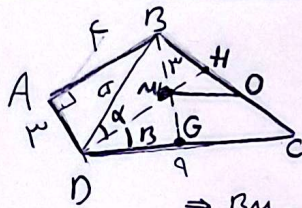


ارتفاع‌ها برابر $\Rightarrow \frac{S_{\triangle BCE}}{S_{\triangle BDE}} = \frac{BC}{DE} = \frac{AB}{AD} = \frac{12}{5} = 2.4$



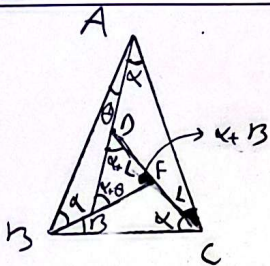
$BD^2 = AD^2 + AB^2 \Rightarrow BD = 5$

$ABD \sim BDM \Rightarrow BM = 3$

$BDC = 2BDM \Rightarrow \alpha = \beta \Rightarrow BMD \sim DMG \Rightarrow BD = DG = 5$

$\Rightarrow BM = MG = 3$ و $(DG = 5) \Rightarrow CG = 9 - 5 = 4$

$BMO \sim BGC \Rightarrow \frac{BM}{BG} = \frac{BO}{BC} = \frac{MO}{GC} = \frac{1}{3} \Rightarrow \frac{MO}{4} = \frac{1}{3} \Rightarrow MO = \frac{4}{3}$



برای راست کردن زوایای برابر در دو مثلث ABC و DEF، این دو مثلث متغایب هستند.

$ABC \sim DEF \Rightarrow \frac{DE}{AC} = \frac{DF}{BC} = \frac{EF}{AB}$

$\Rightarrow \frac{2.5}{1} = \frac{3}{AB} \Rightarrow AB = 1.2$

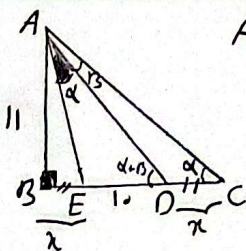
AB وسط M $\Rightarrow AM = MB = 3$ و $MC^2 = BC^2 + MB^2 \Rightarrow MC = \sqrt{3^2 + 9} = 3\sqrt{2}$

$\hat{C} = \hat{M}$ و $A = B = 90^\circ \Rightarrow MBC \sim AMF \Rightarrow \frac{AF}{MB} = \frac{AM}{CB} \Rightarrow \frac{AF}{3} = \frac{3}{4} \Rightarrow AF = \frac{9}{4}$

$MF^2 = AF^2 + AM^2 \Rightarrow MF = \sqrt{9 + \frac{81}{16}} = \frac{15\sqrt{5}}{4}$

$MBE \sim ECD \Rightarrow \frac{MB}{DC} = \frac{ME}{EC} \Rightarrow \frac{3}{4} = \frac{ME}{CE} \Rightarrow CE = 4ME$ و $ME + EC = 3\sqrt{2}$

$\Rightarrow ME + 4ME = 3\sqrt{2} \Rightarrow ME = \frac{3\sqrt{2}}{5}$ $S_{MEF} = \frac{MF \times ME}{2} = \frac{15\sqrt{5}}{4} \times \frac{1}{4} \times \frac{3\sqrt{2}}{5} = \frac{15}{8}$



$AEO \sim AEC \Rightarrow \frac{EO}{AE} = \frac{AE}{EC} = \frac{AO}{AC} \Rightarrow \frac{1}{\sqrt{121+x^2}} = \frac{\sqrt{121+x^2}}{10+x}$

$\Rightarrow 121 + x^2 = 100 + 10x \Rightarrow x^2 - 10x + 21 = 0 \Rightarrow x = 3$ و $x = 7$

$$EF^2 = DF \times FC \Rightarrow 14 = 1 \times FC \Rightarrow FC = 14$$

$$BC^2 = CF \times AC \Rightarrow BC^2 = 14 \times 2 \Rightarrow BC = \sqrt{14 \times 2} = \underline{1\sqrt{5}}$$

5

6

مثلث متساوی الساقین است پس میان آن، ارتفاع نیز است
 $\Rightarrow$ نصف قاعه = 1 $\Rightarrow$ ساق = $\sqrt{1^2 + 1^2} = \sqrt{2}$



$$AB \text{ میان } M \Rightarrow AM = MB = \frac{AB}{2} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$$

$$\hat{C} = \hat{B} = \hat{A}_1 = \hat{A}_2 = 45^\circ \Rightarrow \hat{A} = 90^\circ$$

$$ACM \Rightarrow MC^2 = AM^2 + AC^2 = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 \Rightarrow MC = \frac{1}{\sqrt{2}}$$

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7

$$BC^2 = BD^2 + DC^2 \Rightarrow BC = \sqrt{1+1} \Rightarrow \sqrt{2} = \underline{2\sqrt{5}}$$

چون M و C با هم برابر هستند پس ارتفاع آن (ME) میان BC می شود پس:

$$BE = EC = \frac{BC}{2} = \sqrt{5}$$

$$AE^2 = BE \times CE \Rightarrow AE = \sqrt{5} \Rightarrow S_{ABE} = \frac{\sqrt{5} \times \sqrt{5}}{2} = \frac{5}{2}$$

$$\cot C = \frac{DC}{BD} = 2 \Rightarrow \tan C = \frac{AE}{EC} = 2 \Rightarrow AE = 2\sqrt{5} \Rightarrow S = \frac{1}{2} \times \sqrt{5} \times 2\sqrt{5} = \underline{5}$$

5

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$$AB^2 = AC^2 + BC^2 \Rightarrow AB = \sqrt{1+9} \Rightarrow AB = \sqrt{10} \Rightarrow \begin{cases} AN = x \\ BN = \sqrt{10} - x \end{cases}$$

$$AC^2 = AN \times AB \Rightarrow 9 = x \times (\sqrt{10}) \Rightarrow x = \frac{9}{\sqrt{10}} \Rightarrow BN = \frac{\sqrt{10} \times \sqrt{10} - 9}{1} = \frac{1}{1}$$

$$BE \times BC = BN^2 \Rightarrow \frac{2\sqrt{5} \times \sqrt{5}}{1} = BE \times 9 \Rightarrow \underline{BE = 1.1}$$

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9

$$AB^2 + BC^2 = AC^2 \Rightarrow 16 + 144 = 160 \Rightarrow AC = 20$$

$$BC^2 = CH \times AC \Rightarrow 144 = CH \times 20 \Rightarrow CH = 7.2$$

$$AC = CH + AH \Rightarrow 20 = 7.2 + AH \Rightarrow AH = 12.8, AH = 2AE \Rightarrow AE = 6.4$$

$$AOF \sim ABC \Rightarrow \frac{OE}{BC} = \frac{AE}{AC} \Rightarrow OE = 12 \times \frac{6.4}{20} \Rightarrow \underline{OE = 3.84}$$

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