



gradeup

Sahi Prep Hai Toh Life Set Hai

# ALGEBRA-3

## Agenda

- \* Common Roots → 25min - 28min
- \* Factorization → 23min - 25min
- \* Componendo & Dividendo → 25 - 28min
- Homework → 35 Question
- ...

# COMMON ROOTS

To find the common roots of 2 algebraic expressions, we majorly have two ways:

(1) Factorize the 2 expressions and you will get common factor and then you will get common root.

## (2) Equate both the algebraic expressions

When you will equate both the algebraic expressions, you will get the intersection point of the two graphs but it is not necessarily the common root.

Eg1. Find the common roots of  $x^2 - 9x + 20$  &  $x^2 - 8x + 15$ .

$$x^2 - 9x + 20 \rightarrow (x-4)(\underline{\underline{x-5}})$$

$$x^2 - 8x + 15 \rightarrow (x-3)(\underline{\underline{x-5}})$$

$$\boxed{x=5}$$

5 is the common Root

Ans. Only one common root i.e. 5

II<sup>nd</sup>

$$\cancel{x^2} - 9x + 20 = \cancel{x^2} - 8x + 15$$

$$\boxed{5 = x}$$

Chek

$$5^2 - 9 \cdot 5 + 20$$

$$= 0$$

5 is the common Root

Eg2. Find the common roots of  $x^2 - 9x + 20$  &  $x^2 - 11x + 24$ .

I<sup>st</sup>  
=

$$\begin{aligned} x^2 - 9x + 20 &= (x-4)(x-5) \\ x^2 - 11x + 24 &= (x-3)(x-8) \end{aligned}$$

No Common Root

II<sup>nd</sup>

$$\begin{aligned} \rightarrow x^2 - 9x + 20 &= x^2 - 11x + 24 \\ 2x &= 4 \\ x &= 2 \end{aligned}$$

check       $2^2 - 9 \cdot 2 + 20 = \underline{\underline{6}} \neq 0$

No Common Root

**Ans. No common root**

Eg3. Find the common roots of  $x^3 - 7x^2 + 14x - 8$  &  $x^3 - 12x^2 + 47x - 60$ .

$$\cancel{x^3 - 7x^2 + 14x - 8} = \cancel{x^3 - 12x^2 + 47x - 60}$$

$$5x^2 - 33x + 52 = 0$$

$$\cancel{x = 4, \frac{13}{5}}$$

$$4^3 - 7 \cdot 4^2 + 14 \cdot 4 - 8$$

$$64 - 112 + 56 - 8 = 0$$

$$x = \frac{13}{5}$$

$$\left(\frac{13}{5}\right)^3 - 7\left(\frac{13}{5}\right)^2 + 14 \cdot \frac{13}{5} - 8 \neq 0$$

$x = 4$  is a common root

**Ans. One common root i.e. 4**

Eg4. If the quadratic equation  $x^2 + ax + b = 0$  and  $x^2 + bx + a = 0$  have a common root. Find  $(a+b)$

$$1+a+b=0$$

$$\cancel{a+b} = -1$$

$$x^2 + ax + b = \cancel{x^2 + bx + a}$$

$$ax - bx + b - a = 0$$

$$x(a-b) - 1(a-b) = 0$$

$$(a-b)(x-1) = 0$$

$$\begin{array}{c} a-b \\ \hline x \end{array}$$

$$\text{or } x = 1$$

**Ans.  $a + b = -1$**

Eg5. If the quadratic equation  $ax^2 + 2cx + b = 0$  and  $ax^2 + 2bx + c = 0$  has exactly one common root. Find the value of  $a + 4(b + c) = ??$

$$\cancel{ax^2 + 2cx + b} - \cancel{ax^2 + 2bx + c} \\ 2cx - 2bx + b - c = 0$$

$$a\left(\frac{1}{2}\right)^2 + 2c\left(\frac{1}{2}\right) + b = 0$$

$$a + 4c + 4b = 0$$

$$\cancel{a + 4(b + c)} = 0$$

$$2x(c-b) - 1(c-b) = 0$$

$$(2x-1)(c-b) = 0$$

$x = \frac{1}{2}$  or  $c = b$

**Ans.  $a + 4(b + c) = 0$**



Eg6. Find the value of p if the equation  $3x^2 - 2x + p = 0$  and  $\underline{\underline{6x^2 - 17x + 12 = 0}}$  have a common root.

2 min

$$6x^2 - 17x + 12 = 0$$

$$x = \left(\frac{4}{3}\right), \left(\frac{3}{2}\right)$$

Case I

when  $\frac{4}{3}$  is a common root

$$3 \cdot \frac{4}{3} \cdot \frac{4}{3} - 2 \cdot \frac{4}{3} + p = 0$$

$$\boxed{p = -\frac{8}{3}}$$

Case II

when  $\frac{3}{2}$  is a common root

$$3 \cdot \frac{3}{2} \cdot \frac{3}{2} - 2 \cdot \frac{3}{2} + p = 0$$

$$\boxed{p = -\frac{15}{4}}$$

Ans.  $p = \underline{-8/3}$  ,  $\underline{-15/4}$

**Q1. The factors of  $(x^2 - 1 - 2a - a^2)$  are :**

- (a)  $(x - a + 1)(x - a - 1)$
- (b)  $(x + a - 1)(x - a + 1)$
- (c)  $(x + a + 1)(x - a - 1)$
- (d) None of these

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

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

$$(x-a-1)(x+a+1)$$



Q2. A factor of  $a^4 - 11a^2b^2 + b^4$  is :

Time 1 min

- (a)  $(a^2 - b^2 - 3ab)$
- (b)  $(a^2 + b^2 - 3ab)$
- (c)  $(a^2 + b^2 + 3ab)$
- (d)  $(a^2 - b^2 + 4ab)$

$$a^4 - 2a^2b^2 + b^4 - 9a^2b^2$$

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

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



Q3. The factor of  $(a^2 + 4b^2 + 4b - 4ab - 2a - 8)$  are

Time → 90sec

- (a)  $(a - 2b - 4)(a - 2b + 2)$
- (b)  $(a - b + 2)(a - 4b - 4)$
- (c)  $(a + 2b - 4)(a + 2b + 2)$
- (d)  $(a + 2b - 1)(a - 2b + 1)$

II<sup>nd</sup> comp coeff (options)

Coeff of  $ab$

$$\therefore -4 \text{ (a)}$$

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

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

$$\text{let } a - 2b = x$$

$$x^2 - 2x - 8$$

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

$$(a - 2b - 4)(a - 2b + 2)$$

$$ax^2 + bx + c = 0$$

Roots are ( $\alpha, \beta$ )

$$\alpha + \beta = -\frac{b}{a}$$

$$\alpha \beta = \frac{c}{a}$$



# CUBIC EQUATION

$$ax^3 + bx^2 + cx + d = 0$$

Let  $\alpha, \beta$  and  $\gamma$  are the roots

$$\alpha + \beta + \gamma = -b/a$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = c/a$$

$$\alpha\beta\gamma = -d/a$$

Eg.  $x^3 + 6x^2 + 11x + 6 = 0$

Let  $\alpha, \beta$  and  $\gamma$  are the roots

$$\alpha + \beta + \gamma = -6/1 = -6$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = 11/1 = 11$$

$$\alpha\beta\gamma = -6/1 = -6$$

$$= ax^3 + bx^2 + cx + d = 0$$

$$\alpha + \beta + \gamma = -\frac{b}{a}$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$$

$$\alpha\beta\gamma = -\frac{d}{a}$$

$$\text{Eg7. } 9x^3 + 3x^2 - 11x - 8 = 0$$

Let  $\alpha, \beta$  and  $\gamma$  are the roots

$$\alpha + \beta + \gamma = ??$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = ??$$

$$\alpha\beta\gamma = ??$$

$$3x^3 - 11x^2 + 9x - 8 = 0$$

$$\begin{array}{c} 11/-3 \\ 9/3 = 3 \\ 8/3 = \end{array}$$

# **FACTORIZATION OF CUBIC POLYNOMIALS**

Eg. Factorize :  $x^3 - 6x^2 + 11x - 6$

First, by hit and trial we find that value of  $x$ , where this expression becomes 0 and we start putting values as 1, -1, 2, -2, 3, -3, and so on.

When  $x = 1$ ,  $x^3 - 6x^2 + 11x - 6 = 1 - 6 + 11 - 6 = 0$

Now, we know that  $(x - 1)$  is a factor of

$$\begin{array}{r}
 & x^3 - 6x^2 + 11x - 6 \\
 \overline{(x-1) \quad |} & \overline{x^2 - 5x + 6} \\
 & x^3 - 6x^2 + 11x - 6 \\
 & \cancel{x^3} - \cancel{6x^2} + 11x - 6 \\
 & \cancel{x^3} - \cancel{6x^2} + 11x - 6 \\
 & \cancel{-x^2} \quad \leftarrow \quad -5x + 11x \\
 & \cancel{-x^2} \quad \leftarrow \quad -5x + 11x \\
 & \cancel{-5x} + 11x \\
 & \cancel{-5x} + 11x \\
 & \cancel{11x} \\
 & \cancel{11x} \\
 & \cancel{6x} \\
 & \cancel{6x} \\
 & \cancel{6x} \\
 & \cancel{6x}
 \end{array}$$

$$(x-1)(x^2 - 5x + 6)$$

$$(x-1)(x-2)(x-3)$$



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Q1. Factorize :  $x^3 + 6x^2 + 11x + 6$

$$x = 1$$

$$1 + 6 + 11 + 6 \neq 0$$

$$x = -1$$

$$-1 + 6 - 11 + 6 = 0$$

So  $(x+1)$  is a factor of  $(x^3 + 6x^2 + 11x + 6)$

$$(x+1) (x^2 + 5x + 6)$$

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

Q2. Factorize :  $x^3 + 4x^2 - 11x - 30$

$$x = 1$$

$$1+4-11-30 \neq 0$$

$$x = -1$$

$$-1+4+11-30 \neq 0$$

$$x = 2$$

$$8+16-22-30 \neq 0$$

$$x = -2$$

$$-8+16+22-30 = 0$$

So  $(x+2)$  is a factor of  $x^3 + 4x^2 - 11x - 30 = 0$

$$(x+2) (x^2 + 2x - 15)$$

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

Q3. Factorize :  $2x^3 - 3x^2 - 17x - 12$

$$x = -1 \quad -2 - 3 + 17 - 12 = 0$$

$$(x+1) (2x^2 - 5x - 12)$$

$$(x+1) (2x^2 - 8x + 3x - 12)$$

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

$$\boxed{(x+1) (x-4) (2x+3)}$$

Q4. If the root of the cubic expression  $x^3 - kx^2 + 11x - 6$  is 3. Find the remaining 2 roots?

$$3^3 - k \cdot 3^2 + 11 \cdot 3 - 6 = 0$$

$$k = 6$$

$$x^3 - 6x^2 + 11x - 6 = 0$$

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

$$(x-3)(x-1)(x-2)$$

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# COMPONENDO & DIVIDENDO

$$\text{If } \frac{a}{b} = \frac{c}{d}$$

Then  $\frac{a+b}{a-b} = \frac{c+d}{c-d}$  (Componendo & Dividendo)

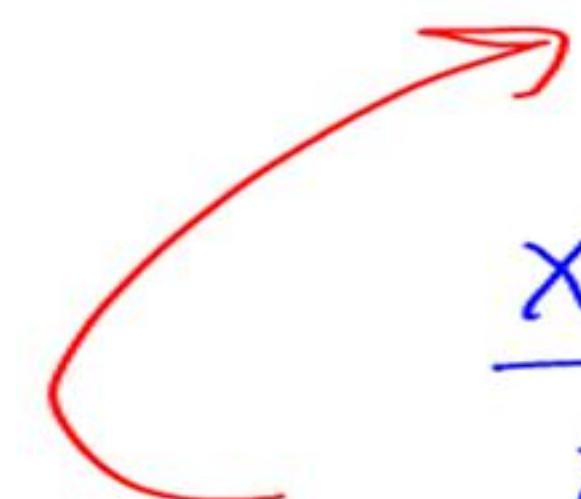
eg

$$\frac{x+y}{z} = \frac{A}{B+C}$$

$$\frac{x+y+z}{x+y-z} = \frac{A+B+C}{A-B-C}$$

$$\rightarrow \frac{x+y}{z} = \frac{A}{B+C}$$

$$\frac{x+3k}{5z} = \frac{y}{3m} \quad \checkmark$$


$$\frac{x+3k+5z}{x+3k-5z} = \frac{y+3m}{y-3m}$$

**Q1.** If  $\frac{a}{b} = \frac{16}{3}$ , what is  $\frac{a+b}{a-b}$

(a)  $\frac{19}{13}$

(b)  $\frac{17}{13}$

(c)  $\frac{19}{26}$

(d)  $\frac{21}{13}$

II<sup>nd</sup>

$$\frac{a}{b} = \frac{16}{3}$$

C S D

Applying

$$\frac{a+b}{a-b} = \frac{16+3}{16-3}$$

$$\boxed{\frac{a+b}{a-b} = \frac{19}{13}}$$

I<sup>st</sup>

Putting values

$$\frac{16+3}{16-3} = \frac{19}{13}$$

**Q2.** If  $x = \frac{a-b}{a+b}$ ,  $y = \frac{b-c}{b+c}$ ,  $z = \frac{c-a}{c+a}$ ,

find  $\frac{1+x}{1-x} \times \frac{1+y}{1-y} \times \frac{1+z}{1-z}$

- (a) 1
- (c)  $abc$

- (b)  $\frac{ab}{bc}$
- (d) 0

$$\frac{1}{x} = \frac{a+b}{a-b}$$

$$\frac{1+x}{1-x} = \frac{a}{b}$$

$$\cancel{a} \times \cancel{b} \times \cancel{c} \\ \cancel{b} \quad \cancel{c} \quad \cancel{a}$$

$$= 1$$

**Q3.** If  $\frac{x^3 + 3x}{3x^2 + 1} = \frac{189}{61}$ , find the value of  $x$

- (a) 9
- (b) 6
- (c) 8
- (d) 4

(d)

$$\frac{x^3 + 3x + 3x^2 + 1}{x^3 + 3x - 3x^2 - 1} = \frac{189 + 6}{189 - 61}$$

$$\frac{(x+1)^3}{(x-1)^3} = \frac{286125}{12864}$$

$$\frac{x+1}{x-1} = \frac{5}{4}$$

$$\frac{x}{1} = \frac{5+4}{5-4}$$

$$x = 9$$

## I\* Cross Multiplication

**Q4.** If  $\frac{\sqrt{3+x} + \sqrt{3-x}}{\sqrt{3+x} - \sqrt{3-x}} = \frac{2}{1}$  then  $x$  is equal to-

- (a)  $\frac{5}{12}$       (b)  $\frac{12}{5}$   
(c)  $\frac{5}{7}$       (d)  $\frac{7}{5}$

$$\begin{aligned}\sqrt{3+x} + \sqrt{3-x} &= 2\sqrt{3+x} - 2\sqrt{3-x} \\ 3\sqrt{3-x} &= \sqrt{3+x} \\ 9(3-x) &= 3+x \\ 10x &= 24 \quad \boxed{x = \frac{12}{5}}\end{aligned}$$

There are different methods for this question i.e. :

- ~~(1) Cross Multiplication~~  
~~(2) Componendo & Dividendo~~  
~~(3) Rationalization~~

Componendo      8      Dividendo

II<sup>nd</sup>

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

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

$$\frac{3+x}{3-x} = \frac{9}{1}$$

$$\frac{3}{x} = \frac{10}{8}$$

$$x = \frac{24}{125}$$



Q5. If  $\frac{x}{1} = \frac{\sqrt{m+3n} + \sqrt{m-3n}}{\sqrt{m+3n} - \sqrt{m-3n}}$ ,

then find the value of  $2mx - 3nx^2$  is

- ~~(a)~~ 3n      (b)  $\frac{3m}{2}$   
 (c) 2n      (d)  $\frac{2m}{3}$

II<sup>nd</sup>

Let  $m = 3n$

$x = 1$

$2mx - 3nx^2$

$6n - 3n$

$= 3n$

T<sup>st</sup>

$$\frac{x+1}{x-1} = \frac{\sqrt{m+3n}}{\sqrt{m-3n}}$$

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

CAD

$$\frac{x+1}{2x} = \frac{m}{3n}$$

$3nx^2 + 3n = 2mx$

$3n = 2mx - 3nx^2$



Q6. If  $x = \frac{\sqrt[3]{m+1} + \sqrt[3]{m-1}}{\sqrt[3]{m+1} - \sqrt[3]{m-1}}$  then  $\underline{x^3 - 3mx^2 + 3x - m} = ?$

- (a) 0      (b) 1      (c) 2      (d) -1

I       $\frac{x}{1} = \frac{\sqrt[3]{m+1} + \sqrt[3]{m-1}}{\sqrt[3]{m+1} - \sqrt[3]{m-1}}$

II<sup>nd</sup>  
Putting values

Put  $m = 1$

$x = 1$

$1 - 3 + 3 - 1$

$= \underline{\underline{0}}$

$\frac{x+1}{x-1} = \frac{\sqrt[3]{m+1}}{\sqrt[3]{m-1}}$

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

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

$x^3 + 3x = 3mx^2 + m$



Q7. If  $x = \frac{\sqrt{3}}{2}$  then the value of  $\left( \frac{\sqrt{1+x} + \sqrt{1-x}}{\sqrt{1+x} - \sqrt{1-x}} \right)$   
is

- (a)  $-\sqrt{3}$
- (b) -1
- (c) 1
- (d)  $\sqrt{3}$

~~(b)~~ ~~(c)~~ ~~(d)~~  $\sqrt{3}$

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

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

~~logical~~

~~ZR > DR~~

d) ~~✓~~

$$= \frac{\sqrt{3}}{1} = \underline{\underline{\sqrt{3}}}$$



~~v.amp~~

$$\text{If } x = \frac{\sqrt{3}}{2}$$

$$\text{then, } \sqrt{1+x} = \frac{\sqrt{3}+1}{2}$$

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

Reason

$$x = \frac{\sqrt{3}}{2}$$

$$\sqrt{1+x} = \sqrt{1 + \frac{\sqrt{3}}{2}}$$

$$= \sqrt{\frac{2+\sqrt{3}}{2}}$$

$$= \sqrt{\frac{4+2\sqrt{3}}{4}}$$

$$= \sqrt{\frac{\sqrt{3}+1}{2}}$$

Q8. If  $x = \frac{4ab}{a+b}$ , ( $a \neq b$ ),

then value of  $\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b}$  is

- (a)  $a$
- (b)  $b$
- (c)  $2ab$
- (d)  $2$

→ (i) LCM  
~~→ (ii) Putting values~~  
~~→ (iii) C.A.D~~  
 → (iv) Substitution

I Putting values  
Let  $a = 3$

$$b = 1 \quad x = \frac{4 \cdot 3 \cdot 1}{3} \\ x = 4$$

$$\frac{3+6}{3-6} + \frac{3+2}{3-2} = -3+5$$

∴ ②

**There are different methods for this question i.e. :**

- (1) Value Approach**
- (2) Componendo & Dividendo**
- (3) LCM Approach**

$$x = \frac{ab}{a+b}$$

Given

$$\frac{x}{2a} = \frac{2b}{a+b}$$

$$\frac{x+2a}{x-2a} = \frac{4b+3a+b}{2b-a-b}$$

$$\frac{x+2a}{x-2a} = \frac{3b+q}{b-q}$$

?

$$\frac{x+2a}{x-2a} + \frac{x+2b}{x-2b} = ??$$

↓                      ↓

$$\frac{3b+q}{b-q} + \frac{3a+b}{a-b}$$

$$\frac{3b+q}{b-q} - \frac{(3a+b)}{b-q}$$

$$= \frac{2(b-a)}{b-q} = 2$$

# HOMEWORK

Q1. If  $x(x + y + z) = 9$ ,  $y(x + y + z) = 16$  and  $z(x + y + z) = 144$ , then what is  $z$  equal to:

- (a)  $144/13$
- (b)  $16/13$
- (c)  $9/13$
- (d)  $9/11$

**Ans. (a)**

Q2. Find the value of  $4^{16} - 15(4^2+1)(4^4+1)(4^8+1)$

- (a) 0
- (b) -1
- (c) -2
- (d) 1

**Ans. (d)**

- Q3. If  $x^4 + x^2y^2 + y^4 = 325$  and  $x^2 + xy + y^2 = 13$ ,  
then  $(x^2 + y^2) =$
- (a) 13
  - (b) 19
  - (c) 23
  - (d) 38

**Ans. (b)**

Q4. If  $a + b + c = 8$  and  $a^2 + b^2 + c^2 = 24$ , then the value of  $ab + bc + ca$  is:

- (a) -20
- (b) 20
- (c) -18
- (d) 18

**Ans. (b)**

Q5. If  $x - \frac{1}{x} = \frac{1}{4}$ , then what is  $16x^2 + \frac{16}{x^2}$  equal to?

- (a) 33
- (b) 35
- (c) 16
- (d) 0

**Ans. (a)**

Q6. If  $\left(\frac{x}{y}\right) + \left(\frac{y}{x}\right) = -1$ , then find the value of  $x^3 - y^3$ ?

- (a) 1
- (b) -1
- (c) 0
- (d) 2

**Ans. (c)**

Q7. If  $x=1000$ ,  $y=1001$ ,  $z=1002$ ; find  $x^2 + y^2 + z^2 - xy - yz - zx$

- (a) 3
- (b) 2
- (c) -2
- (d) 0

**Ans. (a)**

Q8. If  $(x - \frac{1}{x}) = 4$  find  $(x^6 - \frac{1}{x^6})$

- (a)  $1190\sqrt{20}$
- (b)  $1292\sqrt{20}$
- (c)  $1200\sqrt{20}$
- (d) None of these

**Ans. (b)**

Q9. If  $x^2 - x + 1 = 0$  then find  $x^7 + x^{10} + x^{13} + x^{16} + x^{19} + x^{22}$ .

- (a) 10
- (b) 1
- (c) 0
- (d) 5

**Ans. (c)**

Q10. Find square root of  $10 + 2\sqrt{15} + 2\sqrt{6} + 2\sqrt{10}$

- (a)  $\sqrt{3} + \sqrt{5} + \sqrt{2}$
- (b)  $\sqrt{7} + \sqrt{3} + \sqrt{2}$
- (c)  $\sqrt{2} + \sqrt{7}$
- (d) Can't determine

**Ans. (a)**

Q11. Factorize :  $(\sqrt{3}a - 4b)^3 + (4b - 3c)^3 + (3c - \sqrt{3}a)^3$

- (a)  $(\sqrt{3}a + 4b)(4b - 3c)(3c + \sqrt{3}a)$
- (b)  $3(\sqrt{3}a - 4b)(4b - 3c)(3c - \sqrt{3}a)$
- (c)  $(\sqrt{3}a - 4b)(4b - 3c)(3c - \sqrt{3}a)$
- (d)  $3(\sqrt{3}a + 4b)(4b - 3c)(3c + \sqrt{3}a)$

**Ans. (b)**

Q12. If  $a^3 = 117 + b^3$  and  $a = 3 + b$ , then the value of  $a + b$  is  
(given that  $a > 0$  and  $b > 0$ )

- (a) 7
- (b) 9
- (c) 11
- (d) 13

**Ans. (a)**

Q13. If  $\frac{a^2 - 1}{a} = 5$ , then what is the value of  $\frac{a^6 - 1}{a^3}$ ?

- (a) 125
- (b) -125
- (c) 140
- (d) -140

**Ans. (c)**

Q14. If  $x + y + z = 0$  then, what is  $(y + z - x)^3 + (z + x - y)^3 + (x + y - z)^3$  equal to?

- (a)  $(x + y + z)^3$
- (b)  $3(x+y)(y+z)(z+x)$
- (c)  $24xyz$
- (d)  $-24xyz$

**Ans. (d)**

Q15. If  $x = (b - c)(a - d)$ ,  
 $y = (c - a)(b - d)$ ,  $z = (a - b)(c - d)$ ,  
then what is  $x^3 + y^3 + z^3$  equal to ?

- (a) xyz
- (b) 2xyz
- (c) 3xyz
- (d) -3xyz

**Ans. (c)**

Q16. If  $(x+k)$  is the HCF of  $x^2+5x+6$  and  $x^2+8x+15$ , then what is the value of  $k$  ?

- (a) 5
- (b) 3
- (c) 2
- (d) 1

**Ans. (a)**

Q17. What is the LCM of  $(x^2 - y^2 - z^2 - 2yz)$ ,  
 $(x^2 - y^2 + z^2 + 2xz)$  and  $(x^2 + y^2 - z^2 - 2xy)$  ?

- (a)  $(x+y+z)(x+y-z)(x-y+z)$
- (b)  $(x+y+z)(x-y-z)(x-y+z)$
- (c)  $(x-y+z)(x+y-z)(x-y+z)$
- (d)  $(x-y-z)(x+y+z)(x-y+z)$

**Ans. (b)**

Q18. If  $(x + 2)$  is the HCF of  $x^2 + ax + b$  and  $x^2 + cx + d$  ( $a \neq c$  and  $b \neq d$ ), then which one of the following is correct?

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

**Ans. (c)**

Q19. Which one of the following is correct?

- (a)  $(x + 1)$  is a factor of  $x^4 - 6x^3 + 12x^2 - 24x + 32$
- (b)  $(x - 1)$  is a factor of  $x^4 + 6x^3 - 12x^2 + 24x - 32$
- (c)  $(x - 2)$  is a factor of  $x^4 - 6x^3 + 12x^2 - 24x + 32$
- (d)  $(x - 2)$  is a factor of  $x^4 + 6x^3 - 12x^2 + 24x - 32$

**Ans. (c)**

Q20. Find the remainder when  $f(t) = t^3 + t^2 + 2t + 3$  is divided by  $(t+2)$ .

- (a) 2
- (b) -2
- (c) -3
- (d) -5

**Ans. (d)**

Q21. When  $(x^3 - 2x^2 + ax - b)$  is divided by  $(x^2 - 2x - 3)$  then the remainder is  $(x - 6)$ . What is the value of a and b?

- (a)  $a = 1, b = 2$
- (b)  $a = 2, b = 3$
- (c)  $a = -2, b = 6$
- (d)  $a = 1, b = -3$

**Ans. (c)**

Q22.  $t^4 + 2t^3 - 2t^2 + 2t - 3$  is exactly divisible by:

- (a)  $t^3 + 2t - 3$
- (b)  $t^2 + 2t - 3$
- (c)  $t^2 + t - 6$
- (d)  $t^3 + t - 6$

**Ans. (b)**

Q23. Two of the roots of the cubic equation  $t^3 - 9t^2 + 14t + 24 = 0$  are in the ratio 2:3. The third root is:

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

**Ans. (b)**

- Q24. If  $x = 2^{\frac{1}{3}} + 2^{-\frac{1}{3}}$ , then the value of  $2x^3 - 6x - 5$  is equal to
- (a) 0
  - (b) 1
  - (c) 2
  - (d) 3

**Ans. (a)**

- Q25. If  $p$ ,  $q$  and  $r$  satisfy the equation  $x^3 - 3x^2 + 2x + 1 = 0$  then  
what is the value of  $\frac{2}{p} + \frac{2}{q} + \frac{2}{r}$  ?
- (a) -1
  - (b) 2
  - (c) -4
  - (d) 0

**Ans. (c)**

Q26. What is  $\frac{5 + \sqrt{10}}{5\sqrt{5} - 2\sqrt{20} - \sqrt{32} + \sqrt{50}}$  equal to?

- (a) 5
- (b)  $5\sqrt{2}$
- (c)  $5\sqrt{5}$
- (d)  $\sqrt{5}$

**Ans. (d)**

Q27. What is the value of  $\frac{1}{1+x^{b-a}+x^{c-a}} + \frac{1}{1+x^{a-b}+x^{c-b}} + \frac{1}{1+x^{a-c}+x^{b-c}}$  Where  $x \neq 0$  ?

- (a) -1
- (b) 0
- (c) 1
- (d) 3

**Ans. (c)**

Q28. If  $p^x = r^y = m$  and  $r^w = p^z = n$ , then which one of the following is correct ?

- (a)  $xw = yz$
- (b)  $xz = yw$
- (c)  $x+y = w+z$
- (d)  $x-y = w-z$

**Ans. (a)**

Q29. If  $a^x = b, b^y = c$  and  $xyz = 1$ , then what is  $c^z$  equal to?

- (a) a
- (b) b
- (c) ab
- (d) a/b

**Ans. (a)**

Q30. If  $3^x + 27(3^{-x}) = 12$  , then what is the value of x?

- (a) 1 only
- (b) 2 only
- (c) 1 or 2
- (d) 0 or 1

**Ans. (c)**

Q31. If  $n = 7 + 4\sqrt{3}$ , then the value of  $\sqrt{n} + \frac{1}{\sqrt{n}}$  is ?

- (a) 4
- (b) 2
- (c) 0
- (d) 3

**Ans. (a)**

Q32. If  $x^2 + 9y^2 = 6xy$ , then what is  $y:x$  equal to ?

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

**Ans. (a)**

Q33. If  $a = 11$ , then find the value of  $a^5 - 12a^4 + 12a^3 - 12a^2 + 12a - 1$ .

- (a) 10
- (b) 11
- (c) 12
- (d) 0

**Ans. (a)**

- Q34. If  $5x + \left[ \frac{1}{(7x)} \right] = 9$ , what is the value of  $\frac{7x}{35x^2 + 35x + 1}$  ?
- (a) 1/14
  - (b) 1/63
  - (c) 1/98
  - (d) 7/14

**Ans. (a)**

Q35. If  $16a^4 + 36a^2b^2 + 81b^4 = 55$  and  $4a^2 + 9b^2 - 6ab = 11$ , then what is the value of  $5ab$ ?

- (a) 3
- (b)  $-5/2$
- (c)  $3/2$
- (d) -5

**Ans. (b)**



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