Pre Placement Training and Aptitude

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

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

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

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

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

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

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

8) $a^3 + b^3 + c^3 - 3abc$

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

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

9) If $a+b+c=0$ then $a^3 + b^3 + c^3 = 3abc$

8) $a^2 + b^2 + c^2 - ab - bc - ca$

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

$x + \frac{1}{x} = k$

$x^2 + \frac{1}{x^2} = k^2 - 2$

$\left(x + \frac{1}{x}\right)^2 - 2 \times \frac{1}{x} \Rightarrow k^2 - 2$

$x - \frac{1}{x} = k$

$x^2 + \frac{1}{x^2} = k^2 + 2$

If $x + \frac{1}{x} = k$

$x^3 + \frac{1}{x^3} = k^3 - 3k$

If $x - \frac{1}{x} = k$

$x^3 - \frac{1}{x^3} = k^3 + 3k$

If $x + \frac{1}{x} = 1$

then $x^3 = -1$

If $x + \frac{1}{x} = -1$

then $x^3 = +1$

TO REMEMBER

$x + \frac{1}{x} = 1$

$x^2 + 1 = x$

$x^2 - x + 1 = 0$

$(x+1)(x^2 - x + 1) = 0$

$x^3 + 1 = 0$

$x^3 = -1$

$x^3 = ?$

$x + \frac{1}{x} = 1$

$x^2 + 1 = x$

$x^3 + x = x^2$

$x^3 + 1 = 0$ $\quad x^3 = -1$

① If $x + \frac{1}{x} = 2$ then $x = 1$

② If $x + \frac{1}{x} = -2$ then $x = -1$

③ If $x + \frac{1}{x} = \sqrt{3}$

or

$$\left(x + \frac{1}{x}\right)^2 = 3$$

$$x^3 + \left(\frac{1}{x}\right)^3 = \left(x + \frac{1}{x}\right)^3 - 3x \cdot \frac{1}{x}\left(x + \frac{1}{x}\right)$$

$$\left(\sqrt{3}\right)^3 = 3\sqrt{3}$$

$$3\sqrt{3} - 3\sqrt{3} = 0$$

$$x^3 + \frac{1}{x^3} = 0 \Rightarrow x^6 + 1 = 0$$

$$x^6 = -1$$

×

$$x + \frac{1}{x} = 1$$

$$x^3 = -1$$

$$x^3 + 1 = 0$$

$$x + \frac{1}{x} = \sqrt{3}$$

$$x^3 + \frac{1}{x^3} = 0$$

$$x^6 = -1$$

$$x^6 + 1 = 0$$

If $x^{79} + \frac{1}{x^{79}} = 3$

$$x^{79} - \frac{1}{x^{79}} = ?$$

If $x^{113} - \frac{1}{x^{113}} = 4$

$$x^{113} + \frac{1}{x^{113}} = ?$$

$$\sqrt{4^2 + 4}$$

If $x^n + \frac{1}{x^n} = k$

$$x^n - \frac{1}{x^n} = \sqrt{k^2 - 4}$$

If $x^n - \frac{1}{x^n} = k$

$$x^n + \frac{1}{x^n} = \sqrt{k^2 + 4}$$

1) If $x^y + y^x = 50$

$49^1 + 1^{49} = 50$

2) $x^y + y^x = 100$

$99^1 + 1^{99} = 100$

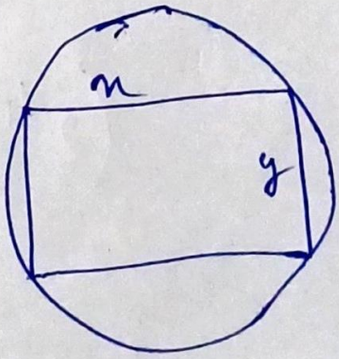
3) If $x+y=4$ then find maximum value of $x^3+y^3+xy = ?$

$2^3 + 2^3 + 2 \times 2$

4) If $x+y=6$ the find max value of $x^3 y^3 + xy$

$x = y = \frac{6}{2} = 3$

$3^3 \times 3^3 + 3 \times 3$



Max Area

$x + \frac{1}{x} = 1$

$x^{36} + \frac{1}{x^{36}} = ?$

$(x^3)^{12} + \left(\frac{1}{x^3}\right)^{12}$

$x + \frac{1}{x} = -1 \Rightarrow (-1)^{12} + \left(\frac{1}{-1}\right)^{12} \Rightarrow 1 + 1 = 2$

$x^3 = 1$

$x^{35} + \frac{1}{x^{35}} = (x^3)^{11} \times x^2 + \frac{1}{(x^3)^{11}\, x^2}$

$x^{60} + \frac{1}{x^{60}} = ?$

$(x^3)^{20} + \left(\frac{1}{x^3}\right)^{20} = 1 + 1 = 2$

$16^{41} + 2^{7925} + 16^n$ is a

$(2^4)^{41} + 2^1 \cdot 2^{8^2} \cdot 2^{2n} + (2^{2n})^2$

$2^{83 + 2n} = 2^{7925}$

If $x + \frac{1}{x} = 4$

then find the value of i) $x^5 + \frac{1}{x^5} = ?$

ii) $x^7 + \frac{1}{x^7} = ?$

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

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

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

$$= x^5 + x + \frac{1}{x} + \frac{1}{x^5} - x - \frac{1}{x}$$

$$= x^5 + \frac{1}{x^5}$$

Aptitude

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Level 2
Chap: 1 Variation
2 Indices
3 Surds
4 Logarithm Imps (4 qs?)
5 Binomial
6 Theory of Equation

Informations

① $(x+1)^2 = x^2+2x+1$

② $(x-1)^2 = x^2-2x+1$

③ $(x+1)^3 = x^3+3x^2+3x+1$

④ $(x-1)^3 = x^3-3x^2+3x-1$

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

⑥ $(a+b)^2+(a-b)^2 = 2(a^2+b^2)$

⑦ $(a+b)^2-(a-b)^2 = 4ab$

⑧ $a^2+b^2+c^2-ab-bc-ca = \frac{1}{2}\{(a-b)^2+(b-c)^2+(c-a)^2\}$

⑨
$$a^3+b^3+c^3-3abc = (a+b+c)(a^2+b^2+c^2-ab-bc-ca)$$
$$= \frac{1}{2}(a+b+c)\{(a-b)^2+(b-c)^2+(c-a)^2\}$$

⑩ If $a+b+c=0$
$a^3+b^3+c^3 = 3abc$

⑪
$$x+\frac{1}{x} = k$$
$$x^2+\frac{1}{x^2} = k^2-2$$
$$\left(x^2+\frac{1}{x}\right)^2-2x\frac{1}{x} = k^2-2$$

(12) $x - \frac{1}{x} = k$

$x^2 + \frac{1}{x^2} = k^2 + 2$

(13) If $x + \frac{1}{x} = k$

$x^3 + \frac{1}{x^3} = k^3 - 3k$

(14) If $x - \frac{1}{x} = k$

$x^3 - \frac{1}{x^3} = k^3 + 3k$

(15) If $x + \frac{1}{x} = 1$

$x^3 = ?$ -1

If $x + \frac{1}{x} = -1$

$x^3 = 1$

(16) bf method

$x + \frac{1}{x} = 1$

$x^2 + 1 = x$

$x^2 - x + 1 = 0$ ∴ this is zero.

$(x+1)(x^2 - x + 1) = 0$

$x^3 + 1 = 0$

$x^3 = -1$

direct method →

$x + \frac{1}{x} = 1$

$\times x \rightarrow x^2 + 1 = x$

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

$(-) \Rightarrow x^3 + 1 = 0$

$\Rightarrow x^3 = -1$

(17)

(18)

(19)

$x + \frac{1}{x} = 1$

$x^3 + \frac{1}{x^3} = 1 - 3 = -2$

$x^3 = -2 - \frac{1}{x^3}$

1. (16) If $x+\frac{1}{x}=2$

$\boxed{x=1}$

ii. If $x+\frac{1}{x}=-2$

$\boxed{x=-1}$

iii. If $\boxed{x+\frac{1}{x}=\sqrt{3}}$

or

$\boxed{\left(x+\frac{1}{x}\right)^2=3}$

then $x^3+\left(\frac{1}{x^3}\right)^3=\left(x+\frac{1}{x}\right)^3-3x\frac{1}{x}\left(x+\frac{1}{x}\right)$

$=(\sqrt{3})^3-3\sqrt{3}$

$=0$

i $x^3+\frac{1}{x^3}=0$

$x^6+1=0$

ii $x^6=-1$

(17) $x+\frac{1}{x}=1$

$x^3=+1$

$x^3+1=0$

(power diff = 3, combo = 0)

If $x+\frac{1}{x}=\sqrt{3}$

$x^3+\frac{1}{x^3}=0$

$x^6=-1$

$x^6+1=0$

(18)

Q. If $x^{79}+\frac{1}{x^{79}}=3$

$x^{79}-\frac{1}{x^{79}}=?$

$=\sqrt{3^2-4}=\sqrt{5}$

Q. If $x^{113}+\frac{1}{x^{113}}=4$

$x^{113}+\frac{1}{x^{113}}=?$

$\sqrt{4^2+4}=\sqrt{20}$

(18) Tricks

If $x^n+\frac{1}{x^n}=k$

$x^n-\frac{1}{x^n}=\sqrt{k^2-4}$

If $x^n-\frac{1}{x^n}=k$

$x^n+\frac{1}{x^n}=\sqrt{k^2+4}$

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Application

1. $x^y + y^x = 50$

$x = ?$

$y = ?$

$50 = 49^1 + 1^{49}$

$x = 49/1$

$y = 1/49$

2. $x^y + y^x = 100$

$x = ?$

$y = ?$

$100 = 99^1 + 1^{99}$

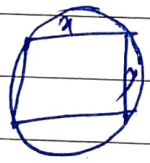
$x = 99/1$

$y = 1/99$

3. $x + y = 4$

Max value of

$x^3 + y^3 + ay = ?$



Max value of area of a rect. in a circle

$\Rightarrow x = y$

$x + y = 4 \leftarrow$ circle.

$x = 2 = y$

$= 20$

4. If $x + y = 6$

Max value of $x^3y^3 + xy = ?$

$x = y = 3$

$= 738$

27×27

189

54

729

Level 1.

Q. 1. $x + \frac{1}{x} = 1$ $\quad x^3 = -1$

$x^{36} + \frac{1}{x^{36}} = ?$

$(x^3)^{12} + \frac{1}{(x^3)^{12}} = ?$

$(-1)^{12} + \frac{1}{(-1)^{12}}$

$= 2$

2. $x + \frac{1}{x} = 1 \Rightarrow x^3 = 1$

i. $x^{35} + \frac{1}{x^{35}} = ?$

$(x^3)^{11} \cdot x^2 + \frac{1}{(x^3)^{11} \cdot x^2}$

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

$= -1$

ii. $x^{60} + \frac{1}{x^{60}} = ?$

$(x^3)^{20} + \frac{1}{(x^3)^{20}} = 1 + 1$

$= 2$

Q. $16^{41} + 2^{7925} + 16^n$ is a perfect square. then, what is the value of n [TCS -]

~~$n = 8$~~

Step 1 → bring to base 2.

$(2)^{164} + 2^{7925} + (2)^{4n}$

$2^{7924} \cdot 2 + 2^{4n}$

$= 2^{164} (1$

$\Rightarrow (2^{82})^2 + 2 \cdot 2^{82} \cdot 2^{2n} + (2^{2n})^2$

$a^2 \quad 2ab \quad b^2$

or $2^{7925} = 2^1 \cdot 2^{82} \cdot 2^{2n}$

$\Rightarrow 7925 = 83 + 2n$

$\Rightarrow 7842 = 2n$

$\Rightarrow n = 3921$

practice @home

- If $x + \frac{1}{x} = 4$

Find the value of : $x^5 + \frac{1}{x^5} = ?$ $x^7 + \frac{1}{x^7} = ?$

$x^7 + \frac{1}{x^7} =$

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

$$\left[x^5 + \frac{1}{x^5} + \left(x + \frac{1}{x}\right) - \left(x + \frac{1}{x}\right)\right]$$

$$= \left(4^3 - 3 \cdot 4\right)\left(4^2 - 2\right) - 4 = 724$$

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$$x^7 + \frac{1}{x^7} =$$

$$= \textcircled{1}$$

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