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Chapter 7: Algebraic Expressions and Identities & Factorisation

NCERT Exemplar · Class 8 · Maths

Questions

Question 1

The product of a monomial and a binomial is a

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

Solution

Solution:-

(b) binomial

Let monomial = $2x$, binomial = $x + y$

Then, product of a monomial and a binomial = $(2x) \times (x + y)$

$$= 2x^2 + 2xy$$

Question 2

In a polynomial, the exponents of the variables are always

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

Solution

Solution:-

(b) positive integers

Question 3

Which of the following is correct?

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

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

Solution

Solution:-

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

We have, $= (a - b) \times (a - b)$

$= a \times (a - b) - b \times (a - b)$

$= a^2 - ab - ba + b^2$

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

Question 4

The sum of $-7pq$ and $2pq$ is

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

Solution

Solution:-

(d) $-5pq$

The given two monomials are like terms.

Then sum of $-7pq$ and $2pq = -7pq + 2pq$

$= (-7 + 2) pq$

$= -5pq$

Question 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) $4x^2y^2$

Solution

Solution:-

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

We have,

The given two monomials are like terms.

Subtract $-3x^2y^2$ from $x^2y^2 = x^2y^2 - (-3x^2y^2)$

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

$$= x^2y^2 (1 + 3)$$

$$= 4x^2y^2$$

Question 6

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

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

Solution

Solution:-

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

Like terms are formed from the same variables, and the powers of these variables are also the same. But coefficients of like terms need not be the same.

Question 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) $6(a^2 + b)$

Solution

Solution:-

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

Expressions that contain exactly two terms are called binomials.

$$= 6(a^2 + b)$$

$$= 6a^2 + b$$

Question 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) $2c - ab + ac + bc$

Solution

Solution:-

(a) $2c + ab - ac - bc$

We have,

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

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

Now, grouping like terms

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

$$= 2c + ab - bc - ac$$

Question 9

Product of the following monomials $4p$, $-7q^3$, $-7pq$ is

(a) $196 p^2 q^4$ (b) $196 pq^4$ (c) $-196 p^2 q^4$ (d) $196 p^2 q^3$

Solution**Solution:-**

$$\begin{aligned} \text{(a) } & 196 p^2 q^4 \\ &= 4p \times (-7q^3) \times (-7pq) \\ &= (4 \times (-7) \times (-7)) \times p \times q^3 \times pq \\ &= 196p^2q^4 \end{aligned}$$

Question 10

Area of a rectangle with length $4ab$ and breadth $6b^2$ is

- (a) $24a^2b^2$ (b) $24ab^3$ (c) $24ab^2$ (d) $24ab$

Solution**Solution:-**

(b) $24ab^3$

We know that the area of a rectangle = length $\times$ breadth

Given, length = $4ab$, breadth = $6b^2$

$$= 4ab \times 6b^2$$

$$= 24ab^3$$

Question 11

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) $2ab + 3ac + 2ac$

Solution**Solution:-**

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

We know that, volume of cuboid = length $\times$ breadth $\times$ height

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

$$= 2ab \times 3ac \times 2ac$$

$$= (2 \times 3 \times 2) \times ab \times ac \times ac$$

$$= 12a^3bc^2$$

Question 12

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) $12a^2b - 7ab^2 + 10ab$

Solution

Solution:-

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

Now, we have to find the product of trinomial and monomial,

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

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

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

Question 13

Square of $3x - 4y$ is

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

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

Solution

Solution:-

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

As per the condition in the question, $(3x - 4y)^2$

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

Where, $a = 3x$, $b = 4y$

Then,

$$\begin{aligned}(3x - 4y)^2 &= (3x)^2 - (2 \times 3x \times 4y) + (4y)^2 \\ &= 9x^2 - 24xy + 16y^2\end{aligned}$$

Question 14

Which of the following are like terms?

(a) $5xyz^2$, $-3xy^2z$ (b) $-5xyz^2$, $7xyz^2$

(c) $5xyz^2$, $5x^2yz$ (d) $5xyz^2$, $x^2y^2z^2$

Solution

Solution:-

(b) $-5xyz^2$, $7xyz^2$

Like the terms are formed from the same variables, and the powers of these variables are also the same. But coefficients of like terms need not be the same.

Question 15

Coefficient of y in the term $-y/3$ is

(a) -1 (b) -3 (c) $-1/3$ (d) $1/3$

Solution

Solution:-

(c) $-1/3$

$-y/3$ can also be written as $y \times (-1/3)$

So, the coefficient of y is $-1/3$

Question 16

$a^2 - b^2$ is equal to

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

Solution

Solution:-

- (c) $(a + b)(a - b)$

$(a^2 - b^2) = (a + b)(a - b)$ is one of the standard identities.

Question 17

Common factor of $17abc$, $34ab^2$, $51a^2b$ is

- (a) $17abc$ (b) $17ab$ (c) $17ac$ (d) $17a^2b^2c$

Solution

Solution:-

- (b) $17ab$

The given factors can be written in expanded form as,

$$17abc = 17 \times a \times b \times c$$

$$34ab^2 = 2 \times 17 \times a \times b \times b$$

$$51a^2b = 3 \times 17 \times a \times a \times b$$

So, common factors in the above are $17 \times a \times b$

$$= 17ab$$

Question 18

Square of $9x - 7xy$ is

- (a) $81x^2 + 49x^2y^2$ (b) $81x^2 - 49x^2y^2$

(c) $81x^2 + 49x^2y^2 - 126x^2y$ (d) $81x^2 + 49x^2y^2 - 63x^2y$

Solution

Solution:-

(c) $81x^2 + 49x^2y^2 - 126x^2y$

As per the condition in the question, $(9x - 7xy)^2$

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

Where, $a = 9x$, $b = 7xy$

Then,

$$(9x - 7xy)^2 = (9x)^2 - (2 \times 9x \times 7xy) + (7xy)^2$$

$$= 81x^2 - 126x^2y + 49x^2y^2$$

Question 19

Factorised form of $23xy - 46x + 54y - 108$ is

(a) $(23x + 54)(y - 2)$ (b) $(23x + 54y)(y - 2)$

(c) $(23xy + 54y)(-46x - 108)$ (d) $(23x + 54)(y + 2)$

Solution

Solution:-

(a) $(23x + 54)(y - 2)$

Factorised form of $23xy - 46x + 54y - 108$ is = $23xy - (2 \times 23x) + 54y - (2 \times 54)$

Take out the common factors,

$$= 23x(y - 2) + 54(y - 2)$$

Again take out the common factor,

$$= (y - 2)(23x + 54)$$

Question 20

Factorised form of $r^2 - 10r + 21$ is

(a) $(r - 1)(r - 4)$ (b) $(r - 7)(r - 3)$

(c) $(r - 7)(r + 3)$ (d) $(r + 7)(r + 3)$

Solution

Solution:-

(b) $(r - 7)(r - 3)$

Factorised form of $r^2 - 10r + 21$ is $= r^2 - 7r - 3r + 21$

Take out the common factors,

$$= r(r - 7) - 3(r - 7)$$

Again take out the common factor,

$$= (r - 7)(r - 3)$$

Question 21

Factorised form of $p^2 - 17p - 38$ is

(a) $(p - 19)(p + 2)$ (b) $(p - 19)(p - 2)$

(c) $(p + 19)(p + 2)$ (d) $(p + 19)(p - 2)$

Solution

Solution:-

(a) $(p - 19)(p + 2)$

Factorised form of $p^2 - 17p - 38$ is $= p^2 - 19p + 2p - 38$

Take out the common factors,

$$= p(p - 19) + 2(p - 19)$$

Again take out the common factor,

$$= (p - 19)(p + 2)$$

Question 22

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

(a) $\frac{1}{4}pr$ (b) $\frac{3}{4}pr$ (c) $\frac{1}{2}pr$ (d) $2pr$

Solution

Solution:-

(c) $\frac{1}{2}pr$

On dividing $57p^2qr$ by $114pq$,

It can be expanded as $= (57 \times p \times p \times q \times r) / (114 \times p \times q)$

$= 57pr/114$... [divide both numerator and denominator by 57]

$= \frac{1}{2}pr$

Question 23

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

(a) $2p + 4$ (b) $2p - 4$ (c) $p + 2$ (d) $p - 2$

Solution

Solution:-

(c) $p + 2$

On dividing $p(4p^2 - 16)$ by $4p(p - 2)$

$= (p((2p)^2 - (4)^2)) / (4p(p - 2))$

$= ((2p - 4) \times (2p + 4)) / (4(p - 2))$

Take out the common factors

$= ((2(p - 2)) \times (2(p + 4))) / (4(p - 2))$

$= (4(p - 2)(p + 2)) / (4(p - 2))$

$$= p + 2$$

Question 24

The common factor of $3ab$ and $2cd$ is

- (a) 1 (b) -1 (c) a (d) c

Solution

Solution:-

- (a) 1

Considering the two monomials $3ab$ and $2cd$, there is no common factor except 1.

Question 25

An irreducible factor of $24x^2y^2$ is

- (a) x^2 (b) y^2 (c) x (d) $24x$

Solution

Solution:-

- (c) x

An irreducible factor is a factor which cannot be expressed further as a product of factors. Such a factorisation is called an irreducible factorisation.

$$24x^2y^2 = 2 \times 2 \times 2 \times 3 \times x \times x \times y \times y$$

Therefore an irreducible factor is x .

Question 26

Number of factors of $(a + b)^2$ is

- (a) 4 (b) 3 (c) 2 (d) 1

Solution

Solution:-

(c) 2

Number of factors of $(a + b)^2$ is $= (a + b)(a + b)$ no further factorisation is possible.

Question 27

The factorised form of $3x - 24$ is

(a) $3x \times 24$ (b) $3(x - 8)$ (c) $24(x - 3)$ (d) $3(x - 12)$

Solution

Solution:-

(b) $3(x - 8)$

The factorised form of $3x - 24$ is,

Take out 3 as common,

$$= 3(x - 8)$$

Question 28

The factors of $x^2 - 4$ are

(a) $(x - 2), (x - 2)$ (b) $(x + 2), (x - 2)$

(c) $(x + 2), (x + 2)$ (d) $(x - 4), (x - 4)$

Solution

Solution:-

(b) $(x + 2), (x - 2)$

The factors of $x^2 - 4$ are,

$$x^2 - 4 = x^2 - 2^2$$

$$= (x + 2)(x - 2)$$

Question 29

The value of $(-27x^2y) \div (-9xy)$ is

(a) $3xy$ (b) $-3xy$ (c) $-3x$ (d) $3x$

Solution

Solution:-

(d) $3x$

The value of $(-27x^2y) \div (-9xy) = (-27 \times x \times x \times y) / (-9 \times x \times y)$

$= (27/9)x \dots$ [divide both numerator and denominator by 3]

$= 3x$

Question 30

The value of $(2x^2 + 4) \div 2$ is

(a) $2x^2 + 2$ (b) $x^2 + 2$ (c) $x^2 + 4$ (d) $2x^2 + 4$

Solution

Solution:-

(b) $x^2 + 2$

The value of $(2x^2 + 4) \div 2 = (2x^2 + 4)/2$

$= (2(x^2 + 2))/2$

$= x^2 + 2$

Question 31

The value of $(3x^3 + 9x^2 + 27x) \div 3x$ is

(a) $x^2 + 9 + 27x$ (b) $3x^3 + 3x^2 + 27x$

(c) $3x^3 + 9x^2 + 9$ (d) $x^2 + 3x + 9$

Solution

Solution:-

(d) $x^2 + 3x + 9$

The value of $(3x^3 + 9x^2 + 27x) \div 3x = (3x^3 + 9x^2 + 27x)/3x$

Takeout 3x as common,

$$= 3x (x^2 + 3x + 9)/3x$$

$$= x^2 + 3x + 9$$

Question 32

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

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

Solution

Solution:-

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

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

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

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

Question 33

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

(a) $4ab$ (b) $-4ab$ (c) $2a^2 + 2b^2$ (d) $2a^2 - 2b^2$

Solution

Solution:-

(a) $4ab$

$$\text{The value of } (a + b)^2 - (a - b)^2 = (a^2 + b^2 + 2ab) - (a^2 + b^2 - 2ab)$$

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

$$= 4ab$$

In questions 34 to 58, fill in the blanks to make the statements true:

Question 34

The product of two terms with like signs is a term.

Solution

Solution:-

The product of two terms with like signs is a positive term.

Let us assume two like terms are, $3p$ and $2q$

$$= 3p \times 2q$$

$$= 6pq$$

Question 35

The product of two terms with unlike signs is a term.

Solution

Solution:-

The product of two terms with unlike signs is a negative term.

Let us assume two unlike terms are, $-3p$ and $2q$

$$= -3p \times 2q$$

$$= -6pq$$

Question 36

$$a(b + c) = a \times \underline{\quad} + a \times \underline{\quad}.$$

Solution

Solution:-

$$a(b + c) = a \times b + a \times c. \dots \text{[by using left distributive law]}$$

$$= ab + ac$$

Question 37

$$(a - b) \underline{\hspace{2cm}} = a^2 - 2ab + b^2$$

Solution

Solution:-

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

$$(a - b)(a - b) = a \times (a - b) - b \times (a - b)$$

$$= a^2 - ab - ba + b^2$$

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

Question 38

$$a^2 - b^2 = (a + b) \underline{\hspace{2cm}}.$$

Solution

Solution:-

$$a^2 - b^2 = (a + b)(a - b) \dots \text{[from the standard identities]}$$

Question 39

$$(a - b)^2 + \underline{\hspace{2cm}} = a^2 - b^2$$

Solution

Solution:-

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

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

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

$$= a^2 - b^2$$

Question 40

$$(a + b)^2 - 2ab = \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

Solution

Solution:-

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

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

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

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

Question 41

$$(x + a)(x + b) = x^2 + (a + b)x + \underline{\hspace{2cm}}.$$

Solution

Solution:-

$$(x + a)(x + b) = x^2 + (a + b)x + ab$$

$$= (x + a)(x + b)$$

$$= x \times (x + b) + a \times (x + b)$$

$$= x^2 + xb + xa + ab$$

$$= x^2 + x(b + a) + ab$$

Question 42

The product of two polynomials is a .

Solution

Solution:-

The product of two polynomials is a polynomial.

Question 43

Common factor of $ax^2 + bx$ is _____.

Solution

Solution:-

Common factor of $ax^2 + bx$ is $x(ax + b)$

Question 44

Factorised form of $18mn + 10mnp$ is _____.

Solution

Solution:-

Factorised form of $18mn + 10mnp$ is $2mn(9 + 5p)$

$$= (2 \times 9 \times m \times n) + (2 \times 5 \times m \times n \times p)$$

$$= 2mn(9 + 5p)$$
