EXPRESSWALA ACADEMY

Algebraic Expressions

Question Paper, Set 08

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 divided by y. [1 mark]

2. Write the factors of $-15pqr^3$. [1 mark]

3. Simplify: $\frac{q}{3} + \frac{q}{4}$ [1 mark]

4. Simplify: $9x + x - 11x - 6$ [2 marks]

5. Is $8 + \frac{t}{7}$ a polynomial? Give a reason. [1 mark]

6. Find the degree of $\frac{5}{6}p^2qt^3$. [1 mark]

7. Find the degree of the polynomial $-5a^2b^4 + 6a^5b^3 + a^4b + 6a^4b^3$. [2 marks]

8. Find the value of $-4a^2b$ when $a = -4$ and $b = 2$. [2 marks]

9. Add $8a + 7b + 9m$ and $-4a + \frac{1}{4}b + 8m$. [3 marks]

10. Add $\frac{2}{3}n^2 + 2t^2 + 5nt$ and $-\frac{3}{4}n^2 + \frac{4}{3}nt - t^2$ by the vertical method. [3 marks]

11. Subtract $3x + \frac{1}{3}y$ from $4x + 7y$. [2 marks]

12. If $A = 3c^2 - 7c - 6$ and $B = 5c^2 - c - 5$, find (i) $3A - 4B$ (ii) $(A + B) - (B - A)$. [5 marks]

13. Subtract $m^2 - 5t^2 - 2mt - 8$ from $m^2 - 2t^2 + 4$ by the vertical method. [3 marks]

14. Find $5x^2y \times (-4x^3y) \times 5xy^3$. [1 mark]

15. Multiply: $-4p^2(-4p^2q - 5t + 8q^2)$ [2 marks]

16. Multiply: $(q - 3r)(3q + r)$ [3 marks]

17. Simplify: $(q + 6)(q - 5) - (3q + 7)(q - 4)$ [5 marks]

18. Subtract $5mn(2m - n)$ from $3mn(m + 3n)$. [2 marks]

19. Simplify: $5r(q^2 - 2qr) - 3qr(q - 2r) + q(qr - r^2) + 2q^2(r - 2r^2)$ [5 marks]

20. Simplify: $a - [5b + \{2a - (2b + 4c)\}]$ [5 marks]

Key sheet

Q	Answer
1	$\frac{4}{y}$
2	$-15,\ p,\ q,\ r,\ r,\ r$
3	$\frac{7q}{12}$
4	$-x-6$
5	Yes, it is a polynomial.
6	6
7	8
8	-128
9	$4a+\frac{29}{4}b+17m$
10	$-\frac{1}{12}n^2+t^2+\frac{19}{3}nt$
11	$x+\frac{20}{3}y$
12	(i) $-11c^2-17c+2$ (ii) $6c^2-14c-12$
13	$3t^2+12+2mt$
14	$-100x^6y^5$
15	$16p^4q+20p^2t-32p^2q^2$
16	$3q^2-8qr-3r^2$
17	$-2q^2+6q-2$
18	$-7m^2n+14mn^2$
19	$5q^2r-5qr^2-4q^2r^2$
20	$-a-3b+4c$

Solutions

1. Write in symbolic form: 4 divided by y. [1]

4 divided by y is written $\frac{4}{y}$.

Symbolic form: $\frac{4}{y}$

Ans: $\frac{4}{y}$

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2. Write the factors of $-15pqr^3$. [1]

$-15pqr^3 = -15 \times p \times q \times r \times r \times r$

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

Factors: -15, p, q, r, r, r

Ans: -15, p, q, r, r, r

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3. Simplify: $\frac{q}{3} + \frac{q}{4}$ [1]

$\frac{q}{3} + \frac{q}{4}$

$= (\frac{1}{3} + \frac{1}{4})q$

For q: $\frac{1}{3} + \frac{1}{4} = \frac{4+3}{12} = \frac{7}{12}$

$= \frac{7q}{12}$

Ans: $\frac{7q}{12}$

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4. Simplify: $9x + x - 11x - 6$ [2]

$9x + x - 11x - 6$

$= (9 + 1 - 11)x - 6$

$= -x - 6$

Ans: $-x - 6$

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5. Is $8 + \frac{t}{7}$ a polynomial? Give a reason. [1]

$\frac{t}{7} = \frac{1}{7}t$; the power of t is 1, a whole number.

Both terms are monomials.

Yes, it is a polynomial.

Ans: Yes, it is a polynomial.

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6. Find the degree of $\frac{5}{6}p^2qt^3$. [1]

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

$2 + 1 + 3 = 6$

So the degree of $\frac{5}{6}p^2qt^3$ is 6.

Ans: 6

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7. Find the degree of the polynomial $-5a^2b^4 + 6a^5b^3 + a^4b + 6a^4b^3$. [2]

Degrees of the terms: $-5a^2b^4$: 6, $6a^5b^3$: 8, a^4b: 5, $6a^4b^3$: 7.

Greatest among $\{6, 8, 5, 7\}$ is 8.

So the degree of the polynomial is 8.

Ans: 8

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8. Find the value of $-4a^2b$ when $a = -4$ and $b = 2$. [2]

Put $a = -4$ and $b = 2$:

$-4(-4)^2(2)$

$= -128$

Ans: -128

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9. Add $8a + 7b + 9m$ and $-4a + \frac{1}{4}b + 8m$. [3]

$8a + 7b + 9m - 4a + \frac{1}{4}b + 8m$

$= (8 - 4)a + (7 + \frac{1}{4})b + (9 + 8)m$

For b: $7 + \frac{1}{4} = \frac{28+1}{4} = \frac{29}{4}$

$= 4a + \frac{29}{4}b + 17m$

Ans: $4a + \frac{29}{4}b + 17m$

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10. Add $\frac{2}{3}n^2 + 2t^2 + 5nt$ and $-\frac{3}{4}n^2 + \frac{4}{3}nt - t^2$ by the vertical method. [3]

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

$$\begin{array}{rrr} \frac{2}{3}n^2 & +2t^2 & +5nt \\ -\frac{3}{4}n^2 & -t^2 & +\frac{4}{3}nt \\ \hline -\frac{1}{12}n^2 & +t^2 & +\frac{19}{3}nt \end{array}$$

For n^2: $\frac{2}{3} - \frac{3}{4} = \frac{8-9}{12} = -\frac{1}{12}$

For nt: $5 + \frac{4}{3} = \frac{15+4}{3} = \frac{19}{3}$

Sum $= -\frac{1}{12}n^2 + t^2 + \frac{19}{3}nt$

Ans: $-\frac{1}{12}n^2 + t^2 + \frac{19}{3}nt$

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11. Subtract $3x + \frac{1}{3}y$ from $4x + 7y$. [2]

$(4x + 7y) - (3x + \frac{1}{3}y)$

$= 4x + 7y - 3x - \frac{1}{3}y$

$= (4 - 3)x + (7 - \frac{1}{3})y$

For y: $7 - \frac{1}{3} = \frac{21-1}{3} = \frac{20}{3}$

$= x + \frac{20}{3}y$

Ans: $x + \frac{20}{3}y$

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12. If $A = 3c^2 - 7c - 6$ and $B = 5c^2 - c - 5$, find (i) $3A - 4B$ (ii) $(A + B) - (B - A)$. [5]

(i) $3(3c^2 - 7c - 6) - 4(5c^2 - c - 5)$

$= 9c^2 - 21c - 18 - 20c^2 + 4c + 20$

$= (9 - 20)c^2 + (-21 + 4)c + (-18 + 20)$

$= -11c^2 - 17c + 2$

(ii) $A + B = 8c^2 - 8c - 11$

$B - A = 2c^2 + 6c + 1$

$(A + B) - (B - A) = (8c^2 - 8c - 11) - (2c^2 + 6c + 1)$

$= 8c^2 - 8c - 11 - 2c^2 - 6c - 1$

$= (8 - 2)c^2 + (-8 - 6)c + (-11 - 1)$

$= 6c^2 - 14c - 12$

Ans: (i) $-11c^2 - 17c + 2$ **(ii)** $6c^2 - 14c - 12$

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13. Subtract $m^2 - 5t^2 - 2mt - 8$ from $m^2 - 2t^2 + 4$ by the vertical method. [3]

Write $m^2 - 2t^2 + 4$ on top and the expression to be subtracted below it, like terms in the same column.

m^2	$-2t^2$	$+4$	
m^2	$-5t^2$	-8	$-2mt$
$(-)$	$(+)$	$(+)$	$(+)$
	$3t^2$	$+12$	$+2mt$

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

The m^2 terms cancel.

$= 3t^2 + 12 + 2mt$

Ans: $3t^2 + 12 + 2mt$

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14. Find $5x^2y \times (-4x^3y) \times 5xy^3$. [1]

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

$= -100x^6y^5$

Ans: $-100x^6y^5$

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15. Multiply: $-4p^2(-4p^2q - 5t + 8q^2)$ [2]

$= (-4p^2)(-4p^2q) + (-4p^2)(-5t) + (-4p^2)(8q^2)$

$= 16p^4q + 20p^2t - 32p^2q^2$

Ans: $16p^4q + 20p^2t - 32p^2q^2$

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16. Multiply: $(q - 3r)(3q + r)$ [3]

$= 3q^2 + qr - 9qr - 3r^2$

$= 3q^2 - 8qr - 3r^2$

Ans: $3q^2 - 8qr - 3r^2$

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17. Simplify: $(q+6)(q-5)-(3q+7)(q-4)$ [5]

$= (q^2 - 5q + 6q - 30) - (3q^2 - 12q + 7q - 28)$

$= q^2 - 5q + 6q - 30 - 3q^2 + 12q - 7q + 28$

$= (1-3)q^2 + (-5+6+12-7)q + (-30+28)$

$= -2q^2 + 6q - 2$

Ans: $-2q^2 + 6q - 2$

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18. Subtract $5mn(2m-n)$ from $3mn(m+3n)$. [2]

$3mn(m+3n) - 5mn(2m-n)$

$= 3m^2n + 9mn^2 - 10m^2n + 5mn^2$

$= (3-10)m^2n + (9+5)mn^2$

$= -7m^2n + 14mn^2$

Ans: $-7m^2n + 14mn^2$

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19. Simplify: $5r(q^2-2qr) - 3qr(q-2r) + q(qr-r^2) + 2q^2(r-2r^2)$ [5]

$= 5q^2r - 10qr^2 - 3q^2r + 6qr^2 + q^2r - qr^2 + 2q^2r - 4q^2r^2$

$= (5-3+1+2)q^2r + (-10+6-1)qr^2 - 4q^2r^2$

$= 5q^2r - 5qr^2 - 4q^2r^2$

Ans: $5q^2r - 5qr^2 - 4q^2r^2$

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20. Simplify: $a - [5b + \{2a - (2b+4c)\}]$ [5]

Remove the innermost brackets first.

$= a - [5b + \{2a - 2b - 4c\}]$

$= a - [5b + 2a - 2b - 4c]$

$= a - [3b + 2a - 4c]$

$= a - 3b - 2a + 4c$

$= -a - 3b + 4c$

Ans: $-a - 3b + 4c$