Section A

1. a (b + c) = ab + ac is

(a) commutative property (b) distributive property

(c) associative property (d) closure property

Answer: (b) distributive property

a(b + c) = ab + ac is distribution of addition over multiplication.

Whereas commutative property is (a)(b) = (b)(a) under multiplication and a + b = b + a under addition.

Associative property is (ab)c = a(bc) under multiplication and (a + b) + c = a + (b + c) under addition

Closure property: the property under which the result of the indicated operation must be present in the same set.

2. The product of a monomial and a binomial is a

(a) monomial (b) binomial (c) trinomial (d) none of these

Answer: (b) binomial

The distributive property gets their product as a binomial.

For example, consider a monomial 3a and a binomial 5a + 2.

Multiplying them we get $3a(5a + 2) = 15a^2 + 6a$, which is a binomial.

3. In a polynomial, the exponents of the variables are always

(a) integers (b) positive integers

(c) non-negative integers (d) non-positive integers

Answer: (c) non-negative integers

The definition of the polynomial can be given as: "A **polynomial** is a type of expression in which the exponents of all variables should be a **whole number**".

4. The sum of -7pq and 2pq is

(a) -9pq (b) 9pq (c) 5pq (d) - 5pq

Answer: (d) - 5pq

because adding the polynomials,

$-7pq + 2pq = pq(-7 + 2) = pq(-5) = -5pq$

5. If we subtract $-3x^2y^2$ from x^2y^2, then we get

(a) $-4x^2y^2$ (b) $-2x^2y^2$ (c) $2x^2y^2$ (d) $4x^2y^2$

Answer: (d) $4x^2y^2$

because, subtracting the polynomials, we get

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

6. Like term as $4m^3n^2$ is

(a) $4m^2n^2$ (b) $-6m^3n^2$ (c) $6pm^3n^2$ (d) $4m^3n$

Answer: (b) $-6m^3n^2$

Given term and the term in option (b) have the same variables and powers.

$4m^3n^2$ and $-6m^3n^2$ are like terms

7. Which of the following is a binomial?

(a) $7 \times a + a$ (b) $6a^2 + 7b + 2c$

(c) $4a \times 3b \times 2c$ (d) $6(a^2 + b)$

Answer: (d) $6(a^2 + b)$

“ A polynomial with two terms is usually joined by a plus or minus sign is called a binomial”.

(a) $7 \times a + a = 7a + a = 8a$ → This is a monomial which is a type of polynomial with a single term.

(b) $6a^2 + 7b + 2c$ → This is a trinomial which is a type of polynomial that has three terms.

(c) $4a \times 3b \times 2c = 24abc$ → This is a monomial which is a type of polynomial with a single term.

(d) $6(a^2 + b) = 6a^2 + 6b$ →This is a binomial which is a type of polynomial that has two terms.

8. Sum of a - b + ab, b + c - bc and c - a - ac is

(a) 2c + ab - ac – bc (b) 2c - ab - ac - bc

(c) 2c + ab + ac + bc (d) 2c - ab + ac + bc

Answer:

Given , sum of a - b + ab, b + c - bc and c - a - ac

(a - b + ab) + (b + c - bc) + (c - a - ac)

= a - b + ab + b + c - bc + c - a - ac

Sorting like terms,

= (a - a) + (-b + b) + (c + c) + (ab - bc - ac)

= 2c + ab - bc – ac

9. Volume of a rectangular box (cuboid) with length = 2ab, breadth = 3ac, and height = 2ac is

(a) $12a^3bc^2$ (b) $12a^3bc$ (c) $12a^2bc$ (d) 2ab + 3ac + 2ac

Answer: (a) $12a^3bc^2$

The volume of a rectangular box = length × breadth × height

Given, length = 2ab, breadth = 3ac and height = 2ac

∴ The volume of a rectangular box = length × breadth × height

= 2ab × 3ac × 2ac

= 12 (a × a × a) b (c × c)

= $12a^3bc^2$

10. Product of $6a^2$ - 7b + 5ab and 2ab is

(a) $12a^3b - 14ab^2 + 10ab$ (b) $12a^3b - 14ab^2 + 10a^2b^2$

(c) $6a^2 - 7b + 7ab$ (d) $12a^2b - 7ab^2 + 10ab$

Answer: (b) $12a^3b - 14ab^2 + 10a^2b^2$

Given, $(6a^2 - 7b + 5ab) \times 2ab$

Multiplying each term by 2ab

= $(6a^2 \times 2ab) - (7b \times 2ab) + (5ab \times 2ab)$

= $12a^3b - 14ab^2 + 10a^2b^2$

11. Square of 3x - 4y is

(a) $9x^2 - 16y^2$ (b) $6x^2 - 8y^2$

(c) $9x^2 + 16y^2 + 24xy$ (d) $9x^2 + 16y^2 - 24xy$

Answer: (d) $9x^2 + 16y^2 - 24xy$

Given, Square of 3x - 4y = $(3x - 4y)^2$

Using the identity, $(a - b)^2 = a^2 - 2ab + b^2$

Here, a = 3x and b = 4y

$\therefore (3x - 4y)^2 = (3x)^2 - 2(3x)(4y) + (4y)^2$

$= 9x^2 - 24xy + 16y^2$

12. On dividing $57p^2qr$ by 114pq, we get

(a) 1/4 pr (b) 3/4 pr (c) 1/2 pr (d) 2pr

Answer: (c) 1/2 pr

Given, divide $57p^2qr$ by 114pq

$$= \frac{57p^2\,qr}{114pq}$$

$$= \frac{57 \times \mathrm{p} \times \mathrm{p} \times \mathrm{q}}{57 \times 2 \times \mathrm{p} \times \mathrm{q}}$$

Cancelling the common terms,

$$= \left(\frac{1}{2}\right)pr$$

13. On dividing $p(4p^2 - 16)$ by $4p(p - 2)$, we get

(a) 2p + 4 (b) 2p - 4

(c) p + 2 (d) p - 2

Answer: (c) p + 2

Given, divide $\frac{\mathrm{p}(4\mathrm{p}^2 - 16)}{4\mathrm{p}(\mathrm{p} - 2)}$

$\Rightarrow \dfrac{4p(p^2-4)}{4p(p-2)}$

Here, ($4p^2$ - 16) is in the form of the standard identity $a^2 - b^2 = (a + b)(a - b)$.

$\therefore \dfrac{4p(p^2-4)}{4p(p-2)}$

$\Rightarrow \dfrac{4p(p^2-(2)^2)}{4p(p-2)}$

Cancelling the common terms,

= (p + 2)

14. The value of $(a + b)^2 + (a - b)^2$ is

(a) 2a + 2b (b) 2a - 2b (c) $2a^2 + 2b^2$ (d) $2a^2 - 2b^2$

Answer: (c) $2a^2 + 2b^2$

Given, $(a + b)^2 + (a - b)^2$

We have standard identities, $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$

$\therefore (a + b)^2 + (a - b)^2 = a^2 + 2ab + b^2 + a^2 - 2ab + b^2$

$= 2a^2 + 2b^2$

15. The value of p for $51^2 - 49^2 = 100p$ is 2. Is the given statement true or false?

Answer: True

The statement 'The value of p for $51^2 - 49^2 = 100p$ is 2' is true.

Given, $51^2 - 49^2 = 100p$

$51^2 - 49^2$

Using standard identity : $a^2 - b^2 = (a + b)(a - b)$

Here, a = 51 and b = 49,

$51^2 - 49^2 = 100\,p$

(51 + 49) (51 - 49) = 100 p

100 × 2 = 100 p

200 = 100 p

p = 2

Section B

16.

(i) Take away $-3x^3 + 4x^2 - 5x + 6$ from $3x^3 - 4x^2 + 5x - 6$

(ii) Take $m^2 + m + 4$ from $-m^2 + 3m + 6$ and the result from $m^2 + m + 1$.

Answer:

(i) Take away $-3x^3 + 4x^2 - 5x + 6$ from $3x^3 - 4x^2 + 5x - 6$

$3x^3$	$-$	$4x^2$	$+$	$5x$	$-$	6
$-3x^3$	$+$	$4x^2$	$-$	$5x$	$+$	6
$+$	$-$		$+$		$-$	
$6x^3$	$-$	$8x^2$	$+$	$10x$	$-$	12

(ii) Take $m^2 + m + 4$ from $-m^2 + 3m + 6$ and the result from $m^2 + m + 1$.

$-m^2$	$+$	$3m$	$+$	6
m^2	$+$	m	$+$	4
$-$	$-$		$-$	
$-2m^2$	$+$	$2m$	$+$	2

m^2	$+$	m	$+$	1
$-2m^2$	$+$	$2m$	$+$	2
$+$	$-$		$-$	
$3m^2$	$-$	m	$-$	1

17. If x = 6a + 8b + 9c ; y = 2b – 3a – 6c and z = c – b + 3a ; find 3y – 2z – 5x

Answer:

3 (2b – 3a – 6c) – 2 (c – b + 3a) – 5 (6a + 8b + 9c)

- ⇨ **6b – 9a - 18c - 2c + 2b - 6a – 30a - 40b - 45c**
- ⇨ **– 9a - 6a – 30a + 6b + 2b - 40b - 18c - 2c - 45c**
- ⇨ **-45a – 32b – 65c**

18. Add the following algebraic expressions:

$$\frac{7}{2}x^3 - \frac{1}{2}x^2 + \frac{5}{3},\ \frac{3}{2}x^3 + \frac{7}{4}x^2 - x + \frac{1}{3},\ \frac{3}{2}x^2 - \frac{5}{2}x - 2$$

Answer:

⇨ $\left(\frac{7}{2}x^3 - \frac{1}{2}x^2 + \frac{5}{3}\right) + \left(\frac{3}{2}x^3 + \frac{7}{4}x^2 - x + \frac{1}{3}\right) + \left(\frac{3}{2}x^2 - \frac{5}{2}x - 2\right)$

⇨ $\frac{7}{2}x^3 - \frac{1}{2}x^2 + \frac{5}{3} + \frac{3}{2}x^3 + \frac{7}{4}x^2 - x + \frac{1}{3} + \frac{3}{2}x^2 - \frac{5}{2}x - 2$

⇨ $\frac{7}{2}x^3 + \frac{3}{2}x^3 - \frac{1}{2}x^2 + \frac{7}{4}x^2 + \frac{3}{2}x^2 - x - \frac{5}{2}x + \frac{5}{3} + \frac{1}{3} - 2$

(Collecting like terms)

$= 5x^3 + \frac{11}{4}x^2 - \frac{7}{2}x$ (Combining like terms)

19. Express the product as monomials and verify the result for x =1, y = 2

$$\left(\frac{4}{9}abc^3\right) \times \left(-\frac{27}{5}a^3b^2\right) \times (-8b^3c)$$

Answer:

$\left(\frac{4}{9}abc^3\right) \times \left(-\frac{27}{5}a^3b^2\right) \times (-8b^3c)$

$= \left[\left(\frac{4}{9}\right) x \left(-\frac{27}{5}\right) x\ (-8)\right]$ x (a x a^3) x (b x b^2 x b^3) x (c^3 x c)

$= \left[\left(\frac{4}{9}\right) x \left(-\frac{27}{5}\right) x\ (-8)\right]$ x (a^{1+3}) x (b^{2+3+1}) x (c^{3+1})

$= \frac{96}{5}$ **$a^4b^6c^4$**

Since the x and y variables are not part of an expression, the result can't be verified for x =1 and y=2

Section C

20. Simplify: $(x^3 – 2x^2 + 3x – 4)(x – 1) – (2x – 3)(x^2 – x + 1)$

Answer:

To simplify we will use distributive laws as follows:

$(x^3 – 2x^2 + 3x – 4)(x – 1) – (2x – 3)(x^2 – x + 1)$

$= [(x^3 – 2x^2 + 3x – 4)(x – 1)] – [(2x – 3)(x^2 – x + 1)]$

$= [x(x^3 – 2x^2 + 3x – 4) -1((x^3 – 2x^2 + 3x – 4)] [2x(x^2 – x + 1) -3(x^2 – x + 1)]$

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

$= (x^4 - 3x^3 + 5x^2 -7x + 4) – (2x^3 - 5x^2 + 5x – 3)$

$= x^4 - 3x^3 + 5x^2 -7x + 4 - 2x^3 + 5x^2 – 5x + 3$

$= x^4 - 5x^3 + 10x^2 – 12x + 7$

$= x^4 - 5x^3 + 3x^2 – 5x + 1$

21.Using suitable identities, evaluate the following.

(i) $(339)^2 – (161)^2$

Answer: Given, $(339)^2 - (161)^2$

Using standard identity: $(a^2 - b^2) = (a + b)(a - b)$

Here $a = 339$ and $b = 161$

$(339)^2 - (161)^2 = (339 + 161)(339 - 161)$

$= (500)(178) = 89000$

(ii) $(9.9)^2$

Answer:

Given, $(9.9)^2 = (10 - 0.1)^2$

Using standard identity: $(a - b)^2 = a^2 - 2ab + b^2$

Here, $a = 10$ and $b = 0.1$

$(9.9)^2 = (10 - 0.1)^2$

$= (10)^2 - 2(10)(0.1) + (0.1)^2$

$= 100 - 2 + 0.01 = 98.01$

(iii) $(x^2y - xy^2)^2$

Answer:

Given, $(x^2y - xy^2)^2$

Using standard identity: $(a - b)^2 = a^2 - 2ab + b^2$

Here, $a = x^2y$ and $b = xy^2$

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

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

22. If the area of a rectangle is $8x^2 - 45y^2 + 18xy$ and one of its sides is $4x + 15y$, find the length of the adjacent side.

Answer: Area of rectangle = $8x^2 - 45y^2 + 18xy$

And, one side = $4x + 15y$

∴ Second (adjacent) side = Area of rectangle/ One side

$= 8x^2 - 45y^2 + 18xy \div 4x + 15y$

$$
\begin{array}{r|l}
 & 2x - 3y \\
\hline
4x + 15y & 8x^2 + 18xy - 45y^2 \\
 & 8x^2 + 30xy \\
 & - \quad - \\
\hline
 & -12xy - 45y^2 \\
 & -12xy - 45y^2 \\
 & + \quad + \\
\hline
 & 0 \\
\end{array}
$$

Thus, the length of the adjacent side is 2x – 3y