

پاسخنامه تشریحی

۱
(الف)

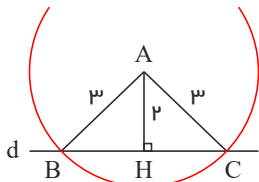
$$\left. \begin{array}{l} BD = BD = \text{مشتک} \\ \hat{A} = \hat{H} = 90^\circ \\ BD = BD = \text{نیمساز} \rightarrow \hat{ABD} = \hat{HBD} \end{array} \right\} \Rightarrow \hat{ABD} = \hat{HBD}$$

(ب)

$$\hat{ABD} = \hat{HBD} \rightarrow \left\{ \begin{array}{l} \hat{ADM} = \hat{HDM} \\ AD = DH \\ AB = BH \end{array} \right.$$

$$\left. \begin{array}{l} \hat{ADM} = \hat{HDM} \\ AD = DH \\ MD = MD \end{array} \right\} \Rightarrow \hat{AMD} = \hat{HMD} \Rightarrow \hat{DAM} = \hat{DHM}$$

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نقطه‌ای که به فاصله‌ی ۳ cm از نقطه‌ی A قرار دارند، روی دایره‌ای به مرکز A و به شعاع ۳ cm قرار دارند و چون شعاع این دایره بیشتر از ۲ cm (فاصله‌ی نقطه‌ی A تا خط AH = d) است، پس دایره خط d را در دو نقطه قطع می‌کند و نقاط C, B جواب مسئله هستند.

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$$\hat{ABD} : ME \parallel AB \xrightarrow{\text{تالس}} \frac{ME}{AB} = \frac{MD}{AD} \rightarrow \frac{ME}{5} = \frac{2}{5} \rightarrow \boxed{ME = 2}$$

$$\hat{ADC} : MF \parallel DC \xrightarrow{\text{تالس}} \frac{MF}{DC} = \frac{AM}{AD} \rightarrow \frac{MF}{10} = \frac{3}{5} \rightarrow \boxed{MF = 6}$$

$$ME + EF = MF \rightarrow 2 + EF = 6 \rightarrow \boxed{EF = 4}$$

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$$AB^2 = BC \cdot BH \rightarrow c^2 = (d + e)d \rightarrow c^2 = (5 + 3) \times 5 \rightarrow c^2 = 40 \rightarrow \boxed{c = 2\sqrt{10}}$$

$$AC^2 = BC \cdot CH \rightarrow b^2 = (d + e)e \rightarrow b^2 = (5 + 3) \times 3 \rightarrow b^2 = 24 \rightarrow \boxed{b = 2\sqrt{6}}$$

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$$\frac{AB}{A'B'} = K \rightarrow \frac{5}{20} = K \rightarrow \boxed{k = \frac{1}{4}}$$

$$\rightarrow \frac{P_{\hat{ABC}}}{P_{\hat{A'B'C'}}} = K \rightarrow \frac{5 + 7 + 11}{P_{\hat{A'B'C'}}} = \frac{1}{4} \rightarrow \boxed{P_{\hat{A'B'C'}} = 92 \text{ cm}}$$

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$$\left. \begin{array}{l} AC \parallel BD \rightarrow \hat{ACE} = \hat{BDE} \\ \hat{CEA} = \hat{BED} \end{array} \right\} \Rightarrow \hat{ACE} \sim \hat{BDE}$$

$$\rightarrow \frac{AE}{BE} = \frac{CH}{DK} \rightarrow \frac{AE}{AE + BE} = \frac{CH}{CH + DK} \rightarrow \frac{AE}{AB} = \frac{3}{3 + 5} \rightarrow \frac{AE}{20} = \frac{3}{8} \rightarrow \boxed{AE = 7,5}$$

$$\rightarrow S_{\hat{ACE}} = \frac{1}{2} AE \times CH = \frac{1}{2} \times 7,5 \times 3 \rightarrow \boxed{S_{\hat{ACE}} = \frac{45}{4}}$$

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$$P_{\hat{ABC}} = 5 + 6 + 9 = 20 \rightarrow K = \frac{P_{\hat{ABC}}}{P_{\hat{A'B'C'}}} = \frac{20}{50} = \frac{2}{5}$$



$$\rightarrow \frac{AB}{A'B'} = \frac{AC}{A'C'} = \frac{BC}{B'C'} = K \rightarrow \frac{5}{A'B'} = \frac{6}{A'C'} = \frac{9}{B'C'} = \frac{2}{5}$$

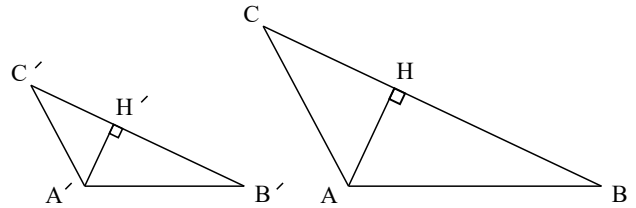
$$\rightarrow \boxed{A'B' = 12,5}, \boxed{A'C' = 15}, \boxed{B'C' = 22,5}$$

$$\left. \begin{array}{l} \widehat{B} = \widehat{D} = 90^\circ \\ \widehat{C} = \widehat{C} \end{array} \right\} \Rightarrow \triangle ABC \sim \triangle EDC \Rightarrow \frac{AB}{DE} = \frac{AC}{EC} = \frac{BC}{CD} \quad (1)$$

$$\triangle DEC : EC^2 = DE^2 + DC^2 \rightarrow 10^2 = 6^2 + DC^2 \rightarrow DC^2 = 64 \rightarrow DC = 8$$

$$\stackrel{(1)}{\rightarrow} \frac{9}{6} = \frac{x+8}{10} = \frac{BC}{8} \rightarrow 6(x+8) = 9 \times 10 \rightarrow x+8 = 15 \rightarrow \boxed{x=7}$$

$$\text{الف) } \left. \begin{array}{l} \widehat{B} = \widehat{B}' \\ \widehat{H} = \widehat{H}' = 90^\circ \end{array} \right\} \Rightarrow \triangle ABH \sim \triangle A'B'H'$$



$$\text{ب) } \triangle ABH \sim \triangle A'B'H' \rightarrow \frac{AB}{A'B'} = \frac{AH}{A'H'} = K \rightarrow \boxed{\frac{AH}{A'H'} = K}$$

$$\text{ج) } \frac{S_{\triangle ABC}}{S_{\triangle A'B'C'}} = \frac{\frac{1}{2}BC \cdot AH}{\frac{1}{2}B'C' \cdot A'H'} = \frac{BC}{B'C'} \cdot \frac{AH}{A'H'} = K^2 \rightarrow \boxed{\frac{S_{\triangle ABC}}{S_{\triangle A'B'C'}} = K^2}$$

$$\text{د) } \frac{AB}{A'B'} = \frac{AC}{A'C'} = \frac{BC}{B'C'} = K \rightarrow AB = A'B' \cdot K, \quad AC = A'C' \cdot K, \quad BC = B'C' \cdot K$$

$$\frac{P_{\triangle ABC}}{P_{\triangle A'B'C'}} = \frac{AB + AC + BC}{A'B' + A'C' + B'C'} = \frac{K(A'B' + A'C' + B'C')}{A'B' + A'C' + B'C'} \rightarrow \boxed{\frac{P_{\triangle ABC}}{P_{\triangle A'B'C'}} = K}$$

$$AB^2 = AH^2 + BH^2 \rightarrow 12^2 = x^2 + 11^2 \rightarrow x^2 = 144 - 121$$

$$\rightarrow x^2 = 23 \rightarrow \boxed{x = \sqrt{23}}$$

$$\triangle ADH \sim \triangle ABH \rightarrow \frac{AH}{BH} = \frac{AD}{AB} \rightarrow \frac{\sqrt{23}}{11} = \frac{y}{12} \rightarrow \boxed{y = \frac{12}{11}\sqrt{23}}$$