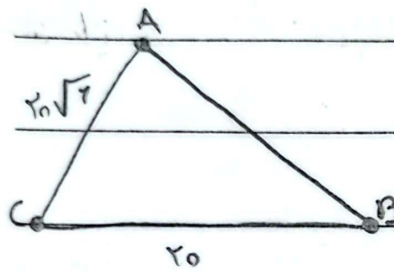


تکلیف ۱۳:

پیدا کردن

کمانه‌های / دایره‌های (متر)



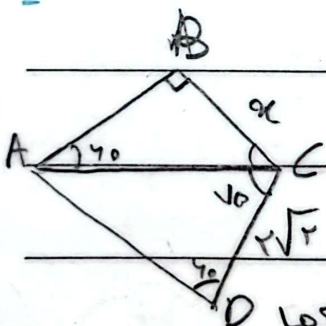
$$\hat{A} + \hat{B} + \hat{C} = 180^\circ \quad \hat{B} + \hat{C} = 140^\circ \quad \hat{A} = 40^\circ$$

①

$$\frac{BC}{\sin 40^\circ} = \frac{AC}{\sin \hat{B}} \Rightarrow \frac{20\sqrt{2}}{\sin 40^\circ} = \frac{20}{\sin \hat{B}} \Rightarrow \frac{\sqrt{2}}{\sin 40^\circ} = \frac{1}{\sin \hat{B}}$$

$$\hat{B} = \frac{\sqrt{2}}{\sin 40^\circ} = \frac{1.414}{0.643} = 2.2 \Rightarrow \hat{B} = 60^\circ$$

$$\hat{B} + \hat{C} = 140^\circ \Rightarrow \hat{C} = 80^\circ$$



$$\hat{A} + \hat{B} + \hat{C} + \hat{D} = 360^\circ \Rightarrow \hat{A} = 360^\circ - (90 + 90 + 50) = 130^\circ$$

②

$$\hat{A} = 130^\circ \quad \hat{C} + \hat{B} + \hat{A} = 360^\circ$$

$$\hat{C} = 360^\circ - (40 + 90) = 230^\circ$$

$$\frac{CD}{\sin 130^\circ} = \frac{AC}{\sin 50^\circ} \Rightarrow \frac{CD}{\sin 130^\circ} = \frac{20\sqrt{2}}{\sin 50^\circ}$$

$$AC = 20\sqrt{2}$$

$$BC = \frac{\sqrt{2}}{\sin 40^\circ} \times 20\sqrt{2} = 100$$

Senobar

$$(b^2 - r^2) \frac{\sin C}{\sin B} = C \frac{b^2 - r^2}{\sin B} = \frac{C}{\sin C} \quad (10)$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \leftarrow \text{Law of Sines}$$

$$\Rightarrow b = b^2 - r^2 \rightarrow b^2 - b - r^2 = 0 \rightarrow (b - r)(b + r) = 0$$

$$\Rightarrow b = r \quad \text{or} \quad b = -r \quad \leftarrow \text{Not possible}$$

$$\cos B \Rightarrow b^2 = a^2 + c^2 - 2ac \cos B \quad (11)$$

$$149 = 200 + 221 - 2 \times 10 \times 11 \cos B$$

$$\frac{4 \times 10 \times 11}{2 \times 10 \times 11} = \cos B \rightarrow \cos B = \frac{1}{2} \rightarrow B = 60^\circ$$

$$1 - \cos B = \sin^2 B \Rightarrow 1 - \frac{1}{2} = \sin^2 B \Rightarrow \sin B = \frac{1}{2} \rightarrow B = 30^\circ$$

$$a^2 = b^2 + c^2 - 2bc \cos A \quad (12)$$

$$a^2 = 14 + 2(1 + \sqrt{2}) - 2(1 + \sqrt{2}) \times \frac{1}{2}$$

$$a^2 = 14 + 14 + 11\sqrt{2} - 1 - 11\sqrt{2} = 25 \rightarrow a = \sqrt{25} = 5$$

$$\sin A \Rightarrow \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad (13)$$

$$\frac{5\sqrt{2}}{\frac{\sqrt{2}}{2}} = \frac{5}{\sin B} \Rightarrow \sin B = \frac{1}{2} \rightarrow B = 30^\circ$$

$$180 - (60 + 30) = \angle A = 90^\circ$$



Senobar

$$BC^2 = AB^2 + AC^2 - 2AB \times AC \times \cos \alpha \quad (4)$$

$$\rightarrow 5^2 = 1^2 + 5^2 - 2 \times 1 \times 5 \times \cos \alpha \rightarrow \cos \alpha = \frac{1}{5}$$

DE = بزرگترین ضلع

$$DE^2 = AD^2 + AE^2 - 2AD \times AE \times \cos \alpha$$

$$\rightarrow DE^2 = 1^2 + 4^2 - 2 \times 1 \times 4 \times \frac{1}{5} = 5 \rightarrow DE = \sqrt{5}$$

$$BC^2 = AB^2 + AC^2 - 2AB \times AC \times \cos A \quad (5)$$

$$\rightarrow BC^2 = 4^2 + 2^2 - 2 \times 4 \times 2 \times \frac{1}{5} = 29 \rightarrow BC = \sqrt{29}$$

$$S_{ABC} = AB \times AC \times \frac{1}{2} \times \sin A = 4 \times 2 \times \frac{1}{2} \times \frac{\sqrt{5}}{5} = \frac{4\sqrt{5}}{5}$$

$$\frac{(b+c)^2 - a^2}{bc(\cos A + 1)} = \frac{b^2 + c^2 + 2bc - a^2}{bc(\cos A + 1)} \quad \text{با استفاده از قانون کسینوس}$$

$$\rightarrow \frac{b^2 + c^2 + 2bc - b^2 - c^2 + 2b \cos A}{bc(\cos A + 1)} = \frac{2bc(\cos A + 1)}{bc(\cos A + 1)}$$

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

$$\rightarrow (b - c)(b^2 + c^2 + bc) = a^2(b - c) \rightarrow a^2 = b^2 + c^2 + bc$$

$$\text{با استفاده از قانون کسینوس} \rightarrow a^2 = b^2 + c^2 - 2bc \cos A = b^2 + c^2 + bc$$

$$\rightarrow -2 \times \cos A = 1 \rightarrow \cos A = -\frac{1}{2}$$

Genobar

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$$1 \quad S_{ABC} = \frac{AB \times AC \times \sin A}{2} = \frac{(r - \cos \theta)(1 + r \cos \theta)}{2} \quad (10)$$

$$2 \quad = r \rightarrow -r \cos \theta + 1 \cos \theta + r = 1 \rightarrow -r \cos \theta + 1 \cos \theta - 2 = 0$$

$$3 \quad \rightarrow -(\cos \theta - 1)(r \cos \theta - 2) = 0 \rightarrow \boxed{\cos \theta = 1 \text{ or } 0}$$

$$5 \quad AB = c = r \quad \rightarrow \cos \theta = + \frac{1}{r} \text{ or } 0$$

$$5 \quad BC = b = 2 \quad \leftarrow \text{!} \text{ [1, 1] } \cos \theta = 1$$

$$6 \quad a^2 = c^2 + b^2 - 2bc \cos A \rightarrow 2 + 17 - 2 \times 2 \times 2 \times 1 = 2 \quad (2)$$