



**Resonance<sup>®</sup>**  
Educating for better tomorrow

# JEE (MAIN) 2026

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-1

**DATE & DAY:** 02<sup>nd</sup> April 2026 & Thursday

**PAPER-1**

**Duration:** 3 Hrs.

**Time:** 09:00 – 12:00 IST

**SUBJECT: MATHEMATICS**

Selections in JEE (Advanced)/  
IIT-JEE Since 2002

**52979**

Classroom: 35901 | Distance: 17078

Selections in JEE (Main)/  
AIEEE Since 2009

**262693**

Classroom: 194471 | Distance: 68222

Selections in NEET (UG)/  
AIPMT/AIIMS Since 2012

**22733**

Classroom: 15409 | Distance: 7324

**Admission Open for 2026-27**

**Target:** JEE (Advanced) | JEE (Main) | NEET (UG) | PCCP (Class V to X)

**100% Scholarship** on the basis of Class 10<sup>th</sup>, 12<sup>th</sup>  
& JEE (Main) 2026 %ile / AIR

☎ 0744-2777777 | 📞 73400 10345 | Follow Us: @ResonanceEdu | @Resonance\_Edu

**REGISTERED & CORPORATE OFFICE (CIN: U80302RJ2007PLC024029):**

**CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Rajasthan) - 324005**

☎ 0744-2777777 | 📞 73400 10345 | 📧 contact@resonance.ac.in | 🌐 www.resonance.ac.in | Follow Us: @ResonanceEdu | @Resonance\_Edu

This Solution was download from Resonance JEE (Main) 2026 Solution Portal

**PART : MATHEMATICS**

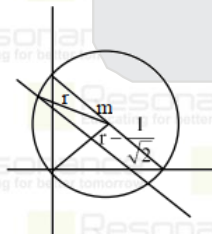
1. Let  $x \in [-\pi, \pi]$  &  $S = \{x: \sin x(\sin x + \cos x) = a, a \in I\}$ , then number of elements in set S is equal to :  
 (1) 5  
 (2) 10  
 (3) 9  
 (4) 4

Ans. (3)

Sol.  $\sin x(\sin x + \cos x) \in \left[\frac{1-\sqrt{2}}{2}, \frac{1+\sqrt{2}}{2}\right]$   
 2 integer will be there  $\Rightarrow a = 0, 1$   
 If  $a = 0$   $\sin x(\sin x + \cos x) = 0$   
 $\Rightarrow \sin x = 0$  or  $\sin x + \cos x = 0$   
 $x = -\pi, 0, \pi = \tan x = -1$   
 3 solutions  $x = -\frac{\pi}{4}, \frac{3\pi}{4}$  2 solutions  
 If  $a = 1$   $\sin x(\sin x + \cos x) = 1$   
 $\sin^2 x + \sin x \cos x = 1$   
 $2\sin^2 x + 2\sin x \cos x = 2$   
 $1 - \cos 2x + \sin 2x = 2$   
 $\sin 2x - \cos 2x = 1 \rightarrow$  square  
 $\sin 4x = 0$   
 $4x = -4\pi, -3\pi,$   
 $x = -\pi, -\frac{3\pi}{4}, -\frac{\pi}{2}, -\frac{\pi}{4}, 0, \frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, \pi$   
 $\Rightarrow x = -\frac{3\pi}{4}, -\frac{\pi}{2}, \frac{\pi}{4}, \frac{\pi}{2}$  4 solutions  
 Total 9 solution

2. A circle meets coordinate axes at 3 points and cuts equal intercepts. If it cuts a chord of length  $\sqrt{14}$  unit on  $x + y = 1$ , then square of its radius is (centre lies in first quadrant)  
 (1) 2  
 (2) 4  
 (3) 8  
 (4) 16

Ans. (3)



Sol.

$$r^2 = \left(\frac{\sqrt{14}}{2}\right)^2 + \left(r - \frac{1}{\sqrt{2}}\right)^2$$

$$r^2 = \frac{7}{2} + r^2 - \sqrt{2}r + \frac{1}{2}$$

$$\sqrt{2}r = 4$$

$$r = 2\sqrt{2}$$

$$r^2 = 8$$

**Resonance Eduventures Ltd.**

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | 7340010333 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | [twitter.com/ResonanceEdu](https://twitter.com/ResonanceEdu) | [www.youtube.com/resowatch](https://www.youtube.com/resowatch) | [blog.resonance.ac.in](https://blog.resonance.ac.in)

3. If  $y = f(x)$  is the solution of the differential equation  $(1 + \sin x) \frac{dy}{dx} + \cos x = 0$ , such that  $f(0) = 0$ , then

$f\left(\frac{\pi}{2}\right)$  is

- (1)  $\ln 2$
- (2)  $-\ln 2$
- (3)  $\ln 3$
- (4)  $\ln 4$

Ans. (2)

Sol.  $dy + \frac{\cos x}{(1 + \sin x)} dx = 0$

$y + \ln(1 + \sin x) = C$

$0 + 0 = C \Rightarrow C = 0$

$y = -\ln(1 + \sin x)$

$f\left(\frac{\pi}{2}\right) = -\ln 2$

4. Number of seven digits numbers which can be formed by using all the digits 1,2,3,4,5 with at least one digit repeated is \_\_\_\_ .

- (1) 16200
- (2) 15600
- (3) 16800
- (4) 14800

Ans. (3)

Sol. Exactly one digit repeated  $\rightarrow {}^5 C_1 \times \frac{7!}{3!} = 4200$  Exactly two digits repeated  $\rightarrow {}^5 C_2 \times \frac{7!}{2!2!} = 12600$  Total numbers = 16800

5. The Range of  $f(x) = \sin^{-1}\left(\frac{1}{x^2 - 2x + 2}\right)$  is

- (1)  $\left(0, \frac{\pi}{2}\right)$
- (2)  $\left[0, \frac{\pi}{2}\right]$
- (3)  $\left(0, \frac{\pi}{2}\right]$
- (4)  $\left[0, \frac{\pi}{2}\right)$

Ans. (3)

Sol.  $f(x) = \sin^{-1}\left(\frac{1}{(x-1)^2 + 1}\right)$

$(x-1)^2 + 1 \geq 1$

$0 < \sin^{-1}\left(\frac{1}{(x-1)^2 + 1}\right) \leq \frac{\pi}{2}$

So range is  $\left(0, \frac{\pi}{2}\right]$

6. Value of definite integral

$I = \int_0^{2\sqrt{3}} \log_2(x^2 + 4) dx + \int_2^4 \sqrt{2x - 4} dx$

- (1)  $2\sqrt{3}$
- (2)  $4\sqrt{3}$
- (3)  $6\sqrt{3}$
- (4)  $8\sqrt{3}$

Ans. (4)






Sol. Direct I =  $4 \cdot (2\sqrt{3}) - 2(0) = 8\sqrt{3}$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555  7340010333  facebook.com/ResonanceEdu  twitter.com/ResonanceEdu  www.youtube.com/resowatch  blog.resonance.ac.in

7. The value of  $\int_0^3 \frac{e^x + e^{-x}}{([x])!} dx$  is equal to

(where  $[ \cdot ]$  denotes greatest integer function)

(1)  $\frac{e^3 + e^2 - e^{-2} - e^{-3}}{2}$

(2)  $\frac{e^3 - e^2 - e^{-2} + e^{-3}}{2}$

(3)  $e^3 + e^2 - e^{-2} - e^{-3}$

(4)  $e^3 - e^2 - e^{-2} + e^{-3}$

Ans. (1)

Sol.  $\int_0^1 \frac{e^x + e^{-x}}{1} dx + \int_1^2 \frac{e^x + e^{-x}}{1} dx + \int_2^3 \frac{e^x + e^{-x}}{2} dx$

$\int_0^2 e^x dx + \int_0^2 e^{-x} dx + \frac{1}{2} \int_2^3 (e^x + e^{-x}) dx$

$(e^2 - 1) + \frac{(e^{-2} - 1)}{-1} + \frac{1}{2} ((e^3 - e^2) - (e^{-3} - e^{-2}))$

$\frac{e^3 + e^2}{2} + 1 - 1 - \frac{e^{-2}}{2} - \frac{e^{-3}}{2}$

$\frac{e^3 + e^2 - e^{-2} - e^{-3}}{2}$

8. Consider  $f(x) = \begin{cases} \left| \frac{\sin x}{x} \right|, & x \neq 0 \\ 1, & x = 0 \end{cases}$

Number of critical points of  $f(x)$  in the interval  $(-2\pi, 2\pi)$  is

(1) 3

(2) 5

(3) 7

(4) 1

Ans. (1)

Sol. We find points where  $f'(x) = 0$  or  $f'(x)$  is not defined.

$\therefore x = -\pi, 0, \pi$

$\therefore$  3 points

9. If eccentricity of an ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ , which passes through the point  $(3,4)$  is  $\frac{\sqrt{5}}{3}$ , then length of latus rectum of ellipse, is :

(1)  $\frac{4\sqrt{5}}{3}$

(2)  $\frac{8\sqrt{5}}{3}$

(3)  $\frac{4\sqrt{7}}{3}$

(4)  $\frac{8\sqrt{7}}{3}$

Ans. (2)

Sol.  $e^2 = 1 - \frac{b^2}{a^2} \Rightarrow \frac{b^2}{a^2} = 1 - e^2 = 1 - \frac{5}{9} = \frac{4}{9}$

$\Rightarrow \frac{b^2}{a^2} = \frac{4}{9}$

(1)

Passes through  $(3,4) \Rightarrow \frac{9}{a^2} + \frac{16}{b^2} = 1$

From (1) and (2)  $a^2 = 45, b^2 = 20$

LR =  $\frac{2b^2}{a} = \frac{8\sqrt{5}}{3}$

10. Let  $|\vec{a}| = 2, |\vec{b}| = 3$ , then maximum value of  $3|3\vec{a} + 2\vec{b}| + 4|3\vec{a} - 2\vec{b}|$  is

(1) 50

(2) 60

(3) 70

(4) 80

Ans. (2)

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | 7340010333 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | [twitter.com/ResonanceEdu](https://twitter.com/ResonanceEdu) | [www.youtube.com/resowatch](https://www.youtube.com/resowatch) | [blog.resonance.ac.in](https://blog.resonance.ac.in)

**Sol.**  $E = 3\sqrt{9a^2 + 4b^2 + 12\vec{a} \cdot \vec{b}} + 4\sqrt{9a^2 + 4b^2 - 12\vec{a} \cdot \vec{b}}$   
 $= 3\sqrt{36 + 36 + 12 \times 6\cos\theta} + 4\sqrt{36 + 36 - 72\cos\theta}$   
 $= 3\sqrt{72 + 72\cos\theta} + 4\sqrt{72 - 72\cos\theta}$   
 $= 18\sqrt{2}\sqrt{1 + \cos\theta} + 24\sqrt{2}\sqrt{1 - \cos\theta}$   
 $= 18\sqrt{2}\sqrt{2}\cos\frac{\theta}{2} + 24\sqrt{2}\left(\sqrt{2}\sin\frac{\theta}{2}\right)$   
 $= 36\left(\cos\frac{\theta}{2}\right) + 48\sin\left(\frac{\theta}{2}\right)$   
 $E_{\max} = \sqrt{(36)^2 + (48)^2} = \sqrt{6^4 + 6^2 \times 8^2} = 60$

11. If probability that  $ax^2 + 2\sqrt{2}bx + c > 0 \forall x \in R$  where  $a, b, c, \in \{1, 2, 3, 4\}$  is  $\frac{m}{n}$  where  $m$  &  $n$  are coprime then

$(m + n)$  is

- (1) 81
- (2) 18
- (3) 78
- (4) 17

**Ans. (1)**

**Sol.**  $8b^2 - 4ac < 0 \Rightarrow 2b^2 < ac$

b	a	c	
1	1	3,4	→ 2
1	2	2,3,4	→ 3
1	3	1,2,3,4	→ 4
1	4	1,2,3,4	→ 4
2	3	3,4	→ 2
2	4	3,4	→ 2

Required probability =  $\frac{17}{64} \equiv \frac{m}{n}$

$\therefore m + n = 17 + 64 = 81$

12. Let  $K = \sin\frac{\pi}{18} \sin\frac{5\pi}{18} \sin\frac{7\pi}{18}$  then the value of  $\sin\left(10K\frac{\pi}{3}\right)$  is :

- (1)  $\frac{\sqrt{3}-1}{2\sqrt{2}}$
- (2)  $\frac{\sqrt{3}+1}{2\sqrt{2}}$
- (3)  $\frac{\sqrt{3}+1}{4}$
- (4)  $\frac{\sqrt{3}-1}{4}$

**Ans. (2)**

**Sol.**  $K = \sin 10^\circ \sin 50^\circ \sin 70^\circ$

$= \frac{1}{4} \sin 30^\circ = \frac{1}{8}$

$\sin 10K\frac{\pi}{3} = \sin\left(10 \times \frac{1}{8} \cdot \frac{\pi}{3}\right) = \sin\frac{5\pi}{12} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 |  7340010333 |  facebook.com/ResonanceEdu |  twitter.com/ResonanceEdu |  www.youtube.com/resowatch |  blog.resonance.ac.in

13. Foot of perpendicular from origin on a line passing through (1,1,1) having direction ratios  $\langle 2,3,4 \rangle$ , is:

(1)  $\left(\frac{11}{29}, \frac{2}{29}, \frac{7}{29}\right)$

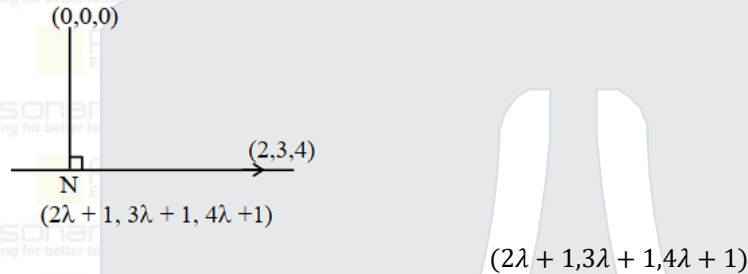
(2)  $\left(\frac{11}{29}, \frac{-2}{29}, \frac{-7}{29}\right)$

(3)  $\left(\frac{11}{29}, \frac{2}{29}, \frac{-7}{29}\right)$

(4)  $\left(\frac{-11}{29}, \frac{2}{29}, \frac{-7}{29}\right)$

Ans. (3)

Sol. Line :  $\vec{r} = (\hat{i} + \hat{j} + \hat{k}) + \alpha(2\hat{i} + 3\hat{j} + 4\hat{k})$



$$\vec{ON} \cdot (2\hat{i} + 3\hat{j} + 4\hat{k}) = 0$$

$$2(2\lambda + 1) + 3(3\lambda + 1) + 4(4\lambda + 1) = 0$$

$$29\lambda + 9 = 0$$

$$\lambda = \frac{-9}{29}$$

$$\text{Foot} \left( \frac{11}{29}, \frac{2}{29}, \frac{-7}{29} \right)$$

14.  $\alpha, \alpha + 2 \in \mathbb{Z}$  and  $n \in \mathbb{N}$ , where  $\alpha, \alpha + 2$  are roots of equation  $x(x + 2) + (x + 1)(x + 3) + \dots + (x + n - 1)(x + n + 1) = 4n$  then  $\alpha + n =$

(1) 0

(2) 1

(3) 2

(4) 3

Ans. (2)

Sol.  $nx^2 + x(2 + 4 + 6 + \dots + 2n) + (1 \cdot 3 + \dots + (n - 1)(n + 1)) = 4n$

$$nx^2 + n(n + 1)x + \frac{n(n + 1)(2n + 1)}{6} - 5n = 0$$

$$x^2 + (n + 1)x + \frac{(n + 1)(2n + 1)}{6} - 5 = 0$$

D must be a perfect square

$$D = \frac{122 - 2n^2}{6} = 20 - \left(\frac{n^2 - 1}{3}\right)$$

$$\text{If make perfect square} \Rightarrow \frac{n^2 - 1}{3} = 16 \Rightarrow n = 7$$

So Equation is

$$\Rightarrow x^2 + 8x + \frac{8 \times 15}{6} - 5 = 0$$

$$x^2 + 8x + 15 = 0$$

$$x = -3, -5$$

$$\alpha = -5, \alpha + 2 = -3$$

$$\alpha + n = 7 - 5 = 2$$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | 7340010333 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | [twitter.com/ResonanceEdu](https://twitter.com/ResonanceEdu) | [www.youtube.com/resowatch](https://www.youtube.com/resowatch) | [blog.resonance.ac.in](https://blog.resonance.ac.in)

15. If domain of  $f(x) = \sqrt{\log_{0.6} \left| \frac{2x-5}{x^2-4} \right|}$  is  $(-\infty, a] \cup \{b\} \cup [c, d) \cup (e, \infty)$  then the value of  $(a + b + c + d + e)$  is

Ans. (4)

Sol. For domain  $\log_{0.6} \left| \frac{2x-5}{x^2-4} \right| \geq 0$

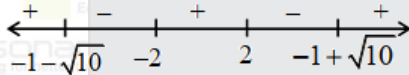
$$\left| \frac{2x-5}{x^2-4} \right| \leq 1 \Rightarrow x \neq \frac{5}{2} \quad (1)$$

$$-1 \leq \frac{2x-5}{x^2-4} \leq 1 \quad (1)$$

$$\frac{2x-5}{x^2-4} + 1 \geq 0 \quad (1)$$

$$\frac{x^2+2x-9}{x^2-4} \geq 0 \quad (1)$$

$$\frac{(x+1)^2-10}{(x-2)(x+2)} \geq 0 \quad (1)$$



$$x \in (-\infty, -1 - \sqrt{10}] \cup (-2, 2) \cup [-1 + \sqrt{10}, \infty) \quad (2)$$

$$\frac{2x-5}{x^2-4} - 1 \leq 0 \quad (2)$$

$$\frac{2x-5-x^2+4}{x^2-4} \leq 0 \quad (2)$$

$$\frac{x^2-2x+1}{x^2-4} \geq 0 \quad (2)$$

$$\frac{(x-1)^2}{(x-2)(x+2)} \geq 0 \quad (2)$$

$$x \in (-\infty, -2) \cup (2, \infty) \cup \{1\} \quad (3)$$

$$(1) \cap (2) \cap (3)$$

$$x \in (-\infty, -1 - \sqrt{10}] \cup \{1\} \cup [-1 + \sqrt{10}, \frac{5}{2}) \cup (\frac{5}{2}, \infty)$$

$$a + b + c + d + e = -2 + 1 + 5 = 4$$

16. Consider two AP's  $S_1$  &  $S_2$  such that

$S_1$ : { First term = 1, Common difference = 5, no. of terms = 101 }

$S_2$ : { First term = 9, Common difference = 7, no. of terms = 71 }

Find the number of common terms in both AP's

Ans. (14)

Sol.  $AP_1$ : 1, 6, 11, ... .. 101 terms

$AP_2$ : 9, 16, 23, ... .. 71 terms

$D = \text{L.C.M}\{d_1, d_2\} = 35$

1<sup>st</sup> Common term is 16

$16 + (n-1)35 \leq 499$

$n \leq 14.8$

$\Rightarrow n = 14$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

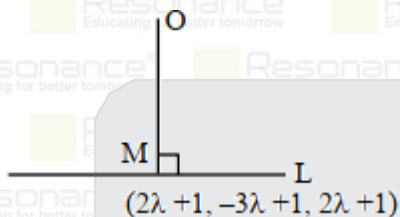
Toll Free : 1800 258 5555 | 7340010333 | facebook.com/ResonanceEdu | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

17. A line through  $(1,1,1)$  and perpendicular to both  $\hat{i} + 2\hat{j} + 2\hat{k}$ ,  $2\hat{i} + 2\hat{j} + \hat{k}$ , let  $(a, b, c)$  be foot of perpendicular from origin then  $34(a + b + c)$  is

Ans. (100)

Sol. Direction vector of line is

$$= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 2 & 2 \\ 2 & 2 & 1 \end{vmatrix} = -2\hat{i} + 3\hat{j} - 2\hat{k}$$



$$\frac{x-1}{2} = \frac{y-1}{-3} = \frac{z-1}{2}$$

So equation of line is

$$\frac{x-1}{2} = \frac{y-1}{-3} = \frac{z-1}{2} = \lambda \text{ let}$$

let  $(2\lambda + 1, -3\lambda + 1, 2\lambda + 1)$  be the foot of perpendicular from  $(0,0,0)$  upon given line

$$\Rightarrow \vec{OM} \cdot (2\hat{i} - 3\hat{j} + 2\hat{k}) = 0$$

$$\Rightarrow 2(2\lambda + 1) - 3(-3\lambda + 1) + 2(2\lambda + 1) = 0$$

$$\Rightarrow \lambda = -\frac{1}{17}$$

$$\text{So } (a, b, c) \equiv \left(\frac{-2}{17} + 1, \frac{3}{17} + 1, \frac{-2}{17} + 1\right)$$

$$\Rightarrow 34(a + b + c) = 100$$

18. If  $50\left(\frac{2x}{1+3i} + \frac{y}{1-2i}\right) = 31 + 17i$  where  $x, y \in \mathbb{R}$  &  $i = \sqrt{-1}$  then value of  $10(x + 3y)$  is \_\_\_\_

Ans. (75)

Sol.  $50\left(\frac{2x(1-3i)}{10} + \frac{y(1+2i)}{5}\right) = 31 + 17i$

$$10x - (30x)i + 10y + 20yi = 31 + 17i$$

$$\left. \begin{aligned} 10(x + y) &= 31 \\ -30x + 20y &= 17 \end{aligned} \right\}$$

$$30x + 30y = 93$$

$$-30x + 20y = 17$$

$$\hline 50y = 110$$

$$y = \frac{11}{5}$$

$$10x = 31 - 10y$$

$$10x = 31 - 22 = 9$$

$$10(x + 3y) = 10x + 30y = 9 + 66 = 75$$

19. let mid - point of sides of  $\Delta$  are

$$\left(\frac{5}{2}, 3\right), \left(\frac{5}{2}, 7\right) \& (4,5)$$

If incentre is  $(h, k)$  then value of  $3h + k$  is

Ans. (13)

## Resonance Eduventures Ltd.

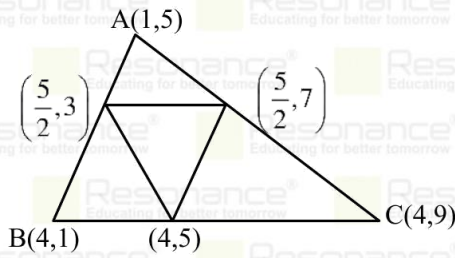
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | WhatsApp : 7340010333 | Facebook : facebook.com/ResonanceEdu | Twitter : twitter.com/ResonanceEdu | YouTube : www.youtube.com/resowatch | Blog : blog.resonance.ac.in

Sol.



$$I = \left(\frac{24}{9}, 5\right)$$

$$\therefore 3h + k = 8 + 5 = 13$$

20. If  ${}^{36}C_{r+1} = 6 \cdot \frac{{}^{35}C_r}{k^2-3}$ , then number of ordered pairs  $(r, k)$ , where  $r, k \in \mathbb{Z}$  is \_\_\_\_.

Ans. (4)

Sol.  $\frac{{}^{36}C_{r+1}}{r+1} = 6 \cdot \frac{{}^{35}C_r}{k^2-3}$

$$k^2 - 3 = \frac{r+1}{6}$$

$$k^2 = \frac{r+19}{6}$$

$$0 \leq r \leq 35$$

$$19 \leq r+19 \leq 54$$

$$3.1 \leq \frac{r+19}{6} \leq 9$$

$$\therefore k^2 = 4, 9$$

$$k = \pm 2, \pm 3$$

$$\therefore (r, k) \Rightarrow (5, \pm 2) \Rightarrow (35, \pm 3)$$

$$\therefore 4$$

21. If  $\sum_{k=1}^n a_k = 6n^3$  then evaluate  $\sum_{k=1}^6 \left(\frac{a_{k+1}-a_k}{36}\right)^2$

Ans. (91)

Sol.  $a_1 + a_2 + \dots + a_n = 6n^3$ .

$$a_1 + a_2 + \dots + a_n + a_{n+1} = 6(n+1)^3$$

$$a_{n+1} = 6(n+1)^3 - 6n^3$$

$$= 6((n+1) - n) = ((n+1)^2 + n^2 + n(n+1))$$

$$a_{n+1} = 6(1)(3n^2 + 3n + 1)$$

$$a_n = 6(3(n-1)^2 + 3(n-1) + 1)$$

$$= 6(3(n^2 - 2n + 1) + n - 1 + 1)$$

$$= 6(3(n^2 - n) + 1)$$

$$a_n = 6(3n^2 - 3n + 1)$$

$$\sum_{k=1}^6 \left(\frac{6(3k^2 + 3k + 1) - 6(3k^2 - 3k + 1)}{36}\right)^2$$

$$\sum_{k=1}^6 \left(\frac{36k}{36}\right)^2 = \sum_{k=1}^6 k^2 = \frac{6 \times 7 \times 13}{6} = 91$$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | WhatsApp : 7340010333 | Facebook : facebook.com/ResonanceEdu | Twitter : twitter.com/ResonanceEdu | YouTube : www.youtube.com/resowatch | Blog : blog.resonance.ac.in

22. If  $\lim_{x \rightarrow 2} \frac{\sin(x^3 - 5x^2 + ax + b)}{(\sqrt{x-1}-1) \cdot \log_e(x-1)} = m$  (exists finitely) then find the value of  $a + b + m$ .

Ans. (6)

Sol. ∴ Denominator = 0 at  $x = 2$

⇒ Numerator = 0 at  $x = 2$

⇒  $2^3 - 5(2)^2 + a(2) + b = 0$

$$\Rightarrow 2a + b = 12 \quad (1)$$

$$\therefore m = \frac{\sin(x^3 - 5x^2 + ax + b)}{(x^3 - 5x^2 + ax + b)} \cdot (x^3 - 5x^2 + ax + b)$$

$$\Rightarrow m = \lim_{x \rightarrow 2} \frac{\sin(x^3 - 5x^2 + ax + b)}{(x - 2)^2}$$

$$\Rightarrow m = \lim_{x \rightarrow 2} \frac{3x^2 - 10x + a}{2(x - 2)}$$

∴ Denominator = 0 at  $x = 2$

⇒ Numerator = 0 at  $x = 2$

⇒  $3(2)^2 - 10(2) + a = 0 \Rightarrow a = 8$

put  $a = 8$  in (1), we get  $b = -4$

$$\therefore m = \lim_{x \rightarrow 2} \frac{6x - 10}{2} \Rightarrow m = 2$$

$$\therefore a + b + m = 6$$

## Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | 7340010333 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | [twitter.com/ResonanceEdu](https://twitter.com/ResonanceEdu) | [www.youtube.com/resowatch](https://www.youtube.com/resowatch) | [blog.resonance.ac.in](https://blog.resonance.ac.in)