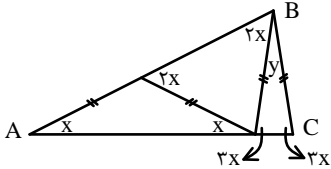




### پاسخ سؤال ۱:

$$\hat{A}_1 + \hat{A}_2 + \hat{B}_1 + \hat{B}_2 = 180^\circ \Rightarrow \hat{A}_1 + 5\hat{A}_1 + \hat{B}_1 + 5\hat{B}_1 = 180^\circ \Rightarrow 6\hat{A}_1 + 6\hat{B}_1 = 180^\circ \Rightarrow 6(\hat{A}_1 + \hat{B}_1) = 180^\circ \Rightarrow \hat{A}_1 + \hat{B}_1 = 30^\circ \Rightarrow \hat{O} = 180^\circ - (\hat{A}_1 + \hat{B}_1) = 150^\circ$$

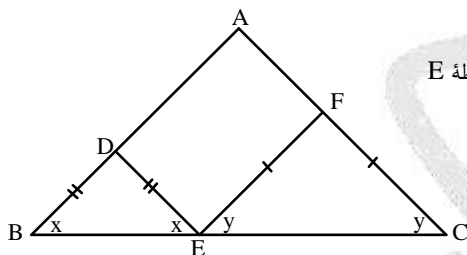
### پاسخ سؤال ۲:



$$\begin{aligned} \hat{ABC} = 100^\circ &\Rightarrow 2x + y = 100^\circ \Rightarrow 2x + y = 100^\circ \Rightarrow 100^\circ - 2x = 180^\circ - 6x \Rightarrow 4x = 180^\circ - 100^\circ \Rightarrow 4x = 80^\circ \Rightarrow x = 20^\circ \Rightarrow \hat{BAC} = 20^\circ \\ x + 2x + y + 3x &= 180^\circ \Rightarrow 6x + y = 180^\circ \end{aligned}$$

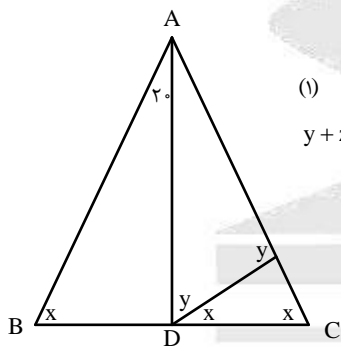
### پاسخ سؤال ۳:

در مثلث ABC داریم:



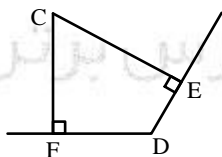
$$\left. \begin{array}{l} x + y + A = 180^\circ \\ x + y + E_1 = 180^\circ \end{array} \right\} \Rightarrow E_1 = A$$

### پاسخ سؤال ۴:



$$\begin{aligned} \text{(i)} \quad y &= x + x \leftarrow \triangle DEC \text{ برای مثلث} \\ y + z &= x + 20^\circ \leftarrow \triangle ABD \text{ برای مثلث} \end{aligned} \xrightarrow{\text{(i)}} z + x + z = x + 20^\circ \Rightarrow 2z = 20^\circ \Rightarrow z = 10^\circ$$

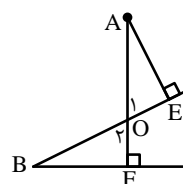
### پاسخ سؤال ۵:



$$\begin{aligned} \hat{C} + \hat{D} + \hat{E} + \hat{F} &= 360^\circ \\ \hat{C} + \hat{D} + 90^\circ + 90^\circ &= 360^\circ \text{ استدلال:} \\ \hat{C} + \hat{D} &= 180^\circ \end{aligned}$$

فرض:  $\overline{CF} \perp \overline{DF}$ ,  $\overline{CE} \perp \overline{DE}$

حکم:  $\hat{D} + \hat{C} = 180^\circ$



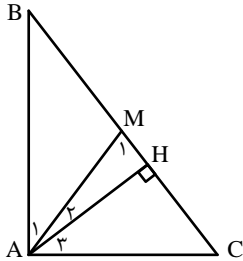
$$\begin{aligned} \hat{A} + \hat{O}_1 &= 90^\circ \\ \hat{B} + \hat{O}_2 &= 90^\circ \\ \hat{O}_1 &= \hat{O}_2 \text{ متقابل به رأس} \\ \Rightarrow \hat{A} &= \hat{B} \end{aligned}$$

فرض:  $\overline{AE} \perp \overline{BE}$ ,  $\overline{AF} \perp \overline{BF}$

حکم:  $\hat{A} = \hat{B}$



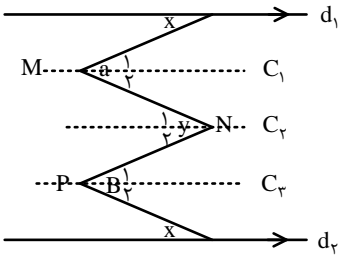
## پاسخ سؤال ۶:

الف) فرض:  $\hat{A} = 90^\circ$ ,  $\overline{BM} = \overline{CM}$ ,  $\hat{H} = 90^\circ$ حکم:  $\hat{A}_r = |\hat{B} - \hat{C}|$   
(ب)

$$\left. \begin{array}{l} \hat{A}_r = 90 - \hat{M}_1 \\ \hat{M}_1 = \hat{A}_1 + \hat{B} \\ BM = AM = CM \Rightarrow \hat{A}_1 = \hat{B} \end{array} \right\} \Rightarrow \hat{A}_r = \frac{\hat{C}}{90 - \hat{B}} - \hat{B}$$

$$\Rightarrow \hat{A}_r = |\hat{B} - \hat{C}| \quad \text{از آنجایی که مقدار زاویه همیشه نامنفی است} \Rightarrow \hat{A}_r = \hat{C} - \hat{B}$$

## پاسخ سؤال ۷:

خطهای موازی  $C_1$ ,  $C_r$  و  $C_p$  را موازی  $d_1$  و  $d_r$  رسم می‌کنیم.

$$\begin{aligned} d_1 \parallel C_1 &\Rightarrow \hat{M}_1 = x, \hat{M} = a - x \\ C_1 \parallel C_r &\Rightarrow \hat{N}_1 = a - x \\ d_r \parallel C_r &\Rightarrow \hat{P}_r = z, \hat{P}_1 = b - z \\ C_r \parallel C_p &\Rightarrow \hat{N}_r = b - z \\ \Rightarrow \hat{N} &= \hat{N}_1 + \hat{N}_r \Rightarrow y = a - x + b - z \Rightarrow y + x + z = a + b \end{aligned}$$

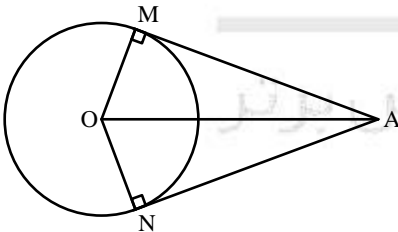
## پاسخ سؤال ۸:

حکم:  $\triangle BEF \cong \triangle GDC$  فرض:  $\left\{ \begin{array}{l} \hat{B} = \hat{C} \\ AB = AC \end{array} \right.$ 

$$AB = AC \xrightarrow{\div 2} \frac{AB}{2} = \frac{AC}{2} \Rightarrow \left\{ \begin{array}{l} BF = CG \\ \hat{G} = \hat{F} = 90^\circ \\ \hat{C} = \hat{B} \end{array} \right. \xrightarrow{\text{ض ز ض}} \triangle CDG \cong \triangle BFE$$

استدلال:

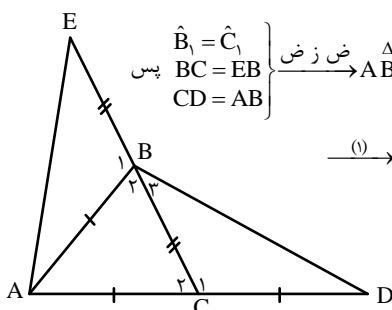
## پاسخ سؤال ۹:

فرض: شعاع دایره  $OM = ON$   $\hat{M} = \hat{N} = 90^\circ$ 

$$\left\{ \begin{array}{l} \text{شعاع: } \overline{OM} = \overline{ON} \\ \text{ضلع مشترک: } \overline{OA} = \overline{OA} \\ \hat{M} = \hat{N} = 90^\circ \end{array} \right\} \xrightarrow{\text{وتر و یک ضلع}} \triangle OMA \cong \triangle ONA \Rightarrow AM = AN$$

## پاسخ سؤال ۱۰:

$$\overline{AB} = \overline{AC} \Rightarrow \hat{C}_r = \hat{B}_r \Rightarrow \hat{B}_1 = \hat{C}_1$$



$$\left\{ \begin{array}{l} \hat{B}_1 = \hat{C}_1 \\ BC = EB \\ CD = AB \end{array} \right\} \xrightarrow{\text{ض ز ض}} \triangle ABE \cong \triangle CBD \Rightarrow \hat{B}_r = \hat{E} \quad (1) \quad \triangle ABC: \hat{A} = 52^\circ \Rightarrow \hat{B}_r + \hat{C}_r = 180 - 52 = 128 \Rightarrow \hat{B}_r = \hat{C}_r = 64^\circ \Rightarrow \hat{C}_r = 64^\circ \Rightarrow \hat{D} + \hat{B}_r = 64^\circ$$

$$\xrightarrow{(1)} \hat{D} + \hat{E} = 64^\circ$$