

By. Er. Dharmendra Sir

7974073108, 9584873492

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

BASIC NOTES (CBSE/NCERT)

ALGEBRAIC EXPRESSIONS AND IDENTITIES

PART -1 OUT OF 1

6th, 7th & 8th

JOIN TODAY FOR ADVANCE CONCEPTS

ONLY IN ₹1000 PER MONTH

MRP: ₹ 100/- ONLY

ALSO, BASIC CONCEPTS CLASSES IN SUMMER

VACATION Apr, May & Jun (Every Year)

By. Er. Dharmendra Sir

7974073108, 9584873492

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

-: Algebraic expressions and identities :-

Q. Expressions : Expression are formed from variable and constant.

Ex. - $2y - 5$ y is a variable and 5, 2 are constant.

Value of expression changes with the value choosen for the variables.

Choose - $y = 1, 2, 3, 4, 5$ etc.

$$2y - 5 = 2 \times 1 - 5 = 2 - 5 = -3$$

$$2y - 5 = 2 \times 2 - 5 = 4 - 5 = -1$$

$$2y - 5 = 2 \times 3 - 5 = 6 - 5 = 1 \text{ etc.}$$



Q. Terms, factors and Co-efficients :-

- Terms : Terms are added to form expressions.
- Terms themselves can be formed as the product of factors.

Ex - $4x$ is the products of its factor 4 and x

- The numerical factor of a term is called its numerical Co-efficient or simply Coefficient.

EX - The Coefficient in the term $7xy$ is 7.



Q. Monomials, binomials and polynomials :-

- Expression that contains only one terms is called monomial. Ex - $4x^2$, $9zy$, $82mnp$ etc.

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities :-

- Expression that contains two terms is called binomial. Ex - $a^2 + b$, $x^2y - xy$, $xy^2 + y$ etc.
- Expression that contains three terms is called Trinomial. Ex - $4x^2 + 4x + 9$, $9x^3 + 4x + 2$ etc.
- Expression that contains one or more than terms in general terms are called polynomial.

Ex - $9x$, $9x + 2$, $4x^2 + 2x + 3y + 4$, $9x^2 + 2 + 4x$ etc.

③. Like and unlike terms :-

Ex - $7xy$ and $8yx$, $4x$ and $6x$ - Like terms
 (Like) $7x^2y$ and $8x^2y$, $-4z^2$ and $9z^2$ - Like terms.

Ex - $4xy$ and $2x^2y$, $4x^2$ and $-4y^2$ - Unlike terms
 (Unlike) $40xy$ and $20x$, $-4xy$ and $-7x^2y^2$ - Unlike terms

④. Addition and Subtraction of algebraic expressions :-
Addition and Subtraction always in like terms.

Ex - Add: $7xy + 5yz - 3zx$, $4yz + 9zx - 4y$ and
 $-3xz + 5x - 2xy$ [xz and zx are same]

Sol.

$$\begin{array}{r}
 7xy + 5yz - 3zx + 0 + 0 \\
 0 + 4yz + 9zx - 4y + 0 \\
 2xy + 0 - 3zx + 0 + 5x \\
 \hline
 5xy + 9yz + 3zx - 4y + 5x
 \end{array}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

-: Algebraic Expression and Identities :-

Ex. Subtract $3x^2 - 4x$ from $8x^2 - 4y$

Sol.

$$\begin{array}{r}
 8x^2 - 4y + 0 \\
 5x^2 + 0 - 4x \\
 \hline
 3x^2 - 4y + 4x
 \end{array}$$



②. Multiplying a monomial by a monomial :-

$$\begin{aligned}
 \text{EX - } 9x \times 3y &= 9 \times 3 \times x \times y \\
 &= 27xy
 \end{aligned}$$

$$\begin{aligned}
 5x \times -7x &= 5 \times (-7) \times x \times x \\
 &= -35x^2
 \end{aligned}$$

$$\begin{aligned}
 [a^m \times a^n &= a^{m+n}] \\
 [x^1 \times x^1 &= x^{1+1} = x^2]
 \end{aligned}$$

$$\begin{aligned}
 [- (+) &= - \\
 + (-) &= - \\
 + (+) &= + \\
 - (-) &= +
 \end{aligned}$$



Note: multiply -

$$\text{Coefficients} = 5 \times 7 = 35$$

$$\text{Sign} = (+) \times (-) = -$$

$$\text{Variables} = x^1 \times x^1 = x^{1+1} = x^2$$

Power add in multiply and power subtract in divide.

② multiplying three or more monomials :-

$$\begin{aligned}
 \text{EX - } 2x \times 5y \times 7z &= (2x \times 5y) \times 7z \\
 &= 10xy \times 7z \\
 &= 70xyz
 \end{aligned}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and identities :-

$$\begin{aligned}
 \text{Ex - } & 4xy \times 5x^2y^2 \times 6x^3y^3 \\
 & = (4xy \times 5x^2y^2) \times 6x^3y^3 \\
 & = 20x^3y^2 \times 6x^3y^3 \\
 & = 120x^6y^5
 \end{aligned}$$



③. multiplying a monomial by a polynomial :-

$$\begin{aligned}
 \text{Ex - } & 3x \times (5y + 2) \\
 & = 3x \times 5y + 3x \times 2 \quad (\text{Using the distributive law}) \\
 & = 15xy + 6x
 \end{aligned}$$

$$\begin{aligned}
 \text{EX - } & (9x^2 + 2) \times (-3x) \\
 & = (-3x) \times (9x^2 + 2) \quad (\text{Write in proper according you}) \\
 & = -3x \times 9x^2 + (-3x) \times 2 \quad (\text{Using the distributive law}) \\
 & = -27x^3 + (-6x) \\
 & = -27x^3 - 6x
 \end{aligned}$$



④. multiplying a monomial by a trinomial :-

$$\begin{aligned}
 \text{Ex - } & 3p \times (4p^2 + 5p + 3) \\
 & = (3p \times 4p^2) + (3p \times 5p) + (3p \times 3) \quad (\text{by using distributive law}) \\
 & = 12p^3 + 15p^2 + 9p
 \end{aligned}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

-; Algebraic expression and identities :-

②. multiplying a binomial by a binomial :-

Ex - $(2a + 4b) \times (2a + 3b)$

$$2a \times (2a + 3b) + 4b (2a + 3b)$$

$$(2a \times 2a) + (2a \times 3b) + (4b \times 2a) + (4b \times 3b)$$

$$4a^2 + 6ab + 8ab + 12b^2 \quad [\text{like term are add}]$$

$$4a^2 + 14ab + 12b^2$$

②. multiplying a binomial by a trinomial :-

Ex - $(a + 7) \times (a^2 + 3a + 5)$

$$= a \times (a^2 + 3a + 5) + 7 \times (a^2 + 3a + 5)$$

$$= (a \times a^2) + (a \times 3a) + (a \times 5) + (7 \times a^2) + (7 \times 3a) + (7 \times 5)$$

$$= a^3 + 3a^2 + 5a + 7a^2 + 21a + 35$$

$$= a^3 + 3a^2 + 7a^2 + 5a + 21a + 35 \quad (\text{arrange like terms})$$

$$= a^3 + 10a^2 + 26a + 35 \quad (\text{Add like terms})$$

③. What is an identity :-

Such an equality, true for every value of the variable in it, it is called identity.

$$\bullet (a+b)(a+b) = (a+b)^2 \quad [(a+b)^2 = a^2 + 2ab + b^2]$$

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

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

$$= a^2 + ab + ba + b^2 \quad [ab = ba]$$

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

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities :-

$$\begin{aligned}
 \cdot (a-b)(a-b) &= (a-b)^2 \quad [(a-b)^2 = a^2 - 2ab + b^2] \\
 &= (a-b) \times (a-b) \\
 &= a \times (a-b) - b(a-b) \\
 &= a^2 - ab - ba + b^2 \quad [-ab = -ba] \\
 &= a^2 - 2ab + b^2
 \end{aligned}$$

$$\begin{aligned}
 \cdot (a+b)(a-b) &= (a+b)(a-b) \quad [(a+b)(a-b) = a^2 - b^2] \\
 &= a \times (a-b) + b \times (a-b) \\
 &= (a \times a) + (a \times -b) + (b \times a) + (b \times -b) \\
 &= a^2 - ab + ab - b^2 \\
 &= a^2 - b^2
 \end{aligned}$$

$$\begin{aligned}
 \cdot (x+a)(x+b) &= (x+a)(x+b) \quad [(x+a)(x+b) = x^2 + (a+b)x + ab] \\
 &= x \times (x+b) + a(x+b) \\
 &= (x \times x) + (x \times b) + (a \times x) + (a \times b) \\
 &= x^2 + bx + ax + ab \\
 &= x^2 + (a+b)x + ab \quad (\text{Common } x)
 \end{aligned}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities :-

Q. Get the algebraic expressions in the following cases using variables, constants and arithmetic operations.

(i) Subtraction of z from y .

Sol. $y - z$

[From के बाद वाले पहले लिया जाता है subtraction में]

(ii) One-Half of the sum of numbers x and y .

Sol. $\frac{1}{2}(x+y)$

(iii) The number z multiplied by itself.

Sol. $z \times z = z^2$

(iv) One-fourth of the product of number p and q .

Sol. $\frac{1}{4}(p \times q) = \frac{1}{4}(pq)$

(v) Number x and y both squared and added.

Sol. $x^2 + y^2$

(vi) Number 5 added to three times the product of number m and n .

Sol. $5 + 3(mn)$

(vii) product of numbers y and z subtracted from 10.

Sol. $10 - yz$

(viii) Sum of numbers a and b subtracted from their product.

Sol. $ab - (a+b)$



DPM CLASSES

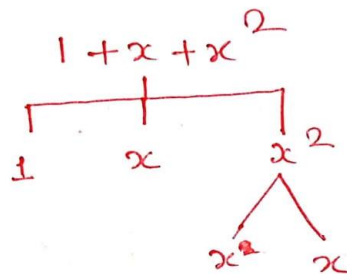
6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identifies:-

Q. Identify the terms and their factors in the following expression: Show the terms and factors by tree diagrams.

(a) $x-3$ (b) $1+x+x^2$ (c) $y-y^3$
 (d) $5xy^2+7x^2y$ (e) $-ab+2b^2-3a^2$

Sol.



[do other itself]

Q. Identify terms and factors in the Expression given below:

(a) $-4x+5$ (b) $-4x+5y$ (c) $5y+3y^2$
 (d) $xy+2x^2y^2$ (e) $pq+q$ (f) $1.2ab-2.4b+3.6a$

Sol.

(f)	Row	Expression	Terms	Factors
-		$1.2ab-2.4b+3.6a$	$1.2ab$ $-2.4b$ $3.6a$	$1.2, a, b$ $-2.4, b$ $3.6, a$



[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities :-

Q. Identify the numerical coefficients of terms (other than constants) in the following expressions :

(i) $5 - 3t^2$ (ii) $1 + t + t^2 + t^3$ (iii) $x + 2xy + 3y$

(iv) $100m + 1000n$ (v) $-p^2q^2 + 7pq$ (vi) $1.2a + 0.8b$

(vii) $3.14r^2$ (viii) $2(l+b)$ (ix) $0.1y + 0.01y^2$

Sol.

Expression	Terms	Coefficients
$-p^2q^2 + 7pq$	$-p^2q^2$ $7pq$	-1 7

[do other itself]



Q. Identify terms which contain y^2 and give the coefficient of y^2 .

(i) $8 - xy^2$ (ii) $5y^2 + 7x$ (iii) $2x^2y - 15xy^2 + 7y^2$

Sol. (iii) $2x^2y - 15xy^2 + 7y^2$

Terms containing y^2 are $-15xy^2$ and $7y^2$

Coefficient of y^2 are $-15x$ and 7



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and identities :-

Q. classify into monomials, binomials and trinomials.

(i) $4y - 7z$ (ii) y^2 (iii) $x+y-xy$ (iv) 100

(v) $ab-a-b$ (vi) $5-3t$ (vii) $4p^2q-4pq^2$ (viii) $7mn$

(ix) z^2-3z+8 (x) a^2+b^2 (xi) z^2+z (xii) $1+x+x^2$

Sol. (ii) y^2 - monomials (one term)

(vi) $5-3t$ - binomials (two terms)

(ix) z^2-3z+8 - trinomials (three terms)

[do other it self]



Q. State whether a given pair of terms is of like or unlike terms :

(i) $1, 100$ (ii) $-7x, \frac{5}{2}x$ (iii) $-29x, -29y$

(iv) $14xy, 42yx$ (v) $4m^2p, 4mp^2$ (vi) $12xz, 12x^2z^2$

Sol. [When variable are same in any order are like]

(iv) $14xy, 42yx$ Like terms

(v) $4m^2p, 4mp^2$ Unlike terms

(vi) $12xz, 12x^2z^2$ Unlike terms

(ii) $-7x, \frac{5}{2}x$ like terms



[do other it self]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

~! Algebraic expression and identities!~

Q. Identify like terms in the following :-

$$(a) -xy^2, -4x^2y, 8x^2, 2xy^2, 7y, -11x^2, -100x, -11yx, 20x^2y, -6x^2y, 2xy, 3x$$

$$(b) 10p^2, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -sp^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$$

$$\text{Sol. (a) } -xy^2, 2xy^2, -4x^2y, 20x^2y, 8x^2, -11x^2, -6x^2, 7y, y, -100x, 3x, -11xy, 2xy$$

[do other itself]



Q. Adding and subtraction like terms :-

$$(a) \quad 3x + 4x = (3 \times x) + (4 \times x) \\ = x(3+4) \\ = x(7) \\ = 7x$$



$$(b) \quad 7n - 4n = (7 \times n) - (4 \times n) \\ = n(7-4) \\ = n(3) \\ = 3n$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities:-

Q. Adding and Subtracting general algebraic Expressions:

(a) $3x+11$ and $7x-5$ (Sum)

$$= 3x+11 + 7x-5$$

$$= 3x+7x + 11-5$$

$$= 10x + 6$$

Hence, $3x+11+7x-5 = 10x+6$

(b) $3x+11+8z$ and $7x-5$

$$= 3x+11+8z+7x-5$$

$$= 3x+7x + 8z + 11-5$$

$$= 10x+8z+6$$

(c) $a-b$ from $3a-b+4$ [From means $-$]

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

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

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

$$= 2a+4$$

Ex (i) $m-n, m+n$ [Add and Subtract]

(ii) $mn+5-2, mn+3$ [Add and Subtract]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

:- Algebraic expression and identities :-

Q. Collect like terms and simplify the expression :

$$12m^2 - 9m + 5m - 4m^2 - 7m + 10$$

$$\begin{aligned} \text{Sol. } & 12m^2 - 9m + 5m - 4m^2 - 7m + 10 \\ &= 12m^2 - 4m^2 - 9m + 5m - 7m + 10 \\ &= (12-4)m^2 + (-9+5-7)m + 10 \\ &= 8m^2 - 11m + 10 \end{aligned}$$

Q. Subtract $24ab - 10b - 18a$ from $30ab + 12b + 14a$

$$\begin{aligned} \text{Sol. } & 30ab + 12b + 14a - (24ab - 10b - 18a) \\ &= 30ab + 12b + 14a - 24ab + 10b + 18a \\ &= 30ab - 24ab + 12b + 10b + 14a + 18a \\ &= (30-24)ab + (12+10)b + (14+18)a \\ &= 6ab + 22b + 32a \end{aligned}$$



Alternate method :-

$$\begin{array}{r} 30ab + 12b + 14a \\ 24ab - 10b - 18a \\ + \quad \quad \quad + \\ \hline 6ab + 22b + 32a \end{array}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities:-

Q. From the sum of $2y^2 + 3yz$, $-y^2 - yz - z^2$ and $yz + 2z^2$, subtract the sum of $3y^2 - z^2$ and $-y^2 + yz + z^2$.

[and (i) - (ii)]

Sol.

$$\begin{array}{r}
 2y^2 + 3yz \\
 -y^2 - yz - z^2 \\
 yz + 2z^2 \\
 \hline
 y^2 + 3yz + z^2
 \end{array}
 \quad \text{(Addition)} \quad \dots \text{(i)}$$

$$\begin{array}{r}
 3y^2 - z^2 \\
 -y^2 + z^2 + yz \\
 \hline
 2y^2 + yz
 \end{array}
 \quad \text{(Addition)} \quad \dots \text{(ii)}$$

Subtract Sum (ii) from Sum (i)

$$\begin{array}{r}
 y^2 + 3yz + z^2 \\
 -2y^2 + yz \\
 \hline
 -y^2 + 2yz + z^2
 \end{array}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

Algebraic expression and identities:-

Q. Simplify combining like terms:-

(i) $21b - 32 + 7b - 20b$

(ii) $-z^2 + 13z^2 - 5z + 7z^3 - 15z$

(iii) $p - (p - q) - q - (q - p)$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

(v) $5x^2y - 5x^2 + 3yx^2 - 3y^2 + x^2 - y^2 + 8xy^2 - 3y^2$

(vi) $(3y^2 + 5y - 4) - (8y - y^2 - 4)$

Sol. (iii) $p - (p - q) - q - (q - p)$

$$= p - p + q - q - q + p$$

$$= p - p + p + q - q - q$$

$$= p - q$$

(iv) $3a - 2b - ab - (a - b + ab) + 3ab + b - a$

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

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

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

$$= a + ab$$

~~a + a~~

$$= a(1 + b)$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

Algebraic expression and identities :-

Q. Add :-

(i) $3mn, -5mn, 8mn, -4mn$

(ii) $t-8tz, 3tz-z, z-t$

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

(iv) $a+b-3, b-a+3, a-b+3$

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

(vi) $5m-7n, 3n-4m+2, 2m-3mn-5$

(vii) $4x^2y, -3xy^2, -5xy^2, 5x^2y$

(viii) $3p^2q^2-4pq+5, -10p^2q^2, 15+9pq+7p^2q^2$

(ix) $ab-4a, 4b-ab, 4a-ab$

(x) $x^2-y^2-1, y^2-1-x^2, 1-x^2-y^2$

Sol.

(viii) $3p^2q^2-4pq+5, -10p^2q^2, 15+9pq+7p^2q^2$

$$= 3p^2q^2-4pq+5+(-10p^2q^2)+(15+9pq+7p^2q^2)$$

$$= 3p^2q^2-4pq+5-10p^2q^2+15+9pq+7p^2q^2$$

$$= 3p^2q^2-10p^2q^2+7p^2q^2-4pq+9pq+5+15$$

$$= (3-10+7)p^2q^2+(-4+9)pq+20$$

$$= (10-10)p^2q^2+5pq+20$$

$$= 5pq+20$$

[do other yourself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities :-

Q. Subtract :

- (i) $-5y^2$ from y^2
 (ii) $6xy$ from $-12xy$
 (iii) $(a-b)$ from $(a+b)$
 (iv) $a(b-s)$ from $b(s-a)$
 (v) $-m^2 + 5mn$ from $4m^2 - 3mn + 8$
 (vi) $-x^2 + 10x - 5$ from $5x - 10$
 (vii) $5a^2 - 7ab + 5b^2$ from $3ab - 2a^2 - 2b^2$
 (viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

Sol. (iv) $a(b-s)$ from $b(s-a)$

$$ab - sa \text{ from } sb - ab$$

$$sb - ab - (ab - sa)$$

$$sb - ab - ab + sa$$

$$sb - 2ab + sa$$

(viii) $4pq - 5q^2 - 3p^2$ from $5p^2 + 3q^2 - pq$

$$5p^2 + 3q^2 - pq - (4pq - 5q^2 - 3p^2)$$

$$5p^2 + 3q^2 - pq - 4pq + 5q^2 + 3p^2$$

$$5p^2 + 3p^2 + 3q^2 + 5q^2 - pq - 4pq$$

$$8p^2 + 8q^2 - 5pq$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities! -

Q. (a) What should be added to $x^2 + xy + y^2$ to obtain $2x^2 + 3xy$?(b) What should be subtracted from $2a + 8b + 10$ to get $-3a + 7b + 16$?Sol. (a) Let be added X

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

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

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

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

(b) Let be ^{Subtracted} ~~added~~ X

$$2a + 8b + 10 - X = -3a + 7b + 16$$

$$-X = -3a + 7b + 16 - 2a - 8b - 10$$

$$= -3a - 2a + 7b - 8b + 16 - 10$$

$$= -5a - b + 6$$



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities:-

Q. What should be taken away from $3x^2 - 4y^2 + 5xy + 20$ to obtain $-x^2 - y^2 + 6xy + 20$ (away means घटाना)

Ans. Let required term α

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

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

$$-\alpha = -4x^2 + 3y^2 + xy$$

$$\alpha = 4x^2 - 3y^2 - xy$$



Q. (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 $-x^2 + 2x + 5$

$$\text{Ans. (b) Sum} = 4 + 3x + 5 - 4x + 2x^2 \\ = 2x^2 - x + 9$$



$$\text{Sum} = 3x^2 - 5x - x^2 + 2x + 5 \\ = 2x^2 - 3x + 5$$

$$\text{Subtract} = 2x^2 - x + 9 - (2x^2 - 3x + 5) \\ = 2x^2 - x + 9 - 2x^2 + 3x - 5 \\ = 2x + 4$$

[Other do it self]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

- Algebraic Expression and Identities! -

Q. Find the values of the following expressions for $x=2$.

(i) $x+4$ (ii) $4x-3$ (iii) $19-5x^2$ (iv) $100-10x^3$

Sol. (iii) $19-5x^2$ [$x=2$]

$$= 19-5 \times 2^2$$

$$= 19-5 \times 4$$

$$= 19-20$$

$$= -1$$

[do other itself]

Q. Find the value of the following expressions when $n=-2$

(i) $5n-2$ (ii) $5n^2+5n-2$ (iii) n^3+5n^2+5n-2

Sol. (ii) $5n^2+5n-2$ [$n=-2$]

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

$$= 5 \times 4 + 5 \times (-2) - 2$$

$$= 20 - 10 - 2$$

$$= 20 - 12$$

$$= 8$$

[do other itself]



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

~ Algebraic Expression and Identities! -

Q. Find the value of the following expressions for $a=3, b=2$.(i) $a+b$ (ii) $7a-4b$ (iii) $a^2+2ab+b^2$ (iv) a^3-b^3 Sol. (iv) a^3-b^3 $[a=3, b=2]$

$$= 3^3 - 2^3$$

$$= 27 - 8$$

$$= 19 \quad [\text{do other itself}]$$

Q. If $m=2$, find the value of:(i) $m-2$ (ii) $3m-5$ (iii) $9-5m$ (iv) $3m^2-2m-7$

$$(v) \frac{5m}{2} - 4$$

Sol. (iv) $3m^2-2m-7$ $[m=2]$

$$= 3 \times 2^2 - 2 \times 2 - 7$$

$$= 3 \times 4 - 4 - 7$$

$$= 12 - 11$$

$$= 1 \quad [\text{do other itself}]$$



$$(v) \frac{5m}{2} - 4 \quad [m=2]$$

$$= \frac{5 \times 2}{2} - 4$$

$$= 5 - 4$$

$$= 1 \quad [\text{do other itself}]$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

Algebraic expression and identities :-

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

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

Sol. (iii) $-2p^3-3p^2+4p+7$ [$p = -2$]

$$= -2 \times (-2)^3 - 3 \times (-2)^2 + 4 \times (-2) + 7$$

$$= -2 \times -8 - 3 \times 4 - 8 + 7$$

$$= 16 - 12 - 8 + 7$$

$$= 23 - 20$$

$$= 3 \quad [\text{do other itself}]$$

Q. Find the value of the following expression, when $x = -1$:

(i) $2x-7$ (ii) $-x+2$ (iii) x^2+2x+1 (iv) $2x^2-x-2$

Sol. (iii) x^2+2x+1 [$x = -1$]

$$= (-1)^2 + 2 \times (-1) + 1$$

$$= 1 - 2 + 1$$

$$= 2 - 2$$

$$= 0 \quad [\text{do other itself}]$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities :-

Q. 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. (ii) a^2+ab+b^2 [$a=2$, $b=-2$]

$$= (2)^2 + 2 \times -2 + (-2)^2$$

$$= 4 - 4 + 4$$

$$= 4 \text{ [do other itself]}$$

Q. 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. (iii) $2a^2b+2ab^2+ab$ [$a=0$, $b=-1$]

$$= 2 \times (0)^2 \times (-1) + 2 \times (0) \times (-1)^2 + 0 \times (-1)$$

$$= 0 + 0 + 0$$

$$= 0$$



(iv) a^2+ab+2 [$a=0$, $b=-1$]

$$= (0)^2 + 0 \times -1 + 2$$

$$= 0 + 0 + 2$$

$$= 2 \text{ [do other itself]}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities :-

Q. 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. (iv) $4(2x-1)+3x+11$

$= 8x-4+3x+11$

$= 11x+7$

$= 11 \times 2+7$

$= 22+7$

$= 29$

Q. Simplify these expression and find their values if $x=3$, $a=-1$, $b=-2$

(i) $3x-5-x+9$ (ii) $3(x+2)+5x-7$

(iii) $2-8x+4x+4$ (iv) $3a+5-8a+1$

(v) $10-3b-4-5b$ (vi) $2a-2b-4-5+a$

Sol. (iii) $2-8x+4x+4$

$= 6-4x$ [$x=3$]

$= 6-4 \times 3$

$= 6-12$

$= -6$

[do other itself]



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities :-

Q. (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. (ii) $p^2 - 2p - 100$ [$p=-10$]

$$= (-10)^2 - 2(-10) - 100$$

$$= 100 + 20 - 100$$

$$= 20 \text{ [do other itself]}$$

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

$$\text{Sol. } 2x^2 + x - a = 5$$

$$2x(0)^2 + (0) - a = 5$$

$$-a = 5$$

$$\boxed{a = -5}$$



Q. Simplify the expression and find its value when

$$a=5, b=-3, 2(a^2 + ab) + 3 - ab$$

$$\text{Sol. } 2(a^2 + ab) + 3 - ab$$

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

$$= 2(25 + 15) + 3 + 15$$

$$= 2 \times 40 + 18$$

$$= 80 + 18$$

$$= 98$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities :-

Q. Add $7xy + 5yz - 3zx$, $4yz + 9zx - 4y$, $-3xz$
 $+ 5x - 2xy$.

Sol.

$$\begin{array}{r}
 7xy + 5yz - 3zx + 0 + 0 \\
 + 0 + 4yz + 9zx - 4y + 0 \\
 - 2xy + 0 - 3xz + 0 + 5x \\
 \hline
 5xy + 9yz + 3zx - 4y + 5x
 \end{array}$$

[Note: xz is same as zx]

Q. Subtract $5x^2 - 4y^2 + 6y - 3$ from $7x^2 - 4xy + 8y^2 + 5x - 3y$

Sol.

$$\begin{array}{r}
 7x^2 - 4xy + 8y^2 + 5x - 3y + 0 \\
 5x^2 + 0 - 4y^2 + 0 + 6y - 3 \\
 - \quad - \quad + \quad - \quad - \quad + \\
 \hline
 2x^2 - 4xy + 12y^2 + 5x - 9y + 3
 \end{array}$$



Q. Identify the terms, their coefficient for each of the following expressions

(i) $5xyz^2 - 3zy$ (ii) $1 + x + x^2$ (iii) $4x^2y^2 = 4x^2y^2z^2 + z^2$

(iv) $3 - pz + 2x - xp$ (v) $\frac{x}{2} + \frac{y}{2} - xy$ (vi) $0.3a - 0.6ab + 0.5b$

Sol. (i) $5xyz^2 - 3zy$
 Terms $5xyz^2$, $-3zy$
 Coefficient 5, -3

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expression and identities! -

Q. classify the following polynomials as monomials, binomials, trinomials, which polynomials do not fit in any of these three categories?

$x+y$, 1000 , $x+x^2+x^3+x^4$, $7+y+5x$, $2y-3y^2$,
 $2y-3y^2+4y^3$, $5x-4y+3xy$, $4z-15z^2$, $ab+bc+cd+da$,
 pqr , p^2q+pq^2 , $2p+2q$

Sol. $x+y$ - binomial
 $x+x^2+x^3+x^4$ - polynomial
 $7+y+5x$ - Trinomial
 1000 - monomial

[do other itself]

Q. Add the following :-

- (i) $ab-bc, bc-ca, ca-ab$
 (ii) $a-b+ab, b-c+bc, c-a+ac$
 (iii) $2p^2q^2-3pq+4, 5+7pq-3p^2q^2$
 (iv) $l^2+m^2, m^2+n^2, n^2+l^2, 2lm+2mn+2nl$

Sol.
$$\begin{array}{r} l^2 + m^2 \\ m^2 + n^2 \\ l^2 + n^2 \\ \hline 2l^2 + 2m^2 + 2n^2 + 2lm + 2mn + 2nl \end{array}$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities :-

Q. (a) Subtract :

$$4a - 7ab + 3b + 12 \text{ from } 12a - 9ab + 5b - 3$$

(b) Subtract :

$$3xy + 5yz - 7zx \text{ from } 5xy - 2yz - 2zx + 10xyz$$

(c) Subtract :

$$4p^2q - 3pq + 5p^2 - 8p + 7q - 10 \text{ from } 18 - 3p - 11q + 5pq - 2p^2 + 5p^2q$$

Sol. (c)

$$\begin{array}{r} 18 - 3p - 11q + 5pq - 2p^2 + 5p^2q \\ - 10 - 8p + 7q - 3pq + 5p^2 - 4p^2q \\ + \quad + \quad - \quad + \quad - \quad - \\ \hline 28 + 5p - 18q + 8pq - 7p^2 + p^2q \end{array}$$

Alternate :

$$\begin{aligned} &= 18 - 3p - 11q + 5pq - 2p^2 + 5p^2q - (4p^2q - 3pq \\ &\quad + 5p^2 - 8p + 7q - 10) \\ &= 18 - 3p - 11q + 5pq - 2p^2 + 5p^2q - 4p^2q + 3pq \\ &\quad - 5p^2 + 8p - 7q + 10 \\ &= 18 + 10 - 3p + 8p - 11q - 7q + 5pq + 3pq - 2p^2 - 5p^2 \\ &\quad + 5p^2q - 4p^2q \\ &= 28 + 5p - 18q + 8pq - 7p^2 + p^2q \end{aligned}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities:-

Q. Complete the table for area of a rectangle with given length and breadth.

Sol.

length	breadth	area
$3x$	$5y$	$3x \times 5y = 15xy$
$9y$	$4y^2$	$9y \times 4y^2 = 36y^3$
$4ab$	$5bc$	$5bc \times 4ab = 20ab^2c$
$2l^2m$	$3lm^2$	$3l^2m \times 3lm^2 = 9l^3m^3$

Q. Find the volume of each rectangular box with given length, breadth and height.

	length	breadth	Height
(a)	$29x$	$3by$	$5cz$
(b)	m^2n	n^2p	p^2m
(c)	$2q$	$4q^2$	$8q^3$

Sol.

$$\begin{aligned}
 \text{(a) Volume} &= \text{length} \times \text{breadth} \times \text{height} \\
 &= 29x \times 3by \times 5cz \\
 &= 2 \times 3 \times 5 \times x \times b \times c \times x \times y \times z \\
 &= 30abcxyz
 \end{aligned}$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

Algebraic expressions and identities.

Q. Find the areas of rectangles with the following pairs of monomials as their lengths and breadths respectively.

(a) (p, q) (10m, 5n) (c) $(4x, 3x^2)$

(b) $(20x^2, 5y^2)$ (d) $(3mn, 4np)$

Sol. (b) $20x^2, 5y^2$

$$\begin{aligned}
 \text{Area of rectangle} &= \text{length} \times \text{breadth} \\
 &= 20x^2 \times 5y^2 \\
 &= 20 \times 5 \times x^2 \times y^2 \\
 &= 100x^2y^2
 \end{aligned}$$



[do other itself]

Q. Obtain the volume of rectangle box with the following length, breadth and height respectively.

(i) $3a, 2a^2, 7a^4$ (ii) $2p, 4q, 8r$

(iii) $xy, 2x^2y, 2xy^2$ (iv) $a, 2b, 3c$



Sol. (iii)

$$\begin{aligned}
 \text{Volume of rectangular box} &= \text{length} \times \text{breadth} \times \text{height} \\
 &= xy \times 2x^2y \times 2xy^2 \\
 &= x^{1+2+1} y^{1+1+2} \\
 &= x^4 y^4
 \end{aligned}$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expressions and Identities:-

Q. Obtain the product of:

(i) xy, yz, zx (ii) $a, -a^2, a^3$ (iii) $2, 4y, 8y^2, 16y^3$

(iv) $a, 2b, 3c, 6abc$ (v) $m, -mn, mnp$

Sol. (iv) $a, 2b, 3c, 6abc$ (product means multiply)

$$= a \times 2b \times 3c \times 6abc$$

$$= 2 \times 3 \times 6 \times a \times a \times b \times b \times c \times c$$

$$= 36a^2b^2c^2$$

[do other itself]



Q. Find the product:

(i) $(a^2) \times (2a^{22}) \times (4a^{26})$ (ii) $\left(\frac{2}{3}xy\right) \times \left(-\frac{9}{10}x^2y^2\right)$

(iii) $\left(-\frac{10}{3}p^2q^3\right) \times \left(\frac{6}{5}p^3q^2\right)$ (iv) $x \times x^2 \times x^3 \times x^4$

Sol. (iii) $\left(-\frac{10}{3}p^2q^3\right) \times \left(\frac{6}{5}p^3q^2\right)$

$$-\frac{10^2}{3} \times \frac{6^2}{5} \times p \times p^3 \times q^3 \times q^2$$

$$-2 \times 2 \times p^4 \times q^4$$

$$-4p^4q^4$$

[do other itself]



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

- Algebraic expression and identities :-

Q. (a) simplify $3x(4x-5)+3$ and find its values for
(i) $x=3$ (ii) $x=\frac{1}{2}$

(b) simplify $a(a^2+a+1)+5$ and find its value for
(i) $a=0$ (ii) $a=1$ (iii) $a=-1$

Sol. (b) (i) put $a=0$

$$= a(a^2+a+1)+5$$

$$= 0[(0)^2+0+1]+5$$

$$= 0[1]+5$$

$$= 0+5$$

$$= 5$$

(ii) $a=1$

$$= a(a^2+a+1)+5$$

$$= 1[(1)^2+1+1]+5$$

$$= 1[1+1+1]+5$$

$$= 1 \times 3 + 5$$

$$= 3+5$$

$$= 8$$

other do itself.



DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities:-

Q. (a) Add: $p(p-q)$, $q(q-r)$ and $r(r-p)$

(b) Add: $2x(z-x-y)$ and $2y(z-y-x)$

(c) Subtract: $3l(l-4m+5n)$ from $4l(10n-3m+2l)$

(d) Subtract: $3a(a+b+c) - 2b(a-b+c)$ from $4c(-a+b+c)$

Sol. (b) $2x(z-x-y) + 2y(z-y-x)$

$$= 2xz - 2x^2 - 2xy + 2yz - 2y^2 - 2xy$$

$$= 2xz - 2x^2 - 4xy + 2yz - 2y^2$$

(d) $4c(-a+b+c) - [3a(a+b+c) - 2b(a-b+c)]$

$$-4ac + 4bc + 4c^2 - [3a^2 + 3ab + 3ac - 2ab + 2b^2 - 2bc]$$

$$-4ac + 4bc + 4c^2 - 3a^2 - 3ab - 3ac + 2ab - 2b^2 + 2bc$$

$$-7ac + 6bc + 4c^2 - 3a^2 - ab - 2b^2$$

[do other it self]

Q. Find the product:

(i) $(5-2x)(3+x)$

(ii) $(x+7y)(7x-y)$

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

(iv) $(p^2-q^2)(2p+q)$

Sol. do it self.

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities :-

Q. multiply the binomials :-

(i) $(2x+5)$ and $(4x-3)$ (ii) $(y-8)$ and $(3y-4)$

(iii) $(2.5l - 0.5m)$ and $(2.5l + 0.5m)$

(iv) $(a+3b)$ and $(a+5)$

(v) $(3p^2 + 2q^2)$ and $(3p^2 - 2q^2)$

(vi) $(\frac{3}{4}a^2 + 3b^2)$ and $4(a^2 - \frac{2}{3}b^2)$



Sol.

(iii) $(2.5l - 0.5m) \times (2.5l + 0.5m)$

[Use formula: $(a-b)(a+b) = a^2 - b^2$]

$$= (2.5l)^2 - (0.5m)^2$$

$$= 6.25l^2 - 0.25m^2$$



(vi) $(\frac{3}{4}a^2 + 3b^2) \times (4a^2 - \frac{8}{3}b^2)$

$$(\frac{3}{4}a^2 + 3b^2) \times (4a^2 - \frac{8}{3}b^2)$$

$$\frac{3}{4}a^2(4a^2 - \frac{8}{3}b^2) + 3b^2(4a^2 - \frac{8}{3}b^2)$$

$$3a^4 - 2a^2b^2 + 12a^2b^2 - 8b^4$$

$$3a^4 + 10a^2b^2 - 8b^4 \quad [\text{do other it-self}]$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

-! Algebraic expression and identities!-

Q. Simplify :

(i) $(x^2 - 5)(x + 5) + 25$

(ii) $(a^2 + 5)(b^2 + 3) + 5$

(iii) $(t + 8^2)(t^2 - 8)$

(iv) $(a + b)(c - d) + (a - b)(c + d) + 2(ac + bd)$

(v) $(x + y)(2x + y) + (x + 2y)(x - y)$

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

(vii) $(1.5x - 4y)(1.5x + 4y + 3) - 4.5x + 12y$

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

Sol. (i) $(x^2 - 5)(x + 5) + 25$

$$= x^2(x + 5) - 5(x + 5) + 25$$

$$= x^3 + 5x^2 - 5x - 25 + 25$$

$$= x^3 + 5x^2 - 5x$$

(iii) $(t + 8^2)(t^2 - 8)$

$$= t(t^2 - 8) + 8^2(t^2 - 8)$$

$$= t^3 - 8t + 8^2t^2 - 8^3$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities :-

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

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

$$= x^3 - \cancel{x^2y} + \cancel{xy^2} + \cancel{xy^2} - \cancel{xy^2} + y^3$$

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



$$(vii) (1.5x-4y)(1.5x+4y+3) - 4.5x + 12y$$

$$= 1.5x(1.5x+4y+3) - 4y(1.5x+4y+3) - 4.5x + 12y$$

$$= 2.25x^2 + 6.0xy + 4.5x - 6.0xy - 16y^2 - 12y - 4.5x + 12y$$

$$= 2.25x^2 - 16y^2$$



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

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

$$= a^2 + ab - ac + ab + b^2 - bc + ac + bc - c^2$$

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

$$(ix) (t+s)(t^2-s^2) \text{ [Extra]}$$

$$= t(t^2-s^2) + s(t^2-s^2)$$

$$= t^3 - s^2t + st^2 - s^3$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expression and identities :-

Q. Use a suitable identity to get each of the following product :

(i) $(x+3)(x+3)$ (ii) $(2y+5)(2y+5)$

(iii) $(2a-7)(2a-7)$ (iv) $(3a-\frac{1}{2})(3a-\frac{1}{2})$

(v) $(1.1m-0.4)(1.1m+0.4)$ (vi) $(a^2+b^2)(-a^2+b^2)$

(vii) $(-a+c)(-a+c)$ (viii) $(6x-7)(6x+7)$

(ix) $(\frac{x}{2} + \frac{3y}{4})(\frac{x}{2} + \frac{3y}{4})$ (x) $(7a-9b)(7a-9b)$

Sol. (i) $(x+3)(x+3) = (x+3)^2$

[Formula: $(a+b)^2 = a^2 + 2ab + b^2$]

$$\begin{aligned}(x+3)^2 &= (x)^2 + 2 \cdot x \cdot 3 + (3)^2 \\ &= x^2 + 6x + 9\end{aligned}$$

(iii) $(2a-7)(2a-7) = (2a-7)^2$

[Formula: $(a-b)^2 = a^2 - 2ab + b^2$]

$$\begin{aligned}(2a-7)^2 &= (2a)^2 - 2 \cdot 2a \cdot 7 + (7)^2 \\ &= 4a^2 - 28a + 49\end{aligned}$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and Identities :-

$$Q(v) (1.1m - 0.4) (1.1m + 0.4)$$

$$\text{Formula : } (a-b)(a+b) = a^2 - b^2$$

$$= (1.1m - 0.4)(1.1m + 0.4)$$

$$= (1.1m)^2 - (0.4)^2$$

$$= 1.21m^2 - 0.16$$



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

$$[\text{Formula : } (a+b)(a-b) = a^2 - b^2]$$

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

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

$$= b^4 - a^4$$



$$(ix) \left(\frac{x}{2} + \frac{3y}{4}\right) \left(\frac{x}{2} + \frac{3y}{4}\right) = \left(\frac{x}{2} + \frac{3y}{4}\right)^2$$

$$[\text{Formula : } (a+b)^2 = a^2 + 2ab + b^2]$$

$$= \left(\frac{x}{2} + \frac{3y}{4}\right)^2$$

$$= \left(\frac{x}{2}\right)^2 + 2 \cdot \frac{x}{2} \cdot \frac{3y}{4} + \left(\frac{3y}{4}\right)^2$$

$$= \frac{x^2}{4} + \frac{3xy}{4} + \frac{9y^2}{16} \quad [\text{do other itself}]$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expression and identities :-

Q. Use the identity $(x+a)(x+b) = x^2 + (a+b)x + ab$ to find the following products:

(a) $(x+3)(x+7)$ (ii) $(4x+5)(4x+1)$

(c) $(4x-5)(4x-1)$ (d) $(4x+5)(4x-1)$

(e) $(2x+5y)(2x+3y)$ (f) $(2a^2+9)(2a^2+5)$

(g) $(xyz-4)(xyz-2)$

sol. (ii) $(4x+5)(4x+1)$



[Formula: $(x+a)(x+b) = x^2 + (a+b)x + ab$]

$$= (4x+5)(4x+1)$$

$$= (4x)^2 + (5+1) \cdot 4x + 5 \times 1$$

$$= 16x^2 + 24x + 5$$

(g) $(xyz-4)(xyz-2)$



[Formula: $(x+a)(x+b) = x^2 + (a+b) \cdot x + ab$]

$$(xyz-4)(xyz-2)$$

$$(xyz)^2 + (-4-2) \cdot xyz + (-4) \times (-2)$$

$$x^2y^2z^2 - 6xyz + 8$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

-! Algebraic expression and identities!-

Q. Find the following squares by using the identities:

(i) $(b-7)^2$ (ii) $(xy-3z)^2$ (iii) $(6x^2-sy)^2$

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2$ (v) $(0.4p - 0.5q)^2$ (vi) $(2xy + sy)^2$

Sol. (iii) $(6x^2 - sy)^2$

[Formula: $(a-b)^2 = a^2 - 2ab + b^2$]

$$= (6x^2 - sy)^2$$

$$= (6x^2)^2 - 2 \cdot 6x^2 \cdot sy + (sy)^2$$

$$= 36x^4 - 60x^2y + 25y^2$$

(iv) $\left(\frac{2}{3}m + \frac{3}{2}n\right)^2$

[Formula: $(a+b)^2 = a^2 + 2ab + b^2$]

$$= \left(\frac{2}{3}m + \frac{3}{2}n\right)^2$$

$$= \left(\frac{2}{3}m\right)^2 + 2 \cdot \frac{2}{3}m \cdot \frac{3}{2}n + \left(\frac{3}{2}n\right)^2$$

$$= \frac{4}{9}m^2 + 2mn + \frac{9}{4}n^2$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

~! Algebraic Expressions and Identities! -

Q. Simplify :-

(i) $(a^2 - b^2)^2$

(ii) $(2x+5)^2 - (2x-5)^2$

(iii) $(7m-8n)^2 + (7m+8n)^2$ (iv) $(4m+5n)^2 + (5m+4n)^2$

(v) $(2.5p-1.5q)^2 - (1.5p-2.5q)^2$ (vi) $(ab+bc)^2 - 2ab^2c$

(vii) $(m^2-n^2m)^2 + 2m^3n^2$

Sol. (i) $(a^2 - b^2)^2$

[Formula: $(a-b)^2 = a^2 - 2ab + b^2$]

$$= (a^2)^2 - 2 \cdot a^2 \cdot b^2 + (b^2)^2$$

$$= a^4 - 2a^2b^2 + b^4$$



(ii) $(2x+5)^2 - (2x-5)^2$

[Formula: $(a+b)^2 = a^2 + 2ab + b^2$, $(a-b)^2 = a^2 - 2ab + b^2$]

$$= (2x)^2 + 2 \cdot 2x \cdot 5 + 5^2 - [(2x)^2 - 2 \cdot 2x \cdot 5 + 5^2]$$

$$= 4x^2 + 20x + 25 - [4x^2 - 20x + 25]$$

$$= 40x$$



(vi) $(ab+bc)^2 - 2ab^2c$

[Formula: $(a+b)^2 = a^2 + 2ab + b^2$]

$$= (ab)^2 + 2 \cdot ab \cdot bc + (bc)^2 - 2ab^2c$$

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

$$= a^2b^2 + b^2c^2 \quad [\text{Other do itself}]$$

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic expressions and identities! -

Q. Show that -

(i) $(3x+7)^2 - 84x = (3x-7)^2$

(ii) $(9p-5q)^2 + 180pq = (9p+5q)^2$

(iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

(iv) $(4p+3q)^2 - (4p-3q)^2 = 48pq$

(v) $(a-b)(a+b) + (b-c)(b+c) + (c-a)(c+a) = 0$

Sol. (iii) $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn = \frac{16}{9}m^2 + \frac{9}{16}n^2$

LHS = $\left(\frac{4}{3}m - \frac{3}{4}n\right)^2 + 2mn$

$$= \left(\frac{4}{3}m\right)^2 - 2 \times \frac{4}{3}m \times \frac{3}{4}n + \left(\frac{3}{4}n\right)^2 + 2mn$$

$$= \frac{16}{9}m^2 - 2mn + \frac{9}{16}n^2 + 2mn$$

$$= \frac{16}{9}m^2 + \frac{9}{16}n^2 = \text{RHS} \quad \text{Proved}$$

(v) $(a-b)(a+b) + (b-c)(b+c) + (c-a)(c+a) = 0$

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

$$= a^2 + ab - ab - b^2 + b^2 + bc - bc - c^2 + c^2 + ac - ac - a^2$$

$$= 0 = \text{RHS} \quad \text{Proved.}$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

- Algebraic expression and identities! -

Q. Using identities, Evaluate!

(i) 71^2 (ii) 99^2 (iii) 102^2 (iv) 998^2

(v) 5.2^2 (vi) 297×303 (vii) 78×82 (viii) 8.9^2

(ix) 10.5×9.5

Sol. (v) $5.2^2 = [5 + 0.2]^2$

[Formula: $(a+b)^2 = a^2 + 2ab + b^2$]

$$= (5)^2 + 2 \times 5 \times 0.2 + (0.2)^2$$

$$= 25 + 2.0 + 0.04$$

$$= 27.04$$



(vi) $297 \times 303 = (300-3)(300+3)$

[Formula: $(a-b)(a+b) = a^2 - b^2$]

$$= (300)^2 - (3)^2$$

$$= 90000 - 9$$

$$= 8991$$



(ix) $10.5 \times 9.5 = (10+0.5)(10-0.5)$

Formula: $(a+b)(a-b) = a^2 - b^2$

$$= (10)^2 - (0.5)^2$$

$$= 100 - 0.25$$

$$= 99.75$$

[do other itself]

DPM CLASSES

6th to 10th (Math's & Science), 11th & 12th (Physics, Chemistry, Math's)

∴ Algebraic Expression and identities -

Q. Using $a^2 - b^2 = (a+b)(a-b)$, find :

(i) $51^2 - 49^2$ (ii) $(1.02)^2 - (0.98)^2$ (iii) $153^2 - 147^2$

(iv) $12.1^2 - 7.9^2$

Sol. (iv) $12.1^2 - 7.9^2$ [formula: $a^2 - b^2 = (a+b)(a-b)$]

$$= (12.1 + 7.9)(12.1 - 7.9)$$

$$= 20 \times 4.2$$

$$= 84.0$$

$$= 84 \text{ [do other itself]}$$

Q. Using $(x+a)(x+b) = x^2 + (a+b)x + ab$ Find :

(i) 103×104 (ii) 5.1×5.2 (iii) 103×98

(iv) 9.7×9.8

Sol. (iv) $9.7 \times 9.8 = (9 + 0.7)(9 + 0.8)$

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

$$= (9)^2 + (0.7 + 0.8) \times 9 + 0.7 \times 0.8$$

$$= 81 + 1.5 \times 9 + 0.56$$

$$= 81 + 13.5 + 0.56$$

$$= 95.06$$

$$\begin{array}{r} 81.00 \\ + 13.50 \\ + 00.56 \\ \hline 95.06 \end{array}$$

[do other itself]

