



گزینه ۴

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$$\left. \begin{array}{l} \widehat{BC} = 50^\circ \\ \widehat{AB} = \widehat{CD} \end{array} \right\} \Rightarrow \widehat{AB} = \widehat{CD} = \frac{180^\circ - 50^\circ}{2} = 65^\circ$$

$$\widehat{A}_1 = \frac{\widehat{BC}}{2} = \frac{50^\circ}{2} = 25^\circ$$

$$\widehat{C} = \frac{\widehat{AB}}{2} = \frac{65^\circ}{2} = 32.5^\circ$$

$$\widehat{B} = \frac{\widehat{CD} + \widehat{AD}}{2} = \frac{65^\circ + 180^\circ}{2} = 122.5^\circ$$

$$\Rightarrow \widehat{B} - \widehat{A}_1 = 122.5^\circ - 25^\circ = 97.5^\circ$$

گزینه ۱

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$$OM = MF \Rightarrow \widehat{O}_1 = \widehat{F}$$

$$AO = OF \Rightarrow \widehat{F} = x$$

$$\triangle AOF : x + 90^\circ + x + x = 180^\circ \Rightarrow 3x = 90^\circ \Rightarrow x = 30^\circ$$

گزینه ۴

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$$\widehat{A} \text{ محاطی} = 40^\circ \Rightarrow BD = 80$$

$$\widehat{BAD} = x = 360^\circ - 80^\circ = 280^\circ$$

$$\widehat{C} \text{ خارجی} = \frac{280^\circ - 80^\circ}{2} = \frac{200^\circ}{2} = 100^\circ$$

گزینه ۲

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B را به O وصل می‌کنیم، پس مثلث BOC متساوی‌الاضلاع خواهد بود و  $\widehat{B} = \widehat{O} = \widehat{C} = 60^\circ$  و  $\widehat{A} = 30^\circ$  و زاویه محاطی روبه‌روی قطر OB است، پس:  $D = 90^\circ$  پس در مثلث DOA داریم:

$$D\widehat{O}A = 90^\circ - 30^\circ = 60^\circ$$

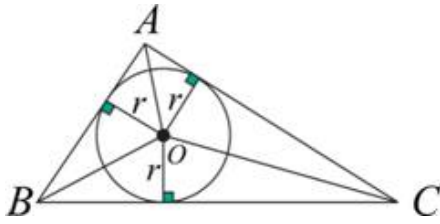
چون وترها باهم برابر هستند، پس کمان‌های نظیر نیز برابرند؛ پس:

$$\frac{۳۶۰}{۵} = ۷۲$$

$$x = \frac{EAB + CD}{۲} = \frac{۲ \times ۷۲ + ۷۲}{۲} = \frac{۳ \times ۷۲}{۲} = ۱۰۸$$

شعاع بر خط مماس در نقطه تماس عمود است؛ بنابراین خواهیم داشت:

از نقطه O به هر یک از رأس‌ها وصل می‌کنیم. آنگاه مجموع مساحت سه مثلث برابر با مساحت کل مثلث است، پس:

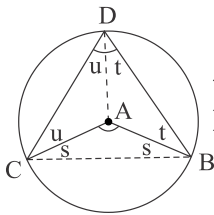


$$S_{OAC} = \frac{r \times AC}{۲}, S_{OAB} = \frac{r \times AB}{۲}, S_{OBC} = \frac{r \times BC}{۲}$$

$$S_{\Delta ABC} = S_{OAC} + S_{OAB} + S_{OBC} = \frac{r \times AC}{۲} + \frac{r \times AB}{۲} + \frac{r \times BC}{۲}$$

$$= \frac{r}{۲}(AC + AB + BC) \Rightarrow ۸۴ = \frac{r}{۲}(۱۳ + ۱۴ + ۱۵) = ۲۱r \Rightarrow r = \frac{۸۴}{۲۱} = ۴$$

در مثلث  $\Delta BCD$  سه مثلث متساوی‌الساقین وجود دارد. زاویه‌های این مثلث‌ها را به صورت زیر نام‌گذاری می‌کنیم:



$$\hat{A} + ۲s = ۱۸۰ \Rightarrow \hat{A} = ۱۸۰ - ۲s$$

$$\hat{D} + \hat{B} + \hat{C} = ۱۸۰ \Rightarrow t + u + s + t + u + s = ۱۸۰ \Rightarrow ۲s + ۲t + ۲u = ۱۸۰$$

$$\left. \begin{array}{l} ۲t + ۲u = ۱۸۰ - ۲s \\ \hat{A} = ۱۸۰ - ۲s \end{array} \right\} \Rightarrow ۲t + ۲u = \hat{A} \Rightarrow ۲(t + u) = ۲\hat{D} = \hat{A}$$

$$\hat{A} + \hat{B}_1 = ۹۰ \quad (۱)$$

$$\left. \begin{array}{l} \text{محاظی } \hat{A} = \frac{\widehat{BC}}{۲} \\ \text{محاظی } \hat{B}_r = \frac{\widehat{CD}}{۲} \end{array} \right\} \Rightarrow \hat{A} + \hat{B}_r = \frac{\widehat{BC} + \widehat{CD}}{۲} = \frac{۱۸۰}{۲} = ۹۰ \quad (۲)$$

$$\left. \begin{array}{l} \hat{A} + \hat{B}_1 = ۹۰ \\ \hat{A} + \hat{B}_r = ۹۰ \end{array} \right\} \Rightarrow \hat{B}_1 = \hat{B}_r$$

$$BE \parallel CD \Rightarrow \widehat{BC} = \widehat{ED} \quad (1)$$

$$\widehat{B} = 2\widehat{C}_1 \Rightarrow \widehat{EDC} = 2\widehat{ED} \Rightarrow \widehat{ED} + \widehat{CD} = 2\widehat{ED} \Rightarrow \widehat{ED} = \widehat{CD} \quad (2)$$

$$\xrightarrow{1,2} \widehat{BC} = \widehat{ED} = \widehat{CD}$$

$$\widehat{BE} = 30^\circ \times 2 = 60^\circ$$

$$360^\circ - 60^\circ = \widehat{BC} + \widehat{ED} + \widehat{CD} \Rightarrow 3\widehat{CD} = 300^\circ \Rightarrow \widehat{CD} = 100^\circ$$

$$\triangle AEC \text{ زاویه خارجی } \widehat{E}_1 = \widehat{x} + 30^\circ \Rightarrow \widehat{x} = \widehat{E}_1 - 30^\circ \Rightarrow \widehat{x} = \frac{\widehat{DC}}{2} - 30^\circ = \frac{100^\circ}{2} - 30^\circ = 20^\circ$$

$$\frac{\widehat{AB}}{360^\circ} = \frac{AB \text{ طول کمان}}{2\pi r} \Rightarrow \frac{\widehat{AB}}{360^\circ} = \frac{\frac{\pi}{4}}{\frac{\pi}{1}} = \frac{1}{4}$$

$$\Rightarrow \widehat{AB} = \frac{360^\circ}{4} = 90^\circ, \text{ زاویه مرکزی } \widehat{O} = 90^\circ \Rightarrow \widehat{CD} = 90^\circ$$

اگر R را شعاع دایره بزرگتر در نظر بگیریم، داریم:

$$\frac{\widehat{CD}}{360^\circ} = \frac{CD \text{ طول کمان}}{2\pi R} \Rightarrow \frac{90^\circ}{360^\circ} = \frac{\frac{\pi}{4}}{\frac{\pi}{1}R} \Rightarrow \frac{1}{4} = \frac{1}{4R}$$

$$\Rightarrow 4R = 4 \Rightarrow R = 1 \Rightarrow R = 1 + x = 3 \Rightarrow x = 2 \Rightarrow \overline{AC} = 2$$

$$\left. \begin{array}{l} \widehat{DC} = 30^\circ \\ \text{زاویه مرکزی } \widehat{DOC} \end{array} \right\} \Rightarrow \widehat{DOC} = 30^\circ$$

$$\left. \begin{array}{l} OC \perp BD \Rightarrow \widehat{DC} = \widehat{BC} = 30^\circ \\ \text{زاویه مرکزی } \widehat{BOC} \end{array} \right\} \Rightarrow \widehat{BOC} = 30^\circ$$

$$\left. \begin{array}{l} BO \perp AC \Rightarrow \widehat{AB} = \widehat{BC} = 30^\circ \\ \text{زاویه مرکزی } \widehat{BOA} \end{array} \right\} \Rightarrow \widehat{BOA} = 30^\circ$$

$$\begin{aligned} \widehat{AED} &= 360^\circ - (\widehat{BOC} + \widehat{H}_1 + \widehat{H}_2) \\ &\Rightarrow \widehat{AED} = 360^\circ - (30^\circ + 90^\circ + 90^\circ) = 360^\circ - 210^\circ = 150^\circ \end{aligned}$$

$$\left. \begin{array}{l} OA = OB \\ OC = OC \text{ (مشترک)} \\ \widehat{A} = \widehat{B} = 90^\circ \text{ (ماس } CB \text{ و } AC) \end{array} \right\} \xrightarrow{\text{وض}} \triangle OAC \cong \triangle OBC \Rightarrow \widehat{O}_1 = \widehat{O}_2$$

$$\left. \begin{array}{l} \text{زاویه مرکزی } \widehat{O} = \widehat{O}_1 + \widehat{O}_2 = \widehat{AB} = 120^\circ \\ \widehat{O}_1 = \widehat{O}_2 \end{array} \right\} \Rightarrow \widehat{O}_1 = \widehat{O}_2 = 60^\circ$$

$$OA = OD \Rightarrow \hat{A} = \hat{D}_1$$

$$\hat{O}_1 = 60^\circ \Rightarrow \hat{A} + \hat{D}_1 + \hat{O}_1 = 180^\circ \Rightarrow \hat{A} + \hat{D}_1 + 60^\circ = 180^\circ$$

$$\hat{A} + \hat{D}_1 = 120^\circ \xrightarrow{\hat{A}=\hat{D}_1} \hat{A} = \hat{D}_1 = 60^\circ$$

$$\Rightarrow \text{متساوی الاضلاع } \triangle OAD \Rightarrow OA = OD = AD = R = 6$$

همچنین داریم:

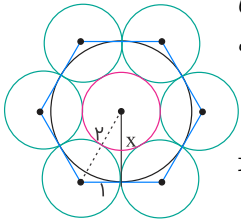
$$OC = OD + DC = 6 + 4 = 10$$

$$\triangle OAC \text{ قائم الزاویه} : OC^2 = OA^2 + AC^2 \Rightarrow 100 = 36 + AC^2$$

$$\Rightarrow AC^2 = 100 - 36 = 64 \Rightarrow \overline{AC} = 8$$

گزینه ۴

۱۳



مطابق شکل با وصل کردن مرکزهای دایره‌های بیرونی، یک ۶ضلعی منتظم به دست می‌آید که فاصله مرکز شش ضلعی از هر رأس آن برابر با ۲ سانتی‌متر است. حال مقدار  $x$  را (شعاع دایره بزرگ) با استفاده از قضیه فیثاغورس حساب می‌کنیم:

$$x^2 + 1^2 = 2^2 \Rightarrow x^2 = 3 \Rightarrow x = \sqrt{3}$$

پاسخ سؤالات ۱۴ تا ۴۸

- ۱۴ O - یکسان
- ۱۵ شعاع - ۲
- ۱۶ داخل
- ۱۷ خارج
- ۱۸ روی محیط
- ۱۹ وتر
- ۲۰ قطر
- ۲۱ کمان
- ۲۲ قطر
- ۲۳ دو
- ۲۴ خط عمود

بیشتر از ۲۵

مماس - یک ۲۶

دو ۲۷

عمود ۲۸

شعاع ۲۹

مرکزی ۳۰

محاطی ۳۱

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۶۰° ۳۵

نیمساز ۳۶

برابر ۳۷

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برابر ۴۲

۷۲° ۴۳

۱۳۵° ۴۴

دو ۴۵

مماس ۴۶

بی‌نهایت - عمودمنصف خط بین دو نقطه ۴۷

۵۴۰ درجه ۴۸

$$\widehat{B} = \widehat{A} = 56^\circ$$

$$\widehat{DC} = 2\widehat{A} = 2 \times 56^\circ = 112^\circ$$

$$D\widehat{OC} = \widehat{DC} = 112^\circ$$

$$\widehat{D} = 60^\circ \Rightarrow \widehat{O}_r = 60^\circ$$

$$\widehat{B} = \widehat{A} = 53^\circ \Rightarrow \widehat{O}_1 = 180 - 2\widehat{A} = 74^\circ$$

$$D\widehat{OA} = 180^\circ - \widehat{O}_r - \widehat{O}_1 = 180^\circ - 74^\circ - 60^\circ = 46^\circ$$

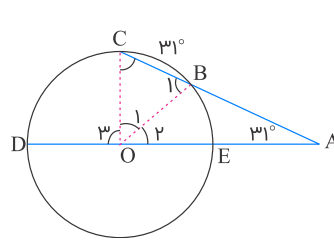
$$\widehat{O} = \widehat{BC} = 90^\circ \Rightarrow \widehat{A} = \frac{\widehat{BC}}{2} = \frac{90^\circ}{2} = 45^\circ$$

$$\widehat{C} = \frac{\widehat{AB}}{2} = 90^\circ$$

$$\widehat{B} = \frac{\widehat{AC}}{2} = \frac{180 - 55}{2} = \frac{125}{2} = 62.5^\circ$$

$$\widehat{AC} = 180 - 55 = 125^\circ$$

$$\widehat{BC} = 55^\circ, \quad \widehat{AB} = 180^\circ$$



$$\widehat{O}_1 = \widehat{BC} = 31^\circ$$

$$\widehat{B}_1 = \widehat{C} = \frac{180 - 31}{2} = 74.5^\circ$$

$$\widehat{DC} = \widehat{O}_r = \widehat{C} + \widehat{A} = 74.5 + 31 = 105.5/5$$

$$\widehat{O}_r = 180 - \widehat{O}_r - \widehat{O}_1 = 180 - 105.5/5 - 31 = 43/5^\circ$$

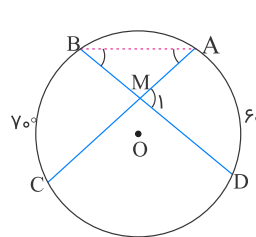
$$\widehat{BE} = \widehat{O}_r = 43/5^\circ$$

$$\widehat{F} = \widehat{A} = 30^\circ$$

$$\widehat{BE} = 2\widehat{F} = 2 \times 30 = 60^\circ$$

$$\widehat{M}_1 = \widehat{C} + \widehat{A} \Rightarrow \widehat{C} = 70 - 30 = 40^\circ$$

$$\widehat{ED} = 2\widehat{C} = 80 \Rightarrow \widehat{BD} = \widehat{ED} - \widehat{BE} = 80 - 60 = 20^\circ$$



$$\widehat{B} = \frac{\widehat{AD}}{2} = \frac{60^\circ}{2} = 30^\circ, \quad \widehat{A} = \frac{\widehat{BC}}{2} = \frac{70}{2} = 35^\circ$$

$$60^\circ \Rightarrow \widehat{M}_1 = \widehat{A} + \widehat{B} = 30 + 35 = 65^\circ$$

ب

ب

ت

ث

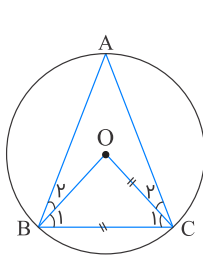
ج

ح

$$\widehat{BC} = 2\hat{A} = 2 \times 115 = 230^\circ$$

$$\widehat{BAC} = 360^\circ - 230^\circ = 130^\circ \Rightarrow \hat{O} = 130^\circ$$

ح



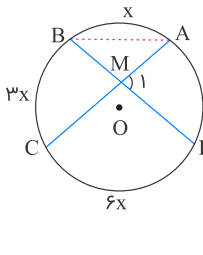
$$\hat{O} = 60^\circ \Rightarrow \hat{B}_1 = 60^\circ \Rightarrow \hat{C}_1 = 60^\circ$$

$$\hat{A} = \frac{\widehat{BC}}{2} = \frac{60}{2} = 30^\circ$$

$$\hat{B} + \hat{C} = 180^\circ - 30^\circ = 150^\circ$$

$$\hat{B}_1 + \hat{B}_2 + \hat{C}_1 + \hat{C}_2 = 150^\circ \Rightarrow \hat{B}_2 + \hat{C}_2 = 150^\circ - 120^\circ = 30^\circ$$

خ

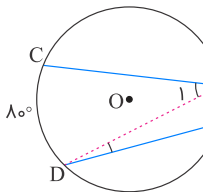


$$360^\circ = x + 3x + 6x + 6x \Rightarrow 12x = 360^\circ \Rightarrow x = 30^\circ$$

$$\hat{A} = \frac{3 \times 30^\circ}{2} = 45^\circ, \quad \hat{B} = \frac{2 \times 30^\circ}{2} = 30^\circ$$

$$\hat{M}_1 = \hat{A} + \hat{B} = 45^\circ + 30^\circ = 75^\circ$$

د



$$\hat{A}\hat{B}_1 = \frac{\widehat{CD}}{2} = \frac{80^\circ}{2} = 40^\circ, \quad \hat{D} = \frac{\widehat{BE}}{2} = \frac{40^\circ}{2} = 20^\circ$$

$$\hat{B}_1 = \hat{A} + \hat{D} \Rightarrow 40^\circ = \hat{A} + 20^\circ \Rightarrow \hat{A} = 40^\circ - 20^\circ = 20^\circ$$

الف 50

$$\hat{C} = \frac{\widehat{AB}}{2} = \frac{180^\circ}{2} = 90^\circ$$

$$\hat{B} = 180^\circ - 90^\circ - 42^\circ = 48^\circ$$

ب

$$\hat{A} + \hat{B} + \hat{C} + \hat{D} + \hat{E} = \frac{\widehat{DC}}{2} + \frac{\widehat{DE}}{2} + \frac{\widehat{AE}}{2} + \frac{\widehat{AB}}{2} + \frac{\widehat{BC}}{2} = \frac{360^\circ}{2} = 180^\circ$$

ج

$$\widehat{DCB} = 2\hat{A} = 206^\circ \Rightarrow \hat{C} = \frac{\widehat{DAB}}{2} = \frac{360^\circ - 206^\circ}{2} = 77^\circ$$

ت

$$\widehat{BD} = \hat{O} = 41^\circ \Rightarrow \hat{C} = \widehat{AB} - \widehat{BD} = 180^\circ - 41^\circ = 139^\circ$$

ث

$$\widehat{CN} = \widehat{NB} = \frac{90^\circ}{2} = 45^\circ$$

$$\widehat{A} = \frac{\widehat{NB}}{2} = \frac{45^\circ}{2} = 22\frac{1}{2}^\circ$$

$$\left. \begin{aligned} \widehat{B}_1 &= \frac{\widehat{ACD}}{2} \\ \widehat{C}_1 &= \frac{\widehat{ABD}}{2} \end{aligned} \right\} \Rightarrow \widehat{B}_1 + \widehat{C}_1 = 180^\circ (*)$$

$$\left. \begin{aligned} \widehat{B}_1 &= 180^\circ - 4x \\ \widehat{C}_1 &= 180^\circ - 4x \end{aligned} \right\} \Rightarrow 360^\circ - 8x = \widehat{B}_1 + \widehat{C}_1 \xrightarrow{(*)} 360^\circ - 8x = 180^\circ$$

$$\Rightarrow 8x = 180^\circ \Rightarrow x = \frac{180^\circ}{8} = 22\frac{1}{2}^\circ$$

$$\widehat{BE} = 2\widehat{D} = 80^\circ$$

$$\widehat{C} = \frac{\widehat{BE}}{2} = 40^\circ$$

$$\widehat{B}_1 = 180^\circ - 75^\circ - 40^\circ = 65^\circ$$

$$\widehat{B}_1 = x + \widehat{D} \Rightarrow 65^\circ = x + 40^\circ \Rightarrow x = 65^\circ - 40^\circ = 25^\circ$$

$$\widehat{AE} = \widehat{O} = 120^\circ, \quad \widehat{C} = \frac{\widehat{AE}}{2} = 60^\circ$$

$$\widehat{BDE} = \widehat{CDA} = 180^\circ - 60^\circ - 30^\circ = 90^\circ$$

$$\left. \begin{aligned} \widehat{FD} = 38^\circ &\Rightarrow \widehat{E}_1 = 19^\circ \Rightarrow \widehat{A}_1 + \widehat{F}_1 = 19^\circ \\ \widehat{CF} = 42^\circ &\Rightarrow \widehat{B}_1 = 21^\circ \Rightarrow \widehat{A}_2 + \widehat{F}_2 = 21^\circ \end{aligned} \right\} \xrightarrow{+} \widehat{A} + \widehat{F} = 40^\circ$$

$$\left. \begin{aligned} \text{شعاع } BO &= CO \\ \text{شعاع } BO &= AO \\ \text{متوازي الاضلاع } ABCO &: AO = BC \end{aligned} \right\} \Rightarrow BO = CO = BC$$

$$\Rightarrow \text{متساوي الاضلاع } \triangle BOC \Rightarrow \widehat{CB} = \widehat{O}_1 = 60^\circ$$

$$\widehat{BE} = 2\widehat{D} = 60^\circ \Rightarrow \widehat{C} = \frac{\widehat{BE}}{2} = \frac{60^\circ}{2} = 30^\circ$$

$$\widehat{E}_1 = 180^\circ - 50^\circ = 130^\circ$$

$$\Rightarrow \widehat{A} = 180^\circ - 130^\circ - 30^\circ = 20^\circ$$



$$\widehat{AB} = 2\widehat{C} = 50^\circ$$

$$\widehat{CD} = 2\widehat{A} = 100^\circ$$

$$\widehat{B} = \frac{\widehat{CD}}{2} = 50^\circ$$

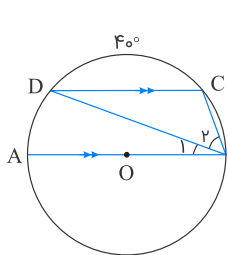
$$\widehat{M}_1 = \widehat{B} + \widehat{C} = 50 + 25 = 75^\circ$$

$$\widehat{B}_1 = 55^\circ, \quad \widehat{D} = 25^\circ$$

$$\widehat{B}_1 = \widehat{D} + x \Rightarrow x = \widehat{B}_1 - \widehat{D} = 55^\circ - 25^\circ = 30^\circ$$

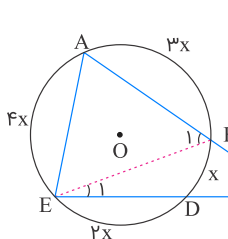
$$\widehat{E}_1 = \frac{110^\circ}{2} = 55^\circ$$

$$y = \widehat{E}_1 + \widehat{D} = 55^\circ + 25^\circ = 80^\circ$$



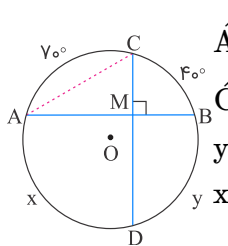
$$\widehat{B}_1 + \widehat{D} = \frac{180^\circ - 40^\circ}{2} = 70^\circ$$

$$\widehat{B}_1 = \widehat{D} = 35^\circ$$

$$\widehat{B}_1 = \frac{\widehat{CD}}{2} = 20^\circ \Rightarrow \widehat{C} = 180^\circ - 35^\circ - 20^\circ \Rightarrow \widehat{C} = 125^\circ$$


$$360 = x + 2x + 3x + 4x$$

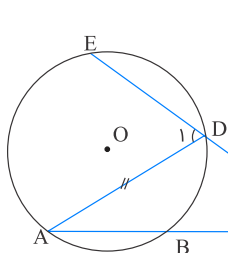
$$10x = 360 \Rightarrow x = 36^\circ$$

$$\left\{ \begin{array}{l} \widehat{B}_1 = \frac{4x}{2} = \frac{4 \times 36}{2} = 72^\circ \\ \widehat{E}_1 = \frac{x}{2} = \frac{36}{2} = 18^\circ \end{array} \right. \Rightarrow \widehat{B}_1 = \widehat{C} + \widehat{E}_1 \Rightarrow \widehat{C} = \widehat{B}_1 - \widehat{E}_1 = 72 - 18 = 54^\circ$$


$$\widehat{A} = \frac{40^\circ}{2} = 20^\circ$$

$$\widehat{C} = 180 - 90 - 20 = 70^\circ \Rightarrow x = 2\widehat{C} = 140^\circ$$

$$y = 360 - 140 - 40 - 70 = 110^\circ$$

$$x - y = 140 - 110 = 30^\circ$$


$$\widehat{A} = 20^\circ \Rightarrow \widehat{D}_1 = \widehat{A} + \widehat{C} = 20 + 20 = 40^\circ \Rightarrow \widehat{AE} = 2\widehat{D}_1 = 80^\circ$$

د

$$\hat{C} = \hat{D}$$

$$\hat{C} + \hat{D} = 60^\circ \Rightarrow \hat{C} = \hat{D} = 30^\circ$$

$$\hat{A} = 90^\circ$$

$$\hat{B} = 180^\circ - 90^\circ - 30^\circ = 60^\circ$$

ذ

$$\hat{AM} = \hat{BM} = \frac{180^\circ}{2} = 90^\circ$$

$$\hat{B} = \frac{90^\circ}{2} = 45^\circ \Rightarrow \hat{C} = 180^\circ - 90^\circ - 45^\circ = 45^\circ$$

ر

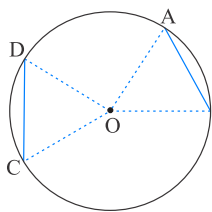
$$\hat{B} = 55^\circ \Rightarrow \hat{AD} = 2 \times 55 = 110^\circ$$

$$\hat{DC} = 90^\circ$$

$$\hat{BC} = 360^\circ - \hat{DC} - \hat{AD} - \hat{AB} = 360^\circ - 90^\circ - 110^\circ - 120^\circ = 40^\circ$$

$$\Rightarrow \hat{A} = \frac{\hat{BC}}{2} = 20^\circ$$

ابتدا از A، B، D و C به O وصل می‌کنیم: ۵۲



$$\left. \begin{array}{l} OA = OB = OC = OD \\ AB = DC \end{array} \right\} \Rightarrow \triangle AOB \cong \triangle DOC$$

چون مثلث‌ها همنهشت هستند، ارتفاع‌های نظیرشان باهم برابر است؛ پس فاصله وترها از O به یک اندازه است.

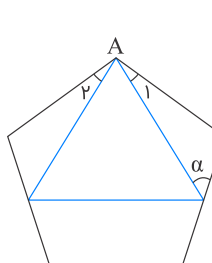
۵۳

اولین مضرب ۱۸۰ بزرگ‌تر از ۲۵۷۰ را به دست می‌آوریم که ۲۷۰۰ می‌شود.

$$180 \times 15 = 2700$$

$$2700 - 2570 = 130^\circ$$

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$$\left. \begin{array}{l} \frac{(\omega - 2) \times 180}{5} = 108^\circ \text{ هر زاویه پنج ضلعی} \\ \hat{A}_1 = \hat{A}_2 = \frac{108 - 60}{2} = 24^\circ \end{array} \right\} \Rightarrow \alpha = 180 - 108 - 24 = 48^\circ$$

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$$\left. \begin{array}{l} AN = AF \\ DE = DF \\ CE = CN \end{array} \right\} \xrightarrow{+} AN + DE + CE = AF + DF + CN \Rightarrow AN + DC = AD + CN$$

$$\left. \begin{array}{l} CN - AN = a - b \\ AN = MC \end{array} \right\} \Rightarrow MN = a - b$$

