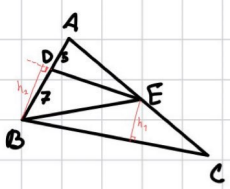


(1)



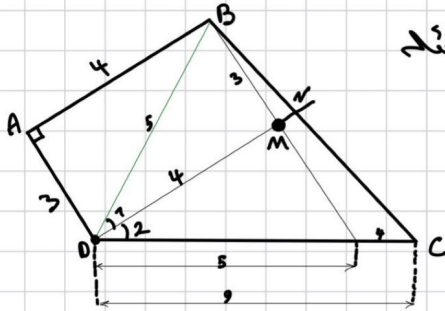
$$\left. \begin{array}{l} h_1 \perp BC \\ h_2 \perp ED \\ DE \parallel BC \end{array} \right\} \Rightarrow h_1 \parallel h_2, h_1 = h_2$$

$$\left. \begin{array}{l} S_{\triangle EDB} = h_2 \times DE \times \frac{1}{2} \\ S_{\triangle BCE} = h_1 \times BC \times \frac{1}{2} \end{array} \right\} \Rightarrow \frac{S_{\triangle BCE}}{S_{\triangle EDB}} = \frac{\cancel{h_1} \times BC \times \frac{1}{2}}{\cancel{h_2} \times DE \times \frac{1}{2}} = \frac{BC}{DE}$$

طبق قضیه
تالس

$$\Delta ADE \sim \Delta ABC \Rightarrow \frac{AB}{AD} = \frac{BC}{DE} \Rightarrow \left\{ \begin{array}{l} AB = 5+7 \\ AD = 5 \end{array} \right. \Rightarrow \frac{BC}{DE} = \frac{AB}{AD} = \frac{12}{5}$$

$$\frac{S_{\triangle BCE}}{S_{\triangle EDB}} = \frac{12}{5}$$



(2) DM نیم ساز زاویه BDE در مثل BDE متساوی الساقین است.

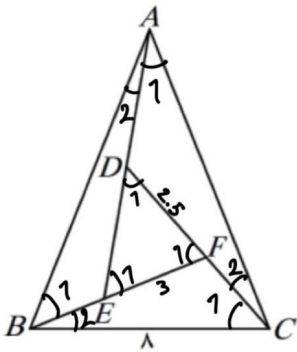
DM هم نیمساز هم ارتفاع است.

$$BD^2 = AB^2 + AD^2 = 4^2 + 3^2 = 25 \rightarrow BD = 5$$

$$BDE \rightarrow BD = DE = 5 \quad EC = DC - DE = 9 - 5 = 4$$

N وسط ضلع BC، در مثل متساوی الساقین BDE ارتفاع DM میان هم هست

$$\frac{BM}{ME} = \frac{BN}{NC} \rightarrow MN \parallel EC \Rightarrow \frac{MN}{4} = \frac{3}{6} \Rightarrow \boxed{MN = 2}$$



$$\angle EFD = \angle ABC$$

$$\angle FDE = \angle BCA$$

(جمع زوایای داخلی)

$$\angle DEF = \angle BAC$$

$$\hat{A}_1 = \hat{B}_1 = \hat{C}_1 = t^\circ \quad (3)$$

AE بخشی از AC است که از D بر می خیزد

BA // BF

CD // CB

خطوط FD، DE، EF از مرکز دایره محیطی ABC، BC، AC، AB متشکل شده است.

زاوای داخلی که این سه خط جدید تشکیل داده اند بازوای داخلی که سه خط قبلی با هم تشکیل داده اند برابر است.

رابطه تساوی زاویه ها بر اساس پاره خط هایی که با هم متناظر از نوخته شده است.

$$\Delta ABC \sim \Delta DEF$$

$$\hat{F}_1 = \hat{B}, \hat{D}_1 = \hat{C}, \hat{E}_1 = \hat{A} \xrightarrow[\text{متناظر زاویه}]{\text{تناسب اضلاع}} \begin{array}{l} BC \leftarrow \text{ضلع مقابل به زاویه } \hat{A} \\ DF \leftarrow \text{ضلع مقابل به زاویه } \hat{E}_1 \end{array} \Rightarrow \frac{BC}{DF} = \frac{8}{2.5}$$

$$\left. \begin{array}{l} AB \text{ متناظر زاویه } \hat{C} \\ EF \text{ متناظر زاویه } \hat{D}_1 \end{array} \right\} \Rightarrow \frac{BC}{DF} = \frac{8}{2.5} = \frac{AB}{EF} = \frac{AB}{3} \Rightarrow AB = 9.6$$

(4)

$$BM = AM = 3 / BM \parallel DC \Rightarrow BME \sim OEC \rightarrow \frac{ME}{CE} = \frac{BM}{DC} = \frac{3}{6} = \frac{1}{2}$$

$$BCM = CM^2 = BC^2 + BM^2 = 6^2 + 3^2 = 45$$

$$CM = 3\sqrt{5} \Rightarrow ME = \sqrt{5}, CE = 2\sqrt{5}$$

$$AMF \sim BCM \Rightarrow \frac{AM}{BC} = \frac{MF}{MC} = \frac{3}{6} = \frac{MF}{3\sqrt{5}} \Rightarrow MF = \frac{3}{2}\sqrt{5}$$

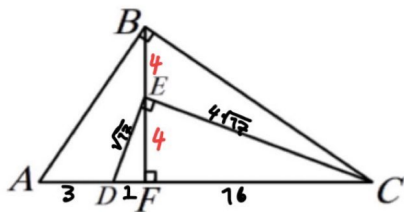
$$S_{MFE} = \frac{1}{2} \times ME \times MF = \frac{1}{2} \times (\sqrt{5} \times \frac{3}{2}\sqrt{5}) = \frac{15}{4} = 3.75$$

$$ABE \rightsquigarrow AE^2 = AB^2 + BE^2 \rightsquigarrow 11^2 + x^2 \rightsquigarrow AE = \sqrt{121 + x^2} \quad (5)$$

$$AEC \sim ACD \Rightarrow \frac{AE}{ED} = \frac{EC}{AE} \rightsquigarrow AE^2 = ED + EC$$

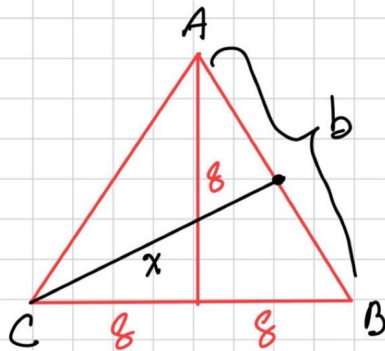
$$\hookrightarrow 121 + x^2 + 10(10+x) \rightarrow 121 + x^2 + 100 + 10x$$

$$\hookrightarrow x^2 - 10x + 21 = 0 \rightarrow x_1 = 3 / x_2 = 7$$



$$ED = \sqrt{1+16} = \sqrt{17} \quad \left. \begin{array}{l} \rightarrow 17 + EC^2 = 289 \\ EC^2 = 272 \rightarrow EC = 4\sqrt{17} \end{array} \right\}$$

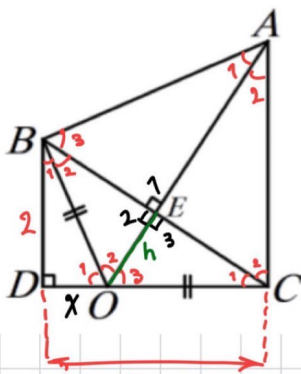
$$BF^2 = 4 \times 16 \rightsquigarrow BF = 8 \quad / \quad BC^2 = 8^2 + 16^2 = 320 \rightsquigarrow BC = 8\sqrt{5}$$



$$b^2 + b^2 = 16^2 \rightarrow 2b^2 = 256 \rightarrow b^2 = 128$$

$$b = 8\sqrt{2} \rightsquigarrow \text{میان دو برآین نصف وتر است پس باسان های } b \text{ قائم الزامی است.}$$

$$\sqrt{(8\sqrt{2})^2 + (4\sqrt{2})^2} = \sqrt{128 + 32} = \sqrt{160} = 4\sqrt{10}$$



$$\sqrt{x^2 + 2^2} = BO \quad \left. \begin{array}{l} \Rightarrow x^2 + 4 = 16 + x^2 - 8x \\ 4 - x = CO \\ BO = CO \end{array} \right\} \Rightarrow 8x = 12$$

$$\rightsquigarrow x = \frac{12}{8} = \frac{3}{2}$$

$$BC = \sqrt{2^2 + 4^2} = \sqrt{20} \Rightarrow BE = \frac{\sqrt{20}}{2} = \sqrt{5}$$

$$\hookrightarrow S_{\triangle BDC} = 2 \times 4 \times \frac{1}{2} = 4, \quad S_{\triangle BDO} = 2 \times \frac{3}{2} \times \frac{1}{2} = \frac{3}{2}$$

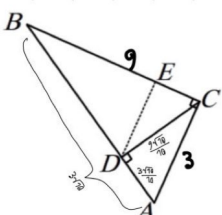
$$S_{\triangle BOC} = 4 - \frac{3}{2} = \frac{5}{2} \rightsquigarrow \frac{5}{2} = \sqrt{20} \times h \times \frac{1}{2} \Rightarrow h = \frac{5}{\sqrt{20}}$$

$$\begin{aligned} \triangle OBC \text{ متساوی الساقین} &\rightarrow \hat{B}_2 = \hat{C}_1 \\ \triangle BEO \text{ در مثل قائم الزامی} &\rightarrow \hat{B}_2 + \hat{O}_2 = 90^\circ \\ OC = OB &\rightarrow \hat{O}_2 = \hat{O}_3 \rightarrow \hat{O}_2 = \hat{O}_3 \rightarrow \hat{O}_2 = \hat{O}_3 \\ \triangle OBA \cong \triangle OCA &\Rightarrow \hat{A}_2 = \hat{A}_1 \\ \hat{C}_1 + \hat{O}_3 = 90^\circ, \hat{O}_3 + \hat{A}_2 = 90^\circ &\Rightarrow \hat{A}_2 = \hat{C}_1 \rightarrow \hat{A}_1 = \hat{C}_1 \end{aligned}$$

$$\left. \begin{array}{l} \hat{A}_1 = \hat{C}_1 \\ 90^\circ = \hat{O} = \hat{E}_1 \end{array} \right\} \Rightarrow \triangle BDC \sim \triangle BEA$$

$$k = \frac{BD}{BE} = \frac{2}{\sqrt{5}} \rightsquigarrow k^2 = \frac{S_{\triangle BDC}}{S_{\triangle BEA}} = \frac{4}{5}$$

$$S_{\triangle BDC} = 2 \times 4 \times \frac{1}{2} = 4 \hookrightarrow S_{\triangle BEA} = 4 \times \frac{5}{4} = 5$$

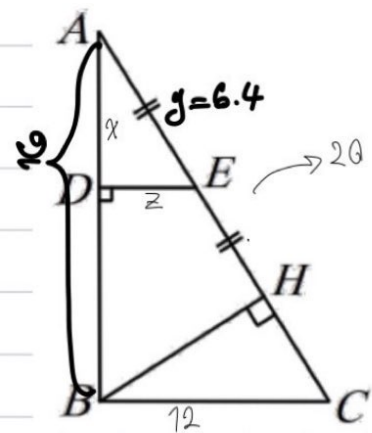


$$\sqrt{3^2 + 9^2} = 3\sqrt{10} \quad \triangle DAC \sim \triangle ABC \rightarrow \frac{AC}{AB} = \frac{DA}{AC} = \frac{DC}{BC} \rightarrow \frac{3}{3\sqrt{10}}$$

$$\hookrightarrow \frac{DA}{3} = \frac{DC}{9} \rightarrow \frac{3\sqrt{10}}{10} = \frac{DC}{9}$$

$$\triangle BDE \sim \triangle ABC \rightarrow \frac{ED}{AC} = \frac{EB}{BC} = \frac{BD}{BA} \rightarrow \frac{ED}{3} = \frac{EB}{9} = \frac{3\sqrt{10} - DA}{3\sqrt{10}}$$

$$\hookrightarrow EB \times 3\sqrt{10} = 9(3\sqrt{10} - 3\frac{\sqrt{10}}{10}) = 27\sqrt{10} \times 9 \Rightarrow EB \times \sqrt{10} = 27\sqrt{10} \Rightarrow EB = 8.1$$



$$\triangle ABC \sim \triangle ADE \Rightarrow \frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC} \Rightarrow \frac{x}{20-x} = \frac{y}{20} = \frac{z}{12}$$

$$\triangle ABC \sim \triangle BHC \Rightarrow \frac{BH}{AB} = \frac{HC}{BC} = \frac{BC}{AC} \Rightarrow \frac{BH}{20} = \frac{20-2y}{12} = \frac{12}{20}$$

$$\Rightarrow \frac{10}{20} \times (20-2y) = \frac{6 \times 6}{12 \times 12} \Rightarrow 100 - 10y = 36 \Rightarrow y = 6.4$$

$$\Rightarrow \frac{6.4}{20} = \frac{z}{12} \Rightarrow z = \underline{3.84}$$

(10)