

RD SHARMA

Solutions

Class 9 Maths

Chapter 5

Ex 5.2

$$Q 1 . p^3 + 27$$

SOLUTION :

$$= p^3 + 3^3 \quad \because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (p + 3)(p^2 - 3p - 9)$$

$$\therefore p^3 + 27 = (p + 3)(p^2 - 3p - 9)$$

$$Q 2 . y^3 + 125$$

SOLUTION :

$$= y^3 + 5^3 \quad \because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (y + 5)(y^2 - 5y + 5^2)$$

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

$$\therefore y^3 + 125 = (y + 5)(y^2 - 5y + 25)$$

$$Q 3 . 1 - 27a^3$$

SOLUTION :

$$= (1)^3 - (3a)^3$$

$$= (1 - 3a)(1^2 + 1 \times 3a + (3a)^2) \quad \because [a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (1 - 3a)(1^2 + 3a + 9a^2)$$

$$\therefore 1 - 27a^3 = (1 - 3a)(1^2 + 3a + 9a^2)$$

$$Q 4 . 8x^3y^3 + 27a^3$$

SOLUTION :

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

$$= (2xy + 3a)((2xy)^2 - 2xy \times 3a + (3a)^2) \quad \because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (2xy + 3a)(4x^2y^2 - 6xya + 9a^2)$$

$$\therefore 8x^3y^3 + 27a^3 = (2xy + 3a)(4x^2y^2 - 6xya + 9a^2)$$

$$Q 5 . 64a^3 - b^3$$

SOLUTION :

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

$$= (4a - b)((4a)^2 + 4a \times b + b^2) \quad \because [a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (4a - b)(16a^2 + 4ab + b^2)$$

$$\therefore 64a^3 - b^3 = (4a - b)(16a^2 + 4ab + b^2)$$

$$\text{Q 6. } \frac{x^3}{216} - 8y^3$$

SOLUTION :

$$= \frac{x^3}{6^3} - (2y)^3$$

$$= \left(\frac{x}{6} - 2y\right) \left(\left(\frac{x}{6}\right)^2 + \frac{x}{6} \times 2y + (2y)^2\right) \quad \because [x^3 - y^3 = (x - y)(x^2 + xy + y^2)]$$

$$= \left(\frac{x}{6} - 2y\right) \left(\frac{x^2}{36} + \frac{xy}{3} + 4y^2\right)$$

$$\therefore \frac{x^3}{216} - 8y^3 = \left(\frac{x}{6} - 2y\right) \left(\frac{x^2}{36} + \frac{xy}{3} + 4y^2\right)$$

$$\text{Q 7. } 10x^4y - 10xy^4$$

SOLUTION :

$$= 10xy(x^3 - y^3)$$

$$= 10xy(x - y)(x^2 + xy + y^2) \quad \because [x^3 - y^3 = (x - y)(x^2 + xy + y^2)]$$

$$\therefore 10x^4y - 10xy^4 = 10xy(x - y)(x^2 + xy + y^2)$$

$$\text{Q 8. } 54x^6y + 2x^3y^4$$

SOLUTION :

$$= 2x^3y(27x^3 + y^3)$$

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

$$= 2x^3y(3x + y)((3x)^2 - 3x \times y + y^2) \quad \because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= 2x^3y(3x + y)(9x^2 - 3xy + y^2)$$

$$\therefore 54x^6y + 2x^3y^4 = 2x^3y(3x + y)(9x^2 - 3xy + y^2)$$

$$\text{Q 9. } 32a^3 + 108b^3$$

SOLUTION :

$$= 4(8a^3 + 27b^3)$$

$$= 4((2a)^3 + (3b)^3)$$

$$= 4[(2a + 3b)((2a)^2 - 2a \times 3b + (3b)^2)]$$

$$\because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= 4(2a + 3b)(4a^2 - 6ab + 9b^2)$$

$$\therefore 32a^3 + 108b^3 = 4(2a + 3b)(4a^2 - 6ab + 9b^2)$$

$$\text{Q 10. } (a - 2b)^3 - 512b^3$$

SOLUTION :

$$= (a - 2b)^3 - (8b)^3$$

$$= (a - 2b - 8b)((a - 2b)^2 + (a - 2b)8b + (8b)^2)$$

$$\because [a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (a - 10b)(a^2 + 4b^2 - 4ab + 8ab - 16b^2 + 64b^2)$$

$$= (a - 10b)(a^2 + 52b^2 + 4ab)$$

$$\therefore (a - 2b)^3 - 512b^3 = (a - 10b)(a^2 + 52b^2 + 4ab)$$

$$\text{Q 11. } (a + b)^3 - 8(a - b)^3$$

SOLUTION :

$$= (a + b)^3 - [2(a - b)]^3$$

$$= (a + b)^3 - [2a - 2b]^3$$

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

$$\because [a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

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

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

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

$$= (3b - a)(3a^2 + 2ab - b^2 + 4a^2 + 4b^2 - 8ab)$$

$$= (3b - a)(3a^2 + 4a^2 - b^2 + 4b^2 - 8ab + 2ab)$$

$$= (3b - a)(7a^2 + 3b^2 - 6ab)$$

$$\therefore (a + b)^3 - 8(a - b)^3 = (3b - a)(7a^2 + 3b^2 - 6ab)$$

$$\text{Q 12. } (x + 2)^3 + (x - 2)^3$$

SOLUTION :

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

$$\because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$\begin{aligned}
&= 2x(x^2 + 4x + 4 - (x + 2)(x - 2) + x^2 - 4x + 4) \\
&= 2x(2x^2 + 8 - (x^2 - 2^2)) \quad [\because (a + b)(a - b) = a^2 - b^2] \\
&= 2x(2x^2 + 8 - x^2 + 4) \\
&= 2x(x^2 + 12) \\
\therefore (x + 2)^3 + (x - 2)^3 &= 2x(x^2 + 12)
\end{aligned}$$

Q 13 . $8x^2y^3 - x^5$

SOLUTION :

$$\begin{aligned}
&= x^2((2y)^3 - x^3) \\
&= x^2(2y - x)((2y)^2 + 2y \times x + x^2) \quad [\because x^3 - y^3 = (x - y)(x^2 + xy + y^2)] \\
&= x^2(2y - x)(4y^2 + 2xy + x^2) \\
\therefore 8x^2y^3 - x^5 &= x^2(2y - x)(4y^2 + 2xy + x^2)
\end{aligned}$$

Q 14 . $1029 - 3x^3$

SOLUTION :

$$\begin{aligned}
&= 3(343 - x^3) \\
&= 3((7)^3 - x^3) \\
&= 3(7 - x)(7^2 + 7x + x^2) \quad [\because a^3 - b^3 = (a - b)(a^2 + ab + b^2)] \\
&= 3(7 - x)(49 + 7x + x^2) \\
\therefore 1029 - 3x^3 &= 3(7 - x)(49 + 7x + x^2)
\end{aligned}$$

Q 15 . $x^6 + y^6$

SOLUTION :

$$\begin{aligned}
&= (x^2)^3 + (y^2)^3 \\
&= (x^2 + y^2)((x^2)^2 - x^2y^2 + (y^2)^2) \\
&= (x^2 + y^2)(x^4 - x^2y^2 + y^4) \quad [\because a^3 + b^3 = (a + b)(a^2 - ab + b^2)] \\
\therefore x^6 + y^6 &= (x^2 + y^2)(x^4 - x^2y^2 + y^4)
\end{aligned}$$

Q 16 . $x^3y^3 + 1$

SOLUTION :

$$= (xy)^3 + 1^3$$

$$= (xy + 1)((xy)^2 + xy + 1^2)$$

$$[\because x^3 + y^3 = (x + y)(x^2 - xy + y^2)]$$

$$= (xy + 1)(x^2y^2 - xy + 1)$$

$$\therefore x^3y^3 + 1 = (xy + 1)(x^2y^2 - xy + 1)$$

$$\text{Q 17. } x^4y^4 - xy$$

SOLUTION :

$$= xy(x^3y^3 - 1)$$

$$= xy((xy)^3 - 1^3)$$

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

$$\because [x^3 - y^3 = (x - y)(x^2 + xy + y^2)]$$

$$= xy(xy - 1)(x^2y^2 + xy + 1)$$

$$\therefore x^4y^4 - xy = xy(xy - 1)(x^2y^2 + xy + 1)$$

$$\text{Q 18. } a^{12} + b^{12}$$

SOLUTION :

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

$$= (a^4 + b^4)((a^4)^2 - a^4 \times b^4 + (b^4)^2)$$

$$\because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (a^4 + b^4)(a^8 - a^4b^4 + b^8)$$

$$\therefore a^{12} + b^{12} = (a^4 + b^4)(a^8 - a^4b^4 + b^8)$$

$$\text{Q 19. } x^3 + 6x^2 + 12x + 16$$

SOLUTION :

$$= x^3 + 6x^2 + 12x + 8 + 8$$

$$= x^3 + 3 \times x^2 \times 2 + 3 \times x \times 2^2 + 2^3 + 8$$

$$= (x + 2)^3 + 8 \quad [\because a^3 + 3a^2b + 3ab^2 + b^3 = (a + b)^3]$$

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

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

$$\because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

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

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

$$= (x + 4)(x^2 + 4 + 2x)$$

$$\therefore x^3 + 6x^2 + 12x + 16 = (x + 4)(x^2 + 4 + 2x)$$

$$\text{Q 20 . } a^3 + b^3 + a + b$$

SOLUTION :

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

$$= (a + b)(a^2 - ab + b^2) + 1(a + b)$$

$$[\because a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (a + b)(a^2 - ab + b^2 + 1)$$

$$\therefore a^3 + b^3 + a + b = (a + b)(a^2 - ab + b^2 + 1)$$

$$\text{Q 21 . } a^3 - \frac{1}{a^3} - 2a + \frac{2}{a}$$

SOLUTION :

$$= (a^3 - \frac{1}{a^3}) - 2(a - \frac{1}{a})$$

$$= (a^3 - (\frac{1}{a})^3) - 2(a - \frac{1}{a})$$

$$= (a - \frac{1}{a})(a^2 + a \times \frac{1}{a} + (\frac{1}{a})^2) - 2(a - \frac{1}{a})$$

$$[\because a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (a - \frac{1}{a})(a^2 + 1 + \frac{1}{a^2}) - 2(a - \frac{1}{a})$$

$$= (a - \frac{1}{a})(a^2 + 1 + \frac{1}{a^2} - 2)$$

$$= (a - \frac{1}{a})(a^2 + \frac{1}{a^2} - 1)$$

$$\therefore a^3 - \frac{1}{a^3} - 2a + \frac{2}{a} = (a - \frac{1}{a})(a^2 + \frac{1}{a^2} - 1)$$

$$\text{Q 22 . } a^3 + 3a^2b + 3ab^2 + b^3 - 8$$

SOLUTION :

$$= (a + b)^3 - 8$$

$$[\because a^3 + 3a^2b + 3ab^2 + b^3 = (a + b)^3]$$

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

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

$$= (a + b - 2)(a^2 + 2ab + b^2 + 2a + 2b + 4)$$

$$\therefore a^3 + 3a^2b + 3ab^2 + b^3 - 8 = (a + b - 2)(a^2 + 2ab + b^2 + 2a + 2b + 4)$$

$$\text{Q 23 . } 8a^3 - b^3 - 4ax + 2bx$$

SOLUTION :

$$= (2a)^3 - b^3 - 2x(2a - b)$$

$$= (2a - b)((2a)^2 + 2a \times b + b^2) - 2x(2a - b) \quad [\because a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (2a - b)(4a^2 + 2ab + b^2 - 2x)$$

$$\therefore 8a^3 - b^3 - 4ax + 2bx = (2a - b)(4a^2 + 2ab + b^2 - 2x)$$

$$\text{Q 24 . i . } \frac{173 \times 173 \times 173 + 127 \times 127 \times 127}{173 \times 173 - 173 \times 127 + 127 \times 127}$$

SOLUTION :

$$= \frac{173^3 + 127^3}{173^2 - 173 \times 127 + 127^2}$$

$$= \frac{(173 + 127)(173^2 - 173 \times 127 + 127^2)}{173^2 - 173 \times 127 + 127^2}$$

$$\because [a^3 + b^3 = (a + b)(a^2 - ab + b^2)]$$

$$= (173 + 127)$$

$$= 300$$

$$\text{Q 24 . ii . } \frac{1.2 \times 1.2 \times 1.2 - 0.2 \times 0.2 \times 0.2}{1.2 \times 1.2 + 1.2 \times 0.2 + 0.2 \times 0.2}$$

SOLUTION :

$$= \frac{1.2^3 - 0.2^3}{1.2^2 + 1.2 \times 0.2 + 0.2^2}$$

$$= \frac{(1.2 - 0.2)((1.2)^2 + 1.2 \times 0.2 + (0.2)^2)}{1.2^2 + 1.2 \times 0.2 + 0.2^2}$$

$$[\because a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (1.2 - 0.2)$$

$$= 1.0$$

$$\text{Q 24 . iii . } \frac{155 \times 155 \times 155 - 55 \times 55 \times 55}{155 \times 155 + 155 \times 55 + 55 \times 55}$$

SOLUTION :

$$= \frac{155^3 - 55^3}{155^2 + 155 \times 55 + 55^2}$$

$$= \frac{(155 - 55)(155^2 + 155 \times 55 + 55^2)}{155^2 + 155 \times 55 + 55^2}$$

$$[\because a^3 - b^3 = (a - b)(a^2 + ab + b^2)]$$

$$= (155 - 55)$$

$$= 100$$