

**Q1. JEE Main 2026 (23 January Shift 1)**

A rectangle is formed by the lines  $x = 0$ ,  $y = 0$ ,  $x = 3$  and  $y = 4$ . Let the line  $L$  be perpendicular to  $3x + y + 6 = 0$  and divide the area of the rectangle into two equal parts. Then the distance of the point  $(\frac{1}{2}, -5)$  from the line  $L$  is equal to :

- (1)  $\sqrt{10}$  (2)  $2\sqrt{5}$  (3)  $2\sqrt{10}$  (4)  $3\sqrt{10}$

**Q2. JEE Main 2026 (24 January Shift 2)**

Let the angles made with the positive  $x$ -axis by two straight lines drawn from the point  $P(2, 3)$  and meeting the line  $x + y = 6$  at a distance  $\sqrt{\frac{2}{3}}$  from the point  $P$  be  $\theta_1$  and  $\theta_2$ . Then the value of  $(\theta_1 + \theta_2)$  is:

- (1)  $\frac{\pi}{3}$  (2)  $\frac{\pi}{6}$  (3)  $\frac{\pi}{2}$  (4)  $\frac{\pi}{12}$

**Q3. JEE Main 2026 (22 January Shift 2)**

Among the statements

(S1) : If  $A(5, -1)$  and  $B(-2, 3)$  are two vertices of a triangle, whose orthocentre is  $(0, 0)$ , then its third vertex is  $(-4, -7)$

and

(S2) : If positive numbers  $2a, b, c$  are three consecutive terms of an A.P., then the lines  $ax + by + c = 0$  are concurrent at  $(2, -2)$ ,

- (1) both are incorrect (2) only (S2) is correct  
(3) only (S1) is correct (4) both are correct

**Q4. JEE Main 2026 (23 January Shift 2)**

Let  $A(1, 2)$  and  $C(-3, -6)$  be two diagonally opposite vertices of a rhombus, whose sides  $AD$  and  $BC$  are parallel to the line  $7x - y = 14$ . If  $B(\alpha, \beta)$  and  $D(\gamma, \delta)$  are the other two vertices, then  $|\alpha + \beta + \gamma + \delta|$  is equal to

- (1) 6 (2) 9 (3) 3 (4) 1

**Q5. JEE Main 2026 (21 January Shift 1)**

Let a point  $A$  lie between the parallel lines  $L_1$  and  $L_2$  such that its distances from  $L_1$  and  $L_2$  are 6 and 3 units, respectively. Then the area (in sq. units) of the equilateral triangle  $ABC$ , where the points  $B$  and  $C$  lie on the lines  $L_1$  and  $L_2$ , respectively, is :

- (1)  $15\sqrt{6}$  (2)  $21\sqrt{3}$  (3)  $12\sqrt{2}$  (4) 27

**Q6. JEE Main 2026 (28 January Shift 1)**

Let  $ABC$  be an equilateral triangle with orthocenter at the origin and the side  $BC$  on the line  $x + 2\sqrt{2}y = 4$ . If the co-ordinates of the vertex  $A$  are  $(\alpha, \beta)$ , then the greatest integer less than or equal to  $|\alpha + \sqrt{2}\beta|$  is

- (1) 2 (2) 5 (3) 3 (4) 4

**Q7. JEE Main 2026 (24 January Shift 1)**

Let  $A(1, 0)$ ,  $B(2, -1)$  and  $C\left(\frac{7}{3}, \frac{4}{3}\right)$  be three points. If the equation of the bisector of the angle  $ABC$  is  $\alpha x + \beta y = 5$ , then the value of  $\alpha^2 + \beta^2$  is

(1) 13

(2) 10

(3) 5

(4) 8

## ANSWERS AND SOLUTIONS

1. (3)      2. (3)      3. (4)      4. (1)      5. (2)      6. (4)      7. (2)

1. (3) Rectangle:  $x = 0, y = 0, x = 3, y = 4$ , area = 12. Center =  $(3/2, 2)$ .

Slope of  $3x + y + 6 = 0$  is  $-3$ , so slope of  $L = 1/3$ .

A line through the center of a rectangle bisects its area. So  $L$  passes through  $(3/2, 2)$  with slope  $1/3$ :

$$y - 2 = \frac{1}{3}(x - 3/2)$$

$$\Rightarrow x - 3y + \frac{9}{2} = 0$$

$$\Rightarrow 2x - 6y + 9 = 0.$$

Distance from  $(1/2, -5)$ :

$$d = \frac{|2(1/2) - 6(-5) + 9|}{\sqrt{4 + 36}} = \frac{|1 + 30 + 9|}{\sqrt{40}} = \frac{40}{2\sqrt{10}} = 2\sqrt{10}.$$

2. (3) Using parametric form through  $P(2, 3)$ : point at distance  $r = \sqrt{\frac{2}{3}}$  is  $(2 + r \cos \theta, 3 + r \sin \theta)$ .

Substituting in  $x + y = 6$ :  $r(\cos \theta + \sin \theta) = 1$ , so  $\cos \theta + \sin \theta = \sqrt{\frac{3}{2}}$ .

$$\sqrt{2} \sin\left(\theta + \frac{\pi}{4}\right) = \sqrt{\frac{3}{2}} \Rightarrow \sin\left(\theta + \frac{\pi}{4}\right) = \frac{\sqrt{3}}{2}.$$

$$\theta + \frac{\pi}{4} = \frac{\pi}{3} \text{ or } \frac{2\pi}{3}.$$

$$\theta_1 = \frac{\pi}{12}, \theta_2 = \frac{5\pi}{12}.$$

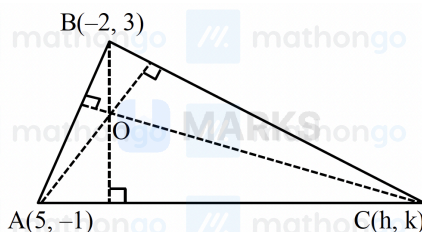
$$\theta_1 + \theta_2 = \frac{\pi}{12} + \frac{5\pi}{12} = \frac{\pi}{2}.$$

3. (4) Statement 1

$$m_{AO} \cdot m_{BC} = -1$$

$$B(-2, 3)$$

$$A(5, -1) \quad C(h, k)$$



$$\Rightarrow 5h - k + 13 = 0 \dots (1)$$

$$\& m_{AB} \cdot m_{OC} = -1$$

$$\Rightarrow 4k = 7h \dots (2)$$

$$\Rightarrow \text{third vertex is } (-4, -7)$$

$\therefore$  Statement 1 is correct.

Statement 2

$$2a, b, c \rightarrow \text{A.P.}$$

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

$$\Rightarrow 2a - 2b + c = 0$$

$\therefore$  lines  $ax + by + c = 0$  are concurrent then

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

$$x = 2 \text{ and } y = -2$$

$\therefore$  Point of concurrency is  $(2, -2)$

$\therefore$  Statement 2 is correct.

4. (1) Midpoint of diagonal  $AC$  is  $M = (-1, -2)$ . Slope of  $AC = \frac{-6-2}{-3-1} = 2$ .

In a rhombus, diagonals are perpendicular bisectors. So  $BD$  has slope  $-\frac{1}{2}$  and passes through  $M$ :

$$y + 2 = -\frac{1}{2}(x + 1).$$

$$AD \text{ has slope } 7: \frac{\delta - 2}{\gamma - 1} = 7 \Rightarrow \delta = 7\gamma - 5.$$

$$D \text{ lies on } BD: \delta = -\frac{\gamma}{2} - \frac{5}{2}.$$

$$\text{Solving: } 7\gamma - 5 = -\frac{\gamma}{2} - \frac{5}{2} \Rightarrow \gamma = \frac{1}{3}, \delta = -\frac{8}{3}.$$

$$B = (2(-1) - \frac{1}{3}, 2(-2) + \frac{8}{3}) = (-\frac{7}{3}, -\frac{4}{3}).$$

$$|\alpha + \beta + \gamma + \delta| = |-\frac{7}{3} - \frac{4}{3} + \frac{1}{3} - \frac{8}{3}| = |-6| = 6.$$

5. (2) Let  $L_2 : y = 0$ ,  $L_1 : y = 9$ .

Point A at  $(0, 3)$ , B at  $(x_B, 9)$ , C at  $(x_C, 0)$ .

$$AB^2 = x_B^2 + 36, AC^2 = x_C^2 + 9, BC^2 = (x_B - x_C)^2 + 81.$$

$$\text{From } AB = AC: x_B^2 - x_C^2 = -27.$$

$$\text{From } AB = BC: 2x_Bx_C = x_C^2 + 45.$$

$$\text{Solving: } 3x_C^4 - 198x_C^2 - 2025 = 0.$$

$$\text{Let } u = x_C^2: u^2 - 66u - 675 = 0 \Rightarrow u = 75.$$

$$a^2 = x_C^2 + 9 = 84.$$

$$\text{Area} = \frac{\sqrt{3}}{4} \times 84 = 21\sqrt{3}.$$

6. (4) Let ABC be an equilateral triangle with orthocenter at the origin  $O(0,0)$  and side BC on the line  $x + 2\sqrt{2}y = 4$ .

Since  $m_{BC} \cdot m_{AD} = -1$ :

$$\left(-\frac{1}{2\sqrt{2}}\right) \left(\frac{\beta}{\alpha}\right) = -1 \Rightarrow \beta = 2\sqrt{2}\alpha \dots (1)$$

$$\text{Distance from O to BC: } OD = \frac{|-4|}{\sqrt{1+8}} = \frac{4}{3}$$

$$\text{For equilateral triangle: } AO = \frac{8}{3}, \text{ so } AD = \frac{4}{3} + \frac{8}{3} = 4$$

$$\frac{|\alpha + 2\sqrt{2}\beta - 4|}{3} = 4 \Rightarrow \alpha = \frac{16}{9} \text{ or } -\frac{8}{9}$$

Since  $A(\alpha, \beta)$  and  $O(0,0)$  lie on the same side of BC (origin gives  $0 + 0 - 4 < 0$ ), we need  $\alpha + 2\sqrt{2}\beta - 4 < 0$ .

$$(\alpha, \beta) = \left(-\frac{8}{9}, -\frac{16\sqrt{2}}{9}\right)$$

$$||\alpha + \sqrt{2}\beta|| = \left| \left| \frac{-8-32}{9} \right| \right| = \left| \frac{40}{9} \right| = 4$$

7. (2) For angle bisector of angle ABC where  $A(1,0)$ ,  $B(2,-1)$ ,  $C(\frac{7}{3}, \frac{4}{3})$ .

Direction BA:  $(1-2, 0-(-1)) = (-1, 1)$ , unit vector  $(-\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}})$

Direction BC:  $(\frac{1}{3}, \frac{7}{3})$ , magnitude  $\frac{5\sqrt{2}}{3}$ , unit vector  $(\frac{1}{5\sqrt{2}}, \frac{7}{5\sqrt{2}})$

Angle bisector direction (sum of unit vectors):  $(\frac{-4}{5\sqrt{2}}, \frac{12}{5\sqrt{2}}) \rightarrow$  direction  $(-1, 3)$

Normal to bisector:  $(3, 1)$ . Bisector passes through  $B(2, -1)$ :

$$3(x-2) + 1(y+1) = 0 \rightarrow 3x + y - 5 = 0$$

Therefore  $\alpha = 3, \beta = 1$ , so  $\alpha^2 + \beta^2 = 9 + 1 = 10$