EXPRESSWALA ACADEMY

Algebraic Expressions

Question Paper, Set 05

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: 4 more than m. [1 mark]

2. Write the factors of $-10abm^2$. [1 mark]

3. From the terms $7m^2n$, $-\frac{3mn^2}{4}$, $2mn$, $2n^2m$, $-5mn^2$, write the like terms. [1 mark]

4. Simplify: $3m + m - 6m - 5$ [2 marks]

5. Is $\frac{4}{3}yz$ a monomial, a binomial or a trinomial? [1 mark]

6. Find the degree of $\frac{2}{3}a^4b^4c^2$. [1 mark]

7. Find the degree of the polynomial $9z^3 - 5y^5z^2 - 7yz + 5y$. [2 marks]

8. Find the value of $x^3 + 2x$ when $x = -3$. [2 marks]

9. Add $-\frac{5}{2}q^2 + qr + \frac{5}{2}r^2$ and $4q^2 + \frac{5}{4}qr - \frac{3}{2}r^2$. [3 marks]

10. Add $9x + 5t$, $6x + 2y$ and $3y + 7t$ by the vertical method. [3 marks]

11. Subtract $6p - 8r$ from $5p - 9r$. [2 marks]

12. If $A = 7x^2 - \frac{1}{4}xy - 6y^2$ and $B = 2x^2 + \frac{2}{3}xy + \frac{1}{3}y^2$, find (i) $4A - B$ (ii) $A - 3B$. [5 marks]

13. Subtract $3m^3 + 3n^3 + 6mn + 8$ from $3m^3 - 3n^3 + 5$ by the vertical method. [3 marks]

14. Find $8p^2 \times (-4pq^2)$. [1 mark]

15. Multiply: $2x^2(-x^2y + x - 5xy)$ [2 marks]

16. Multiply: $(3a - 5)(2a + 2)$ [3 marks]

17. Simplify: $(3p + 4q)(3p - 4q + 4r) - 4r(3p - 4q)$ [5 marks]

18. Subtract $7xy(3x + 2y)$ from $7xy(x - 2y)$. [2 marks]

19. Simplify: $3p(pr - r^2) - 4pr(2p + r) - 6p^2(r - r^2) + pr(2p - 2r)$ [5 marks]

20. Simplify: $5x + [y - \{3t - (2x + 2t)\}]$ [5 marks]

Key sheet

Q	Answer
1	$m + 4$
2	-10, a, b, m, m
3	$-\frac{3mn^2}{4}$, $2n^2m$, $-5mn^2$
4	$-2m - 5$
5	Monomial
6	10
7	7
8	-33
9	$\frac{3}{2}q^2 + \frac{9}{4}qr + r^2$
10	$15x + 12t + 5y$
11	$-p - r$
12	(i) $26x^2 - \frac{5}{3}xy - \frac{73}{3}y^2$ (ii) $x^2 - \frac{9}{4}xy - 7y^2$
13	$-6n^3 - 3 - 6mn$
14	$-32p^3q^2$
15	$-2x^4y + 2x^3 - 10x^3y$
16	$6a^2 - 4a - 10$
17	$9p^2 - 16q^2 + 32qr$
18	$-14x^2y - 28xy^2$
19	$-9p^2r - 9pr^2 + 6p^2r^2$
20	$7x + y - t$

Solutions

1. Write in symbolic form: 4 more than m. [1]

More than means add.

Symbolic form: $m + 4$

Ans: $m + 4$

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2. Write the factors of $-10abm^2$. [1]

$-10abm^2 = -10 \times a \times b \times m \times m$

Each number and each letter in the product is a factor.

Factors: -10, a, b, m, m

Ans: -10, a, b, m, m

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3. From the terms $7m^2n$, $-\frac{3mn^2}{4}$, $2mn$, $2n^2m$, $-5mn^2$, write the like terms. [1]

Like terms have the same literal factors.

$-\frac{3mn^2}{4}$, $2n^2m$, $-5mn^2$ all have the literal factors mn^2 (note $n^2m = mn^2$).

$7m^2n$ and $2mn$ have different literal factors, so they are unlike.

Like terms: $-\frac{3mn^2}{4}$, $2n^2m$, $-5mn^2$

Ans: $-\frac{3mn^2}{4}$, $2n^2m$, $-5mn^2$

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4. Simplify: $3m + m - 6m - 5$ [2]

$3m + m - 6m - 5$

$= (3 + 1 - 6)m - 5$

$= -2m - 5$

Ans: $-2m - 5$

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5. Is $\frac{4}{3}yz$ a monomial, a binomial or a trinomial? [1]

$\frac{4}{3}yz$ is one term, and the powers of its variables are whole numbers.

So it is a monomial.

Ans: Monomial

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6. Find the degree of $\frac{2}{3}a^4b^4c^2$. [1]

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

$4 + 4 + 2 = 10$

So the degree of $\frac{2}{3}a^4b^4c^2$ is 10.

Ans: 10

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7. Find the degree of the polynomial $9z^3 - 5y^5z^2 - 7yz + 5y$. [2]

Degrees of the terms: $9z^3$: 3, $-5y^5z^2$: 7, $-7yz$: 2, $5y$: 1.

Greatest among $\{3, 7, 2, 1\}$ is 7.

So the degree of the polynomial is 7.

Ans: 7

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8. Find the value of $x^3 + 2x$ when $x = -3$. [2]

Put $x = -3$:

$(-3)^3 + 2(-3)$

$= -27 - 6$

$= -33$

Ans: -33

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9. Add $-\frac{5}{2}q^2 + qr + \frac{5}{2}r^2$ and $4q^2 + \frac{5}{4}qr - \frac{3}{2}r^2$. [3]

$-\frac{5}{2}q^2 + qr + \frac{5}{2}r^2 + 4q^2 + \frac{5}{4}qr - \frac{3}{2}r^2$

$= (-\frac{5}{2} + 4)q^2 + (1 + \frac{5}{4})qr + (\frac{5}{2} - \frac{3}{2})r^2$

For q^2: $-\frac{5}{2} + 4 = \frac{-5+8}{2} = \frac{3}{2}$

For qr: $1 + \frac{5}{4} = \frac{4+5}{4} = \frac{9}{4}$

For r^2: $\frac{5}{2} - \frac{3}{2} = \frac{5-3}{2} = \frac{2}{2} = 1$

$= \frac{3}{2}q^2 + \frac{9}{4}qr + r^2$

Ans: $\frac{3}{2}q^2 + \frac{9}{4}qr + r^2$

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10. Add $9x + 5t$, $6x + 2y$ and $3y + 7t$ by the vertical method. [3]

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

$$\begin{array}{rrr} 9x & +5t & \\ 6x & & +2y \\ & 7t & +3y \\ \hline 15x & +12t & +5y \end{array}$$

Sum $= 15x + 12t + 5y$

Ans: $15x + 12t + 5y$

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11. Subtract $6p - 8r$ from $5p - 9r$. [2]

$(5p - 9r) - (6p - 8r)$

$= 5p - 9r - 6p + 8r$

$= (5 - 6)p + (-9 + 8)r$

$= -p - r$

Ans: $-p - r$

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12. If $A = 7x^2 - \frac{1}{4}xy - 6y^2$ and $B = 2x^2 + \frac{2}{3}xy + \frac{1}{3}y^2$, find (i) $4A - B$ (ii) $A - 3B$. [5]

(i) $4(7x^2 - \frac{1}{4}xy - 6y^2) - (2x^2 + \frac{2}{3}xy + \frac{1}{3}y^2)$

$= 28x^2 - xy - 24y^2 - 2x^2 - \frac{2}{3}xy - \frac{1}{3}y^2$

$= (28 - 2)x^2 + (-1 - \frac{2}{3})xy + (-24 - \frac{1}{3})y^2$

For xy: $-1 - \frac{2}{3} = \frac{-3-2}{3} = -\frac{5}{3}$

For y^2: $-24 - \frac{1}{3} = \frac{-72-1}{3} = -\frac{73}{3}$

$= 26x^2 - \frac{5}{3}xy - \frac{73}{3}y^2$

(ii) $(7x^2 - \frac{1}{4}xy - 6y^2) - 3(2x^2 + \frac{2}{3}xy + \frac{1}{3}y^2)$

$= 7x^2 - \frac{1}{4}xy - 6y^2 - 6x^2 - 2xy - y^2$

$= (7 - 6)x^2 + (-\frac{1}{4} - 2)xy + (-6 - 1)y^2$

For xy: $-\frac{1}{4} - 2 = \frac{-1-8}{4} = -\frac{9}{4}$

$= x^2 - \frac{9}{4}xy - 7y^2$

Ans: (i) $26x^2 - \frac{5}{3}xy - \frac{73}{3}y^2$ (ii) $x^2 - \frac{9}{4}xy - 7y^2$

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13. Subtract $3m^3 + 3n^3 + 6mn + 8$ from $3m^3 - 3n^3 + 5$ by the vertical method. [3]

Write $3m^3 - 3n^3 + 5$ on top and the expression to be subtracted below it, like terms in the same column.

$3m^3$	$-3n^3$	$+5$	
$3m^3$	$+3n^3$	$+8$	$+6mn$
$(-)$	$(-)$	$(-)$	$(-)$
	$-6n^3$	-3	$-6mn$

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

The m^3 terms cancel.

$= -6n^3 - 3 - 6mn$

Ans: $-6n^3 - 3 - 6mn$

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14. Find $8p^2 \times (-4pq^2)$. [1]

$= (8 \times (-4))(p^2 \times p)q^2$

$= -32p^3q^2$

Ans: $-32p^3q^2$

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15. Multiply: $2x^2(-x^2y + x - 5xy)$ [2]

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

$= -2x^4y + 2x^3 - 10x^3y$

Ans: $-2x^4y + 2x^3 - 10x^3y$

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16. Multiply: $(3a - 5)(2a + 2)$ [3]

$= 6a^2 + 6a - 10a - 10$

$= 6a^2 - 4a - 10$

Ans: $6a^2 - 4a - 10$

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17. Simplify: $(3p+4q)(3p-4q+4r)-4r(3p-4q)$ [5]

$= (9p^2-12pq+12pr+12pq-16q^2+16qr)-(12pr-16qr)$

$= 9p^2-12pq+12pr+12pq-16q^2+16qr-12pr+16qr$

$= 9p^2+(-12+12)pq+(12-12)pr-16q^2+(16+16)qr$

$= 9p^2-16q^2+32qr$

Ans: $9p^2-16q^2+32qr$

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18. Subtract $7xy(3x+2y)$ from $7xy(x-2y)$. [2]

$7xy(x-2y)-7xy(3x+2y)$

$= 7x^2y-14xy^2-21x^2y-14xy^2$

$= (7-21)x^2y+(-14-14)xy^2$

$= -14x^2y-28xy^2$

Ans: $-14x^2y-28xy^2$

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19. Simplify: $3p(pr-r^2)-4pr(2p+r)-6p^2(r-r^2)+pr(2p-2r)$ [5]

$= 3p^2r-3pr^2-8p^2r-4pr^2-6p^2r+6p^2r^2+2p^2r-2pr^2$

$= (3-8-6+2)p^2r+(-3-4-2)pr^2+6p^2r^2$

$= -9p^2r-9pr^2+6p^2r^2$

Ans: $-9p^2r-9pr^2+6p^2r^2$

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20. Simplify: $5x+[y-\{3t-(2x+2t)\}]$ [5]

Remove the innermost brackets first.

$= 5x+[y-\{3t-2x-2t\}]$

$= 5x+[y-\{t-2x\}]$

$= 5x+[y-t+2x]$

$= 5x+y-t+2x$

$= 7x+y-t$

Ans: $7x+y-t$