

SAMPLE PAPER 6: PAPER 2

QUESTION 9 (70 MARKS)

Question 9 (a)

(i) $|OC| = 10 \text{ cm}$

$$|OC| = |OD| + |DF| + |FE| + |EC|$$

$$\therefore 10 = 3 + a + b + 5$$

$$a + b = 2$$

(ii) Triangles OAF and CBF are similar because:

$$|\angle OAF| = |\angle FBC| (90^\circ \text{ angles})$$

$$|\angle OFA| = |\angle BFC| (\text{Vertically opposite})$$

$$\therefore |\angle AOF| = |\angle BCF|$$

(iii) $\frac{|BC|}{|OA|} = \frac{|FC|}{|OF|} \Rightarrow \frac{5}{3} = \frac{b+5}{a+3}$

$$5a + 15 = 3b + 15$$

$$5a = 3b$$

$$\therefore b = \frac{5a}{3}$$

$$a + b = 2$$

$$a + \frac{5a}{3} = 2 \Rightarrow 3a + 5a = 6$$

$$8a = 6$$

$$\therefore a = 0.75 \text{ cm}$$

$$\therefore b = \frac{5(0.75)}{3} = 1.25 \text{ cm}$$

(iv) $|AB| = |AF| + |FB|$

$$\Delta AOF : |OF|^2 = |OA|^2 + |AF|^2$$

$$\therefore 3.75^2 = 3^2 + |AF|^2$$

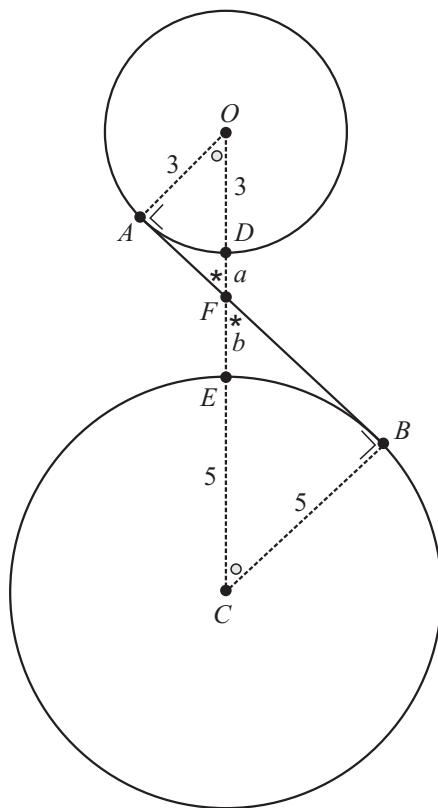
$$|AF| = \sqrt{3.75^2 - 3^2} = 2.25 \text{ cm}$$

$$\Delta FBC : |FC|^2 = |BC|^2 + |FB|^2$$

$$\therefore 6.25^2 = 5^2 + |FB|^2$$

$$|FB| = \sqrt{6.25^2 - 5^2} = 3.75 \text{ cm}$$

$$\therefore |AB| = 2.25 + 3.75 = 6 \text{ cm}$$



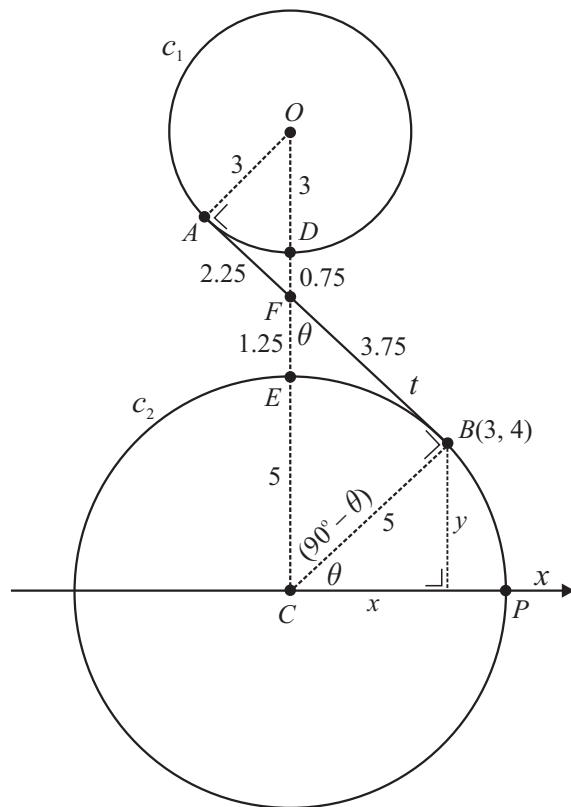
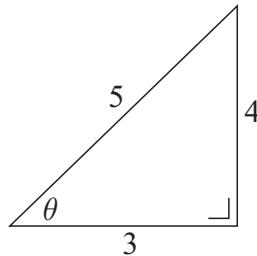
Question 9 (b)

- (i) $E(0, 5)$
 $F(0, 6.25)$
 $D(0, 7)$
 $O(0, 10)$

(ii) $c_1 : x^2 + (y-10)^2 = 9$
 $c_2 : x^2 + y^2 = 25$

(iii) $\tan \theta = \frac{5}{3.75} = \frac{4}{3}$

(iv) $|\angle FCB| = 180^\circ - 90^\circ - \theta = (90^\circ - \theta)$
 $\therefore |\angle BCP| = 90^\circ - (90^\circ - \theta) = \theta$
 $\sin \theta = \frac{y}{5} = \frac{4}{5} \Rightarrow y = 4$
 $\cos \theta = \frac{x}{5} = \frac{3}{5} \Rightarrow x = 3$
 $\therefore B(3, 4)$



- (v) Slope of $BC = \frac{4}{3}$
Slope of tangent $t = -\frac{3}{4}$
Equation of t : $m = -\frac{3}{4}$, $(x_1, y_1) = (3, 4)$

$$\begin{aligned} y - 4 &= -\frac{3}{4}(x - 3) \\ 4y - 16 &= -3x + 9 \\ 3x + 4y - 25 &= 0 \end{aligned}$$

(vi) $c_1 : x^2 + (y-10)^2 = 9$
 $t : 3x + 4y - 25 = 0 \Rightarrow x = \frac{25-4y}{3}$
 $\therefore \left(\frac{25-4y}{3}\right)^2 + (y-10)^2 = 9$
 $\frac{625-200y+16y^2}{9} + y^2 - 20y + 100 - 9 = 0$
 $625 - 200y + 16y^2 + 9y^2 - 180y + 900 - 81 = 0$
 $25y^2 - 380y + 1444 = 0$
 $(5y-38)(5y-38) = 0$
 $\therefore y = \frac{38}{5}$
 $x = \frac{25-4(\frac{38}{5})}{3} = -\frac{9}{5}$
 $\therefore A(-\frac{9}{5}, \frac{38}{5})$

(vii) $A(-\frac{9}{5}, \frac{38}{5}), B(3, 4)$
 $|AB| = \sqrt{(3 + \frac{9}{5})^2 + (4 - \frac{38}{5})^2} = 6$