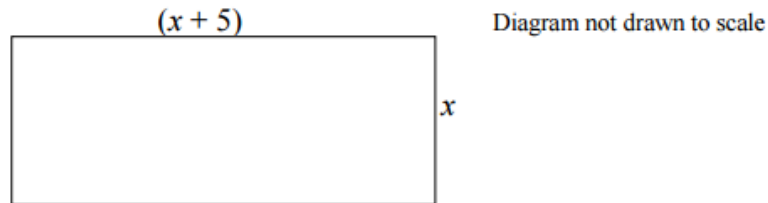


Class: VII
Subject: Math's
Topic: Intro to algebra
No. of Questions: 20

Q1. Expression with two unlike terms is called _____

Sol. Binomial

Q2. The width of a rectangle is x centimeters and its length is $(x + 5)$ cm.



a. Write down an expression for the perimeter of the rectangle, giving your answer in its simplest form.

The perimeter of the rectangle is 62 cm.

b. Work out the length of the rectangle

Sol. (1) (a) $x + x + 5 + x + x + 5$ or $2(x + x + 5)$
 $= 4x + 10$ $= 2(2x + 5)$
 $= 4x + 10$

(b) $4x + 10 = 62$

$$4x = 52$$

$$x = 13$$

Or half the perimeter $x + x + 5 = 31$

$$2x = 26$$

$$x = 13$$

The Length = $x + 5 = 13 + 5 = 18\text{cm}$

Q3. Simplify the following :

1) $10x + 36 - 38x - 47$

4) $-2(7 - n) + 4$

2) $-8(-5b + 7) + 5b$

5) $-4p - (1 - 16p)$

3) $4 - 5(-4n + 3)$

6) $-7(k - 8) + 2k$

Sol. 1) $10x + 36 - 38x - 47$
 $= -28x - 11$

4) $-2(7 - n) + 4$
 $= -10 + 2n$

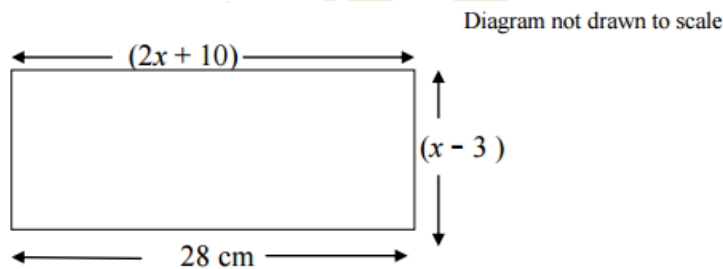
2) $-8(-5b + 7) + 5b$
 $45b - 56$

5) $-4p - (1 - 16p)$
 $2p - 1$

3) $4 - 5(-4n + 3)$
 $= -11 + 20n$

6) $-7(k - 8) + 2k$
 $= -5k + 56$

Q4. The diagram below is a rectangle. All measurements are in centimeters.



- Work out the value of x .
- Hence, work out the perimeter and area of the rectangle.

Sol.

a. $2x + 10 = 28$ Opposite sides equal.
 $2x = 18$
 $x = 9$

b. Hence the width $= x - 3 = 9 - 3 = 6 \text{ cm}$.
 $L = 28, W = 6$ Perimeter $= 2(28 + 6) = 2(34) = 68 \text{ cm}$
 Area $= L \times W = 28 \times 6 = 168 \text{ cm}^2$

Q5. Simplify the expression by combining the like terms.

$$7x^3 - 3x^2y + x^2y + xy^2 - y^3$$

Sol. $= 7x^3 + (-3x^2y) + x^2y + xy^2 - y^3$

$$= 7x^3 + (-3 + 1)x^2y + xy^2 - y^3 \quad [\text{Using distributive property}]$$

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

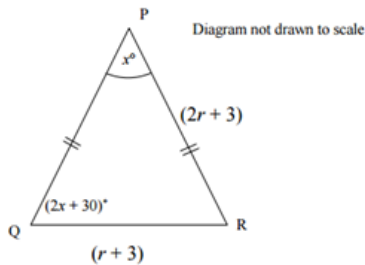
$$= 7x^3 - 2x^2y + xy^2 - y^3$$

Q6. PQR is an isosceles triangle with PQ = PR, and angle QPR = X°

$$\text{Angle PQR} = (2X + 30)^\circ$$

$$\text{PR} = (2r + 3) \text{ cm}$$

$$\text{QR} = (r + 3) \text{ cm}$$



- Find an expression for the perimeter of the triangle in terms of r , giving your answer in its simplest form.
- Work out the value of r , if the perimeter is 49 cm.
- Work out the value of x .

Sol.

a. Perimeter = $2r + 3 + 2r + 3 + r + 3$

$$= 5r + 9 \text{ cm}$$

b. $5r + 9 = 49$

$$5r = 40$$

$$r = 8$$

c. Angle PRQ = $2x + 30$ isosceles triangle

$$\text{Sum of all 3 angles} = 180$$

$$\begin{aligned}2x + 30 + 2x + 30 + x &= 180 \\5x + 60 &= 180 \\5x &= 120 \\x &= \frac{120}{5} = \frac{240}{10} = 24\end{aligned}$$

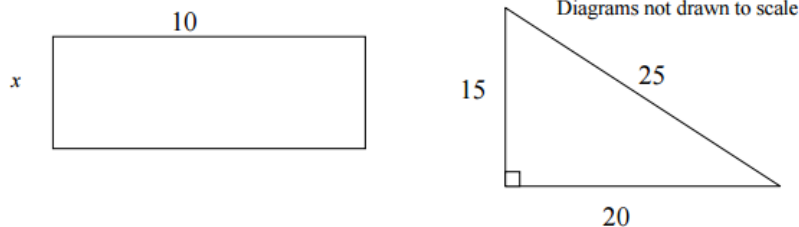
Q7. Find the value of the following expressions at $a = 1$ and $b = -2$:

- a. $a^2 + b^2 + 3ab$
b. $a^2 + a^2b + ab^2 + b^3$

Sol.

- a. Value of $a^2 + b^2 + 3ab$ at $a = 1$ and $b = -2$
 $= (1)^2 + (-2)^2 + 3(1)(-2)$
 $= 1 + 4 - 6$
 $= 5 - 6$
 $= -1$
- b. Value of $a^2 + a^2b + ab^2 + b^3$ at $a = 1$ and $b = -2$
 $= (1)^3 + (1)^2(-2) + (1)(-2)^2 + (-2)^3$
 $= 1 - 2 + 4 - 8$
 $= 5 - 10$
 $= -5$

Q8. The area of the right-angled triangle is equal to the area of the rectangle. Work out the value of x . All measurements are in centimeters.



Sol. Area of triangle $= \frac{1}{2} \times bxh = \frac{1}{2} \times 20 \times 15 = 150$

$$\text{Area of rectangle} = 10x$$

$$10x = 150$$

$$x = \frac{150}{10} = 15$$

Q9. Add:

- $3mn, -5mn, 8mn, -4mn$
- $t - 8tz, 3tz - z, z - t$
- $-7mn + 5, 12mn + 2, 9mn - 8, -2mn - 3$
- $a + b - 3, b - a + 3, a - b + 3$
- $14x + 10y - 12xy - 13, 18 - 7x - 10y + 8xy, 4xy$

Sol.

- $3mn + (-5mn) + 8mn + (-4mn) = mn(3 - 5 + 8 - 4) = 2mn$
- $$(t - 8tz) + (3tz - z) + (z - t) = t - 8tz + 3tz - z + z - t$$

$$= t - t - 8tz + 3tz - z + z$$

$$= t(t - 1) + tz(-8 + 3) + z(-1 + 1)$$

$$= -5tz$$
- $$(-7mn + 5) + (12mn + 2) + (9mn - 8) + (-2mn - 3)$$

$$= -7mn + 5 + 12mn + 2 + 9mn - 8 - 2mn - 3$$

$$= -7mn + 12mn + 9mn - 2mn + 5 + 2 - 8 - 3$$

$$= mn(-7 + 12 + 9 - 2) + (5 + 2 - 8 - 3)$$

$$= 12mn - 4$$
- $$(a + b - 3) + (b - a + 3) + (a - b + 3)$$

$$= a + b - 3 + b - a + 3 + a - b + 3$$

$$= a - a + a + b + b - b - 3 + 3 + 3$$

$$= a(1 - 1 + 1) + b(1 + 1 - 1) + 3(-1 + 1 + 1)$$

$$= a + b + 3$$
- $$14x + 10y - 12xy - 13 + (18 - 7x - 10y + 8yx) + 4xy$$

$$= 14x + 10y - 12xy - 13 + 18 - 7x - 10y + 8yx + 4xy$$

$$= 14x - 7x + 10y - 10y - 12xy + 8yx + 4xy - 13 + 18$$

$$= x(14 - 7) + y(10 - 10) + xy(-12 + 8 + 4) - 13 + 18$$

$$= 7x + 5$$

Q10. What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$?

Sol. Let p be the required term.

$$(3x^2 - 4y^2 + 5xy + 20) - p = -x^2 - y^2 + 6xy + 20$$

$$P = (3x^2 - 4y^2 + 5xy + 20) - (-x^2 - y^2 + 6xy + 20)$$

$$= 3x^2 - 4y^2 + 5xy + 20 + x^2 + y^2 - 6xy - 20$$

$$\begin{aligned} &= 3x^2 + x^2 - 4y^2 + y^2 + 5xy - 6xy + 20 - 20 \\ &= 4x^2 - 3y^2 - xy \end{aligned}$$

- Q11. a. From the sum of $3x - y + 11$ and $-y - 11$, subtract $3x - y - 11$.
b. From the sum of $4 + 3x$ and $5 - 4x + 2x^2$, subtract the sum of $3x^2 - 5x$ and $-x^2 + 2x + 5$.

Sol.

a. $(3x - y + 11) + (-y - 11)$
 $= 3x - y + 11 - y - 11$
 $= 3x - y - y + 11 - 11$
 $= (3x - 2y)$
 $= (3x - 2y) - (3x - y - 11)$
 $= 3x - 2y - 3x + y + 11$
 $3x - 3x - 2y + y + 11$
 $= -y + 11$

b. $(4 + 3x) + (5 - 4x + 2x^2) = 4 + 3x + 5 - 4x + 2x^2$
 $3x - 4x + 2x^2 + 4 + 5$
 $= -x + 2x^2 + 9$
 $(3x^2 - 5x) + (-x^2 + 2x + 5) = 3x^2 - 5x - x^2 + 2x + 5$
 $= 3x^2 - x^2 - 5x + 2x + 5$
 $= 2x^2 - 3x + 5$
 $(-x + 2x^2 + 9) - (2x^2 - 3x + 5)$
 $= -x + 2x^2 + 9 - 2x^2 + 3x - 5$
 $= -x + 3x + 2x^2 - 2x^2 + 9 - 5$
 $= 2x + 4$

Q12. If $m = 2$, find value of:

- (i) $m - 2$
(ii) $3m - 5$
(iii) $9 - 5m$
(iv) $3m^2 - 2m - 7$
(v) $\frac{5m}{2} - 4$

Sol.

- (i) $m - 2 = 2 - 2 = 0$
(ii) $3m - 5 = (3 \times 2) - 5 = 6 - 5 = 1$

- (iii) $9 - 5m = 9 - (5 \times 2) = 9 - 10 = -1$
(iv) $3m^2 - 2m - 7 = 3 \times (2 \times 2) - (2 \times 2) - 7$
 $= 12 - 4 - 7 = 1$
(v) $\frac{5m}{2} - 4 = \left(\frac{5 \times 2}{2}\right) - 4 = 1$

Q13. If $p = -2$, find the value of:

- (i) $4p + 7$
(ii) $-3p^2 + 4p + 7$
(iii) $-2p^3 - 3p^2 + 4p + 7$

Sol.

- (i) $4p + 7 = 4 \times (-2) + 7 = -8 + 7 = -1$
(ii) $-3p^2 + 4p + 7 = -3(-2) \times (-2) + 4 \times (-2) + 7$
 $= -12 - 8 + 7 = -13$
(iii) $-2p^3 - 3p^2 + 4p + 7$
 $= -2(-2) \times (-2) \times (-2) - 3(-2) \times (-2) + 4 \times (-2) + 7$
 $= 16 - 12 - 8 + 7 = 3$

Q14. If $a = 2, b = -2$, find the value of:

- (i) $a^2 + b^2$
(ii) $a^2 + ab + b^2$
(iii) $a^2 - b^2$

Sol.

- (i) $a^2 + b^2$
 $= (2)^2 + (-2)^2 = 4 + 4 = 8$
(ii) $a^2 + ab + b^2$
 $= (2 \times 2) + 2 \times (-2) + (-2) \times (-2)$
 $= 4 - 4 + 4 = 4$
(iii) $a^2 - b^2$
 $= (2)^2 - (-2)^2 = 4 - 4 = 0$

Q15. When $a = 0$, $b = -1$, find the value of the given expressions:

- (i) $2a + 2b$
- (ii) $2a^2 + b^2 + 1$
- (iii) $2a^2b + 2ab^2 + ab$
- (iv) $a^2 + ab + 2$

Sol.

- (i) $2a + 2b = 2 \times (0) + 2 \times (-1) = 0 - 2 = -2$
- (ii) $2a^2 + b^2 + 1$
 $= 2 \times (0)^2 + (-1)^2 + 1$
 $= 0 + 1 + 1 = 2$
- (iii) $2a^2b + 2ab^2 + ab$
 $= 2 \times (0)^2 \times (-1) + 2 \times (0) \times (-1) \times (-1) + 0 \times (-1)$
 $= 0 + 0 + 0 = 0$
- (iv) $a^2 + ab + 2$
 $= (0)^2 + 0 \times (-1) + 2$
 $= 0 + 0 + 2 = 2$

Q16. Simplify the expression and find the value if x is equal to 2

- (i) $x + 7 + 4(x - 5)$
- (ii) $3(x + 2) + 5x - 7$
- (iii) $6x + 5(x - 2)$
- (iv) $4(2x - 1) + 3x + 11$

Sol.

- (i) $x + 7 + 4(x - 5) = x + 7 + 4x - 20$
 $= x + 4x + 7 - 20$
 $= 5x - 13$
 $= (5 \times 2) - 13$
 $= 10 - 13 = -3$
- (ii) $3(x + 2) + 5x - 7 = 3x + 6 + 5x - 7$
 $= 3x + 5x + 6 - 7 = 8x - 1$
 $(8 \times 2) - 1 = 16 - 1 = 15$
- (iii) $6x + 5(x - 2) = 6x + 5x - 10$
 $= 11x - 10$
 $= (11 \times 2) - 10 = 22 - 10 = 12$
- (iv) $4(2x - 1) + 3x + 11 = 8x - 4 + 3x + 11$
 $= 11x + 7$
 $= (11 \times 2) + 7$

$$= 22 + 7 = 29$$

Q17. Solve

- (i) If $Z = 10$, find the value of $Z^3 - 3(Z - 10)$.
- (ii) If $p = -10$, find the value of $p^2 - 2p - 100$

Sol.

- (i) $Z^3 - 3(Z - 10) = Z^3 - 3Z + 30$
 $= (100 \times 10 \times 100) - (3 \times 10) + 30$
 $= 1000 - 30 + 30 = 1000$
- (ii) $p^2 - 2p - 100$
 $= (-10) \times (-10) - 2(-10) - 100$
 $= 100 + 20 - 100 = 20$

Q18. What should be the value of a if the value of $2x^2 + x - a$ equals to 5, when $x = 0$?

Sol. $2x^2 + x - a = 5$, when $x = 0$

$$(2 \times 0) + 0 - a = 5$$

$$0 - a = 5$$

$$a = -5$$

Q19. Simplify the expression and find its value when $a = 5$ and $b = -3$. $2(a^2 + ab) + 3 - ab$

Sol. $2(a^2 + ab) + 3 - ab = 2a^2 + 2ab + 3 - ab$

$$= 2a^2 + 2ab - ab + 3$$

$$= 2a^2 + ab + 3$$

$$= 2 \times (5 \times 5) + 5 \times (-3) + 3$$

$$= 50 - 15 + 3 = 38$$

Q20. Use the given algebraic expression to complete the table of number patterns.

S. No.	Expression	Terms									
		1 st	2 nd	3 rd	4 th	5 th	...	10 th	...	100 th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	-	-
(ii)	$3n + 2$	2	5	8	11	-	-	-	-	-	-
(iii)	$4n + 1$	5	9	13	17	-	-	-	-	-	-
(iv)	$7n + 20$	27	34	41	48	-	-	-	-	-	-
(v)	$n^2 + 1$	2	5	10	17	-	-	-	-	10, 001	-

Sol. The given table can be completed as follows.

S. No.	Expression	Terms									
		1 st	2 nd	3 rd	4 th	5 th	...	10 th	...	100 th	...
(i)	$2n - 1$	1	3	5	7	9	-	19	-	199	-
(ii)	$3n + 2$	2	5	8	11	17	-	32	-	302	-
(iii)	$4n + 1$	5	9	13	17	21	-	41	-	401	-
(iv)	$7n + 20$	27	34	41	48	55	-	90	-	720	-
(v)	$n^2 + 1$	2	5	10	17	26	-	101	-	10, 001	-