{Ans: } \frac{5}{2}a^2 - \frac{7}{12}ab + \frac{10}{3}b^2$$

10. Add $-8m + 5p$, $6m - 6n$ and $-8n - 9p$ by the vertical method. [3]

Write like terms one below the other and add each column.

$$\begin{array}{rrr} -8m & +5p & \\ 6m & & -6n \\ & -9p & -8n \\ \hline -2m & -4p & -14n \end{array}$$

$$\text{Sum} = -2m - 4p - 14n$$

$$\text{Ans: } -2m - 4p - 14n$$

11. Subtract $7x + z$ from $5x - 8z$. [2]

$$(5x - 8z) - (7x + z)$$

$$= 5x - 8z - 7x - z$$

$$= (5 - 7)x + (-8 - 1)z$$

$$= -2x - 9z$$

$$\text{Ans: } -2x - 9z$$

12. If $A = 5a^2 - \frac{4}{3}ab + 5b^2$ and $B = 7a^2 - \frac{1}{3}ab - \frac{1}{2}b^2$, find (i) $3A - 2B$ (ii) $2B - A$. [5]

$$(i) 3(5a^2 - \frac{4}{3}ab + 5b^2) - 2(7a^2 - \frac{1}{3}ab - \frac{1}{2}b^2)$$

$$= 15a^2 - 4ab + 15b^2 - 14a^2 + \frac{2}{3}ab + b^2$$

$$= (15 - 14)a^2 + (-4 + \frac{2}{3})ab + (15 + 1)b^2$$

$$\text{For } ab: -4 + \frac{2}{3} = \frac{-12+2}{3} = -\frac{10}{3}$$

$$= a^2 - \frac{10}{3}ab + 16b^2$$

$$(ii) 2(7a^2 - \frac{1}{3}ab - \frac{1}{2}b^2) - (5a^2 - \frac{4}{3}ab + 5b^2)$$

$$= 14a^2 - \frac{2}{3}ab - b^2 - 5a^2 + \frac{4}{3}ab - 5b^2$$

$$= (14 - 5)a^2 + (-\frac{2}{3} + \frac{4}{3})ab + (-1 - 5)b^2$$

$$\text{For } ab: -\frac{2}{3} + \frac{4}{3} = \frac{-2+4}{3} = \frac{2}{3}$$

$$= 9a^2 + \frac{2}{3}ab - 6b^2$$

$$\text{Ans: (i) } a^2 - \frac{10}{3}ab + 16b^2 \text{ (ii) } 9a^2 + \frac{2}{3}ab - 6b^2$$

13. Subtract $4x^3 + 3y^3 - 5xy - 8$ from $4x^3 + 4y^3 + 3$ by the vertical method. [3]

Write $4x^3 + 4y^3 + 3$ on top and the expression to be subtracted below it, like terms in the same column.

$$\begin{array}{r} 4x^3 + 4y^3 + 3 \\ 4x^3 + 3y^3 - 8 - 5xy \\ (-) \quad (-) \quad (+) \quad (+) \\ \hline y^3 + 11 + 5xy \end{array}$$

Change the sign of every term in the lower row, then add each column.

The x^3 terms cancel.

$$= y^3 + 11 + 5xy$$

$$\text{Ans: } y^3 + 11 + 5xy$$

14. Find $9b \times (-7b^3cz)$. [1]

$$= (9 \times (-7))(b \times b^3)cz$$

$$= -63b^4cz$$

$$\text{Ans: } -63b^4cz$$

15. Multiply: $4x(-5x^2y - 6z + 8y^2)$ [2]

$$= (4x)(-5x^2y) + (4x)(-6z) + (4x)(8y^2)$$

$$= -20x^3y - 24xz + 32xy^2$$

$$\text{Ans: } -20x^3y - 24xz + 32xy^2$$

16. Multiply: $(4q - 2)(q + 1)$ [3]

$$= 4q^2 + 4q - 2q - 2$$

$$= 4q^2 + 2q - 2$$

$$\text{Ans: } 4q^2 + 2q - 2$$

17. Simplify: $(z - 5)(z^2 - 2z + 2) - z(z + 3)$ [5]

$$= (z^3 - 2z^2 + 2z - 5z^2 + 10z - 10) - (z^2 + 3z)$$

$$= z^3 - 2z^2 + 2z - 5z^2 + 10z - 10 - z^2 - 3z$$

$$= z^3 + (-2 - 5 - 1)z^2 + (2 + 10 - 3)z - 10$$

$$= z^3 - 8z^2 + 9z - 10$$
Ans: $z^3 - 8z^2 + 9z - 10$

18. Subtract $4pq(3p - q)$ from $3pq(3p + q)$. [2]

$$3pq(3p + q) - 4pq(3p - q)$$

$$= 9p^2q + 3pq^2 - 12p^2q + 4pq^2$$

$$= (9 - 12)p^2q + (3 + 4)pq^2$$

$$= -3p^2q + 7pq^2$$
Ans: $-3p^2q + 7pq^2$

19. Simplify: $6bc(2b + 2c) - 5bc(2b + c) - 6b^2(c - c^2) - 6c(2b^2 - 2bc)$ [5]

$$= 12b^2c + 12bc^2 - 10b^2c - 5bc^2 - 6b^2c + 6b^2c^2 - 12b^2c + 12bc^2$$

$$= (12 - 10 - 6 - 12)b^2c + (12 - 5 + 12)bc^2 + 6b^2c^2$$

$$= -16b^2c + 19bc^2 + 6b^2c^2$$
Ans: $-16b^2c + 19bc^2 + 6b^2c^2$

20. Simplify: $6x + [5z - \{4y + (3z - 5y)\}]$ [5]
Remove the innermost brackets first.

$$= 6x + [5z - \{4y + 3z - 5y\}]$$

$$= 6x + [5z - \{-y + 3z\}]$$

$$= 6x + [5z + y - 3z]$$

$$= 6x + [2z + y]$$

$$= 6x + 2z + y$$
Ans: $6x + 2z + y$
