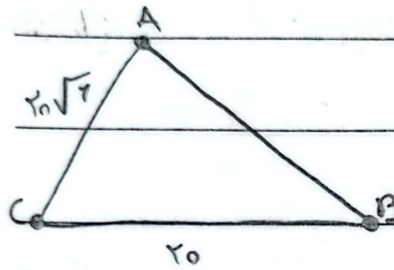


تکلیف ۱۳

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کتاب (مسابقات) / فصل دوم (مختار) A

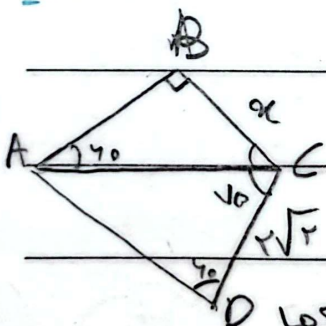


$$\hat{A} + \hat{B} + \hat{C} = 180^\circ \quad \hat{B} + \hat{C} = 140^\circ \quad A = 40^\circ$$

$$\text{Law of Sines: } \frac{BC}{\sin 40^\circ} = \frac{AC}{\sin \hat{B}} \Rightarrow \frac{20}{\frac{\sqrt{2}}{2}} = \frac{20\sqrt{2}}{\sin \hat{B}} \Rightarrow \sin \hat{B} = \frac{\sqrt{2}}{2}$$

$$\hat{B} = 45^\circ \quad \hat{C} = 95^\circ$$

$$\hat{B} + \hat{C} = 140^\circ \rightarrow \hat{C} = 95^\circ$$



$$\hat{A} + \hat{B} + \hat{C} = 180^\circ \rightarrow \hat{A} = 180^\circ - (90^\circ + 40^\circ) = 50^\circ$$

$$\hat{A} = 50^\circ \quad \hat{C} + \hat{B} + \hat{A} = 180^\circ$$

$$\hat{C} = 180^\circ - (40^\circ + 90^\circ) = 50^\circ$$

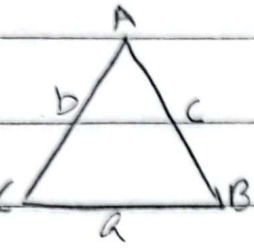
$$\text{Law of Sines: } \frac{CD}{\sin 50^\circ} = \frac{AC}{\sin 40^\circ} \Rightarrow \frac{CD}{\sin 50^\circ} = \frac{20}{\frac{\sqrt{2}}{2}} \Rightarrow CD = 20\sqrt{2} \sin 50^\circ$$

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

$$BC = \sqrt{2} \times 20\sqrt{2} = 40$$

Senobar

$$(b^2 - r^2) \frac{\sin C}{\sin B} = C \frac{1}{\sin C} \Rightarrow \frac{b^2 - r^2}{\sin B} = \frac{C}{\sin C} \quad (10)$$

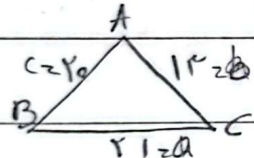


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad \leftarrow \text{Law of Sines}$$

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

$$\Rightarrow b = r \quad \text{or} \quad b = -r \quad \leftarrow \text{Not possible} \quad (11)$$

$$\cos B \Rightarrow b^2 = a^2 + c^2 - 2ac \cos B \quad (12)$$



$$149 = 200 + 221 - 2 \times 11 \times 15 \cos B \quad (13)$$

$$\frac{4 \times 11 \times 15}{2 \times 11 \times 15} = \cos B \Rightarrow \cos B = \frac{1}{2} \Rightarrow B = 60^\circ$$

$$1 - \cos B = \sin^2 B \Rightarrow 1 - \frac{1}{2} = \sin^2 B \Rightarrow \sin B = \frac{\sqrt{3}}{2} \Rightarrow B = 60^\circ \quad (14)$$

$$a^2 = b^2 + c^2 - 2bc \cos A \quad (15)$$

$$a^2 = 14 + 221 - 2 \times 11 \times 15 \cos A = 14 + 221 - 330 \cos A$$

$$a^2 = 14 + 14 + 11\sqrt{3} - 11 - 11\sqrt{3} = 25 \Rightarrow a = 5 \quad (16)$$

$$\sin A \Rightarrow \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \quad (17)$$

$$\frac{5\sqrt{3}}{\frac{\sqrt{3}}{2}} = \frac{11}{\sin B} \Rightarrow \sin B = \frac{11}{10} \Rightarrow B = \sin^{-1} \frac{11}{10} \quad (18)$$

$$\sin A = \frac{5\sqrt{3}}{10} = \frac{\sqrt{3}}{2} \Rightarrow A = 60^\circ \quad (19)$$

$$\sin A = \frac{5\sqrt{3}}{10} = \frac{\sqrt{3}}{2} \Rightarrow A = 60^\circ \quad (20)$$

Senobar

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

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

DE = بزرگترین ضلع

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

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

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

$$\rightarrow BC^2 = 4^2 + 2^2 - 2 \times 4 \times 2 \times \frac{1}{2} = 8 \rightarrow BC = \sqrt{8}$$

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

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

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

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

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

$$\text{بزرگترین ضلع} \rightarrow a^2 = b^2 + c^2 - 2bc \cos A = b^2 + c^2 + bc$$

$$\rightarrow -2 \times \cos A = 1 \rightarrow \cos A = -\frac{1}{2} \rightarrow A = 120^\circ$$

Genobar

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

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

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

$$5. AB = c = r$$

$$5. BC = b = 2$$

←! [1, 1] سے $\cos \theta$ کی

$$\rightarrow \cos \theta = + \frac{1}{r} \text{ or } 0$$

(1, 0)

$$6. a^2 = c^2 + b^2 - 2bc \cos A \rightarrow 2 + 14 - 2 \times 2 \times 2 \times 1 = 2 \quad (5) \rightarrow 2$$

$$\rightarrow a^2 = 14 + 2 - 2 \times 2 \times \frac{\sqrt{13}}{2} \times 2 \rightarrow a^2 = 10 - 4\sqrt{13}$$