General instructions for students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.

MATHS   **3. EXPANSIONS**   **STD. IX**

Special products

1. $(a+b)^2 = a^2 + 2ab + b^2$
2. $(a-b)^2 = a^2 - 2ab + b^2$
3. $(a+b)(a-b) = a^2 - b^2$
4. $(a+\frac{1}{a})^2 = a^2 + \frac{1}{a^2} + 2$
5. $(a-\frac{1}{a})^2 = a^2 + \frac{1}{a^2} - 2$
6. $(a+\frac{1}{a})(a-\frac{1}{a}) = a^2 - \frac{1}{a^2}$
7.   i) $(x+a)(x+b) = x^2 + (a+b)x + ab$ ii) $(x+a)(x-b) = x^2 + (a-b)x - ab$
         iii) $(x-a)(x+b) = x^2 - (a-b)x - ab$ iv) $(x-a)(x-b) = x^2 - (a+b)x + ab$
8. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
9. $(a+b)^3 = a^3 + b^3 + 3ab(a+b) = a^3 + b^3 + 3a^2b + 3ab^2$
10. $(a-b)^3 = a^3 - b^3 - 3ab(a-b) = a^3 - b^3 - 3a^2b + 3ab^2$
11. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
12. $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
13. $a^3 + b^3 + c^3 - 3abc = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ca)$
14. $(x+a)(x+b)(x+c) = x^3 + (a+b+c)x^2 + (ab+bc+ca)x + abc$
15. If $a+b+c = 0$, then $a^3 + b^3 + c^3 = 3abc$

For Example:

Expand the following:

1.   Given: $(2x + 7y)^2$ Using $(a+b)^2 = a^2 + 2ab + b^2$

            $= (2x)^2 + 2(2x)(7y) + (7y)^2$

            $= 4x^2 + 28xy + 49y^2$

2.   Given: $(10.2)^2 = (10 + 0.2)^2$ Using $(a+b)^2 = a^2 + 2ab + b^2$

            $= (10)^2 + 2(10)(0.2) + (0.2)^2$

            $= 100 + 4 + 0.04$

            $= 104.04$

3.   Given: $(3x - 4y)^2$ Using $(a-b)^2 = a^2 - 2ab + b^2$

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

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

4. Given: $(9.8)^2 = (10 - 0.2)^2$ **Using** $(a - b)^2 = a^2 - 2ab + b^2$

$$= (10)^2 - 2(10)(0.2) + (0.2)^2$$

$$= 100 - 4 + 0.04$$

$$= 96.04$$

5. Given: $(3x - 2y)(3x + 2y)(9x^2 + 4y^2)$ **Using** $(a + b)(a - b) = a^2 - b^2$

$$= \{(3x)^2 - (2y)^2\}(9x^2 + 4y^2)$$

$$= (9x^2 - 4y^2)(9x^2 + 4y^2)$$

$$= 81x^4 - 16y^4$$

6. Given: $(a + \frac{1}{a})^2 - (a - \frac{1}{a})^2$ **Using** $(a + b)(a - b) = a^2 - b^2$

$$= (a + \frac{1}{a} + a - \frac{1}{a})(a + \frac{1}{a} - a + \frac{1}{a})$$

$$= (2a)\left(\frac{2}{a}\right)$$

$$= 4$$

7. Given: $(x + 3)(x + 5)$ **Using** $(x + a)(x + b) = x^2 + (a + b)x + ab$

$$= x^2 + (3 + 5)x + (3)(5)$$

$$= x^2 + 8x + 15$$

8. Given: $(x + 5)(x - 3)$ **Using** $(x + a)(x + b) = x^2 + (a + b)x + ab$

$$= (x + 5)\{x + (-3)\} = x^2 + \{5 + (-3)\}x + (5)(-3)$$

$$= x^2 + 2x - 15$$

9. Given: $(2x + 3y - z)^2$ **Using** $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

$$= \{2x + 3y + (-z)^2\}$$

$$= (2x)^2 + (3y)^2 + (-z)^2 + 2\{(2x)(3y) + (3y)(-z) + (-z)(2x)\}$$

$$= 4x^2 + 9y^2 + z^2 + 2(6xy - 3yz - 2zx)$$

10. Given: $(2a + 3b)^3$ **Using** $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$

$$= (2a)^3 + (3b)^3 + 3(2a)(3b)(2a + 3b)$$

$$= 8a^3 + 27b^3 + 18ab(2a + 3b)$$

$$= 8a^3 + 27b^3 + 36a^2b + 54ab^2$$

11. Given: $(3x + 5y)(9x^2 - 15xy + 25y^2)$ **Using** $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

$$= (3x + 5y)\{(3x)^2 - (3x)(5y) + (5y)^2\}$$

$$= (3x)^3 + (5y)^3$$

$$= 27x^3 + 125y^3$$

12. Given: $(2x + 3y + 4z)(4x^2 + 9y^2 + 16z^2 - 6xy - 12yz - 8zx)$

Using $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$

$= (2x + 3y + 4z)\{(2x)^2 + (3y)^2 + (4z)^2 - (2x)(3y) - (3y)(4z) - (4z)(2x)\}$

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

$= 8x^3 + 27y^3 + 64z^3 - 72xyz$

13. Given: $(x + 2)(x - 3)(x - 4)$

$= (x + 2)\{x + (-3)\}\{x + (-4)\}$

Using $(x + a)(x + b)(x + c) = x^3 + (a + b + c)x^2 + (ab + bc + ca)x + abc$

$= x^3 + \{(2 + (-3) + (-4)\}x^2 + \{(2)(-3) + (-3)(-4) + (-4)(2)\}x + (2)(-3)(-4)$

$= x^3 - 5x^2 - 2x + 24$

14. If $a + b + c = 0$, then find the value of $\dfrac{a^2}{bc} + \dfrac{b^2}{ca} + \dfrac{c^2}{ab}$

Given: $a + b + c = 0 \implies a^3 + b^3 + c^3 = 3abc$

$\implies \dfrac{a^3}{abc} + \dfrac{b^3}{abc} + \dfrac{c^3}{abc} = 3$

$\implies \dfrac{a^2}{bc} + \dfrac{b^2}{ca} + \dfrac{c^2}{ab} = 3$ **Ans.**

ASSIGNMENT -V

EXERCISE – 3.1

QUESTION NUMBERS: 2 (i) (ii); 4 (ii), (iii);   6 (i), (ii);   9 (i), (ii); 10 (i), (ii)

13 (i), (ii);   17 (i), (ii);   22,   27, 29, 30 (i),(ii) and 31

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