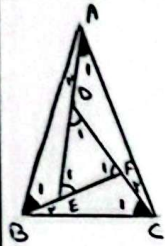


$$DE \parallel BC \rightarrow BH' = EH$$

$$\frac{S_{\triangle BCE}}{S_{\triangle BDE}} = \frac{BC \times EH}{DE \times BH'} = \frac{BC}{DE}$$

$$DE \parallel BC \xrightarrow{\text{میدان}} \frac{AD}{AB} = \frac{DE}{BC} \rightarrow \frac{4}{14} = \frac{DE}{BC} \rightarrow \frac{BC}{DE} = \frac{14}{4}$$

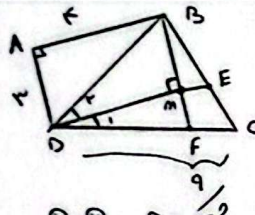
$$\Rightarrow \frac{S_{\triangle BCE}}{S_{\triangle BDE}} = \frac{14}{4}$$



$$\begin{aligned} \hat{E}_1 &= \hat{A}_1 + \hat{B}_1, \quad \hat{B}_1 = \hat{A}_1 \rightarrow \hat{E}_1 = \hat{A}_1 \quad (1) \\ \hat{D}_1 &= \hat{A}_1 + \hat{C}_1, \quad \hat{A}_1 = \hat{C}_1 \rightarrow \hat{D}_1 = \hat{C}_1 \quad (2) \\ \hat{F}_1 &= \hat{C}_1 + \hat{B}_1, \quad \hat{C}_1 = \hat{B}_1 \rightarrow \hat{F}_1 = \hat{B}_1 \quad (3) \end{aligned}$$

$$(1), (2), (3) \rightarrow \triangle ABC \sim \triangle DEF \rightarrow \frac{DE}{BC} = \frac{EF}{AB} = \frac{DF}{AC}$$

$$AB = \frac{14 \times 4}{14} = 4$$



$$AB^2 + AD^2 = AC^2 \rightarrow BC = 4$$

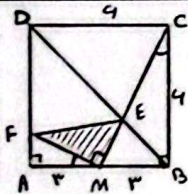
$$BDC = 2BDM \rightarrow \hat{D}_1 = \hat{D}_2 \quad (1)$$

$$\left. \begin{aligned} BM \parallel AD \\ AB \parallel DM \end{aligned} \right\} \rightarrow \triangle BMD \rightarrow \hat{M} = 90^\circ \quad (2)$$

$$(1), (2), \hat{D}_m = 90^\circ \rightarrow \triangle BDM \cong \triangle DMF \rightarrow BM = MF \xrightarrow{(2)} BM = MF = 3 \quad *$$

$$DF = DB = 4 \rightarrow CF = 4$$

$$ME \parallel CF \rightarrow \frac{BM}{BF} = \frac{ME}{FC} \rightarrow \frac{3}{7} = \frac{ME}{4} \rightarrow ME = \frac{12}{7}$$

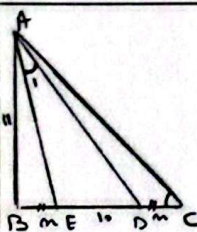


$$BMC \rightarrow BC^2 + MB^2 = MC^2 \rightarrow MC^2 = 4^2 + 9 \rightarrow MC = \sqrt{25} = 5 \quad (1)$$

$$DC \parallel MB \rightarrow \frac{CE}{ME} = \frac{DC}{MB} \rightarrow CE = 2ME \rightarrow 2ME = \sqrt{25} \rightarrow ME = \frac{5}{2} \quad *$$

$$\left. \begin{aligned} \hat{BCE} = \hat{AMF} \\ \hat{A} = \hat{B} = 90^\circ \end{aligned} \right\} \rightarrow \triangle AMF \sim \triangle MRC \rightarrow \frac{AM}{RC} = \frac{FM}{CM} \rightarrow \frac{4}{4} = \frac{FM}{\sqrt{25}} \rightarrow FM = \frac{5}{2}$$

$$\Rightarrow S_{FME} = \frac{FM \times ME}{2} = \frac{\frac{5}{2} \times \frac{5}{2}}{2} = \frac{25}{8} = 3.125$$



$$\left. \begin{aligned} \hat{A}_1 = \hat{C}_1 \\ \hat{E} = \hat{E} \end{aligned} \right\} \rightarrow \triangle AEC \sim \triangle AED \rightarrow \frac{ED}{AE} = \frac{AD}{AC} = \frac{AE}{EC}$$

$$\rightarrow \frac{10}{AE} = \frac{AE}{m+6} \rightarrow AE^2 = 10m + 60$$

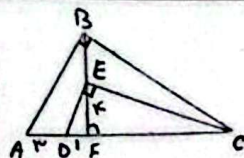
$$\left. \begin{aligned} \hat{A}_1 = \hat{C}_1 \\ \hat{E} = \hat{E} \end{aligned} \right\} \rightarrow \triangle AEC \sim \triangle AED \rightarrow \frac{ED}{AE} = \frac{AD}{AC} = \frac{AE}{EC}$$

$$\rightarrow \frac{10}{AE} = \frac{AE}{m+6} \rightarrow AE^2 = 10m + 60$$

$$\rightarrow AB^2 + BE^2 = AE^2 \rightarrow AE^2 = 14 + m^2$$

$$\Rightarrow m^2 - 6m + 14 = 0 \rightarrow (m-3)(m-4) = 0$$

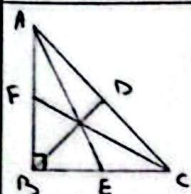
$$\begin{aligned} m &= 3 \rightarrow \text{نہی} \\ m &= 4 \rightarrow \text{نہی} \end{aligned}$$



$$\triangle DEC: EF^2 = DF \times FC \rightarrow 4 = 1 \times CF \rightarrow CF = 4$$

$$\triangle BDC: BC^2 = AC \times CF = 40 \times 4 = 160 \rightarrow \boxed{BC = 4\sqrt{10}}$$

5



چون امانی میانه نصف قاعده است، مثلث قائم الزامی بوده و قاعده وتر می باشد.

$$\triangle ABC \rightarrow \text{قائم الزامی مستقیم} \rightarrow AC^2 = AB^2 + BC^2 \rightarrow (14)^2 = 2 \times AB^2$$

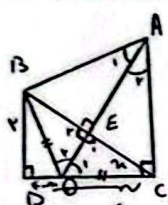
$$\Rightarrow AB = BC = 7\sqrt{2}$$

$$BC \text{ میانه } AE \rightarrow BE = EC = \frac{7\sqrt{2}}{2} = 7\sqrt{2} \rightarrow \triangle ABE \text{ قائم الزامی در } E: AB^2 + BE^2 = AE^2$$

$$\rightarrow (7\sqrt{2})^2 + (7\sqrt{2})^2 = AE^2 \rightarrow \boxed{AE = 7\sqrt{10}} \quad \text{چون مثلث قائم الزامی میانه ها دارم بر دو ضلع هم برابر هستند} \quad \boxed{AE = FC = 7\sqrt{10}}$$

5

7



$$\triangle BDC: BC^2 = BD^2 + CD^2 \rightarrow BC^2 = 4 + 14 \rightarrow BC = 2\sqrt{18}$$

$$\triangle ABC: \text{چون } O \text{ از وسط } AC \text{ می باشد} \rightarrow \angle B = \angle C = \frac{2\sqrt{18}}{2} = \sqrt{18}$$

$$BD = OC = m \quad \text{میدانیم} \quad m^2 = 4 + 14 + m^2 - 14m \rightarrow m = 2\sqrt{5}$$

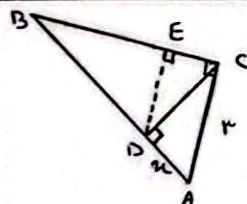
$$\left. \begin{array}{l} \angle E = \angle E \\ BE = EC \\ EO = EO \end{array} \right\} \rightarrow \triangle BOE \cong \triangle COE \rightarrow \hat{O}_1 = \hat{O}_2 \quad \left. \begin{array}{l} \angle A = \hat{A} \\ \hat{A} = \hat{A} \end{array} \right\} \rightarrow \triangle ABO \cong \triangle ACO \rightarrow \hat{B} = 90^\circ \rightarrow BC^2 = OE \times AE$$

$$\triangle EOB: OE^2 + (2\sqrt{5})^2 = \frac{2}{(2\sqrt{5})} \times OE \rightarrow OE = \frac{\sqrt{5}}{2}$$

$$S_{ABE} = \frac{AE \times BE}{2} = \frac{\sqrt{18} \times \sqrt{18}}{2} = \boxed{9}$$

5

1



$$\triangle ABC: \text{میدانیم} \rightarrow AB^2 = AC^2 + BC^2 \rightarrow AB^2 = 11 + 9 = 20 \rightarrow AB = 2\sqrt{5}$$

$$AC^2 = AD \times AB \rightarrow 9 = m \times 2\sqrt{5} \rightarrow m = \frac{3}{\sqrt{5}}$$

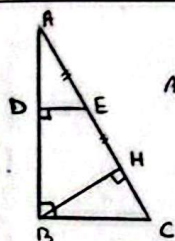
$$BC^2 = BD \times AB \rightarrow 11 = BD \times 2\sqrt{5} \rightarrow BD = \frac{11}{2\sqrt{5}}$$

$$\hat{E} = \hat{C} = 90^\circ \text{ میانه ها} \rightarrow DE \parallel AC \rightarrow \frac{BD}{AB} = \frac{BE}{BC} \rightarrow \frac{\frac{11}{2\sqrt{5}}}{2\sqrt{5}} = \frac{BE}{9}$$

$$\Rightarrow \frac{9}{10} = \frac{BE}{9} \rightarrow \boxed{BE = 8.1}$$

5

9



$$AB = 4 \quad BC = 14$$

$$\triangle ABC: \text{میدانیم} \rightarrow AC^2 = AB^2 + BC^2 \rightarrow AC^2 = 16 + 196 \rightarrow AC = 20$$

$$BC^2 = CH \times AC \rightarrow 196 = 20 \times CH \rightarrow CH = 9.8$$

$$AH = AC - CH = 20 - 9.8 = 10.2 \rightarrow AE = EH = \frac{10.2}{2} = 5.1$$

$$\hat{A} = \hat{B} \text{ میانه ها} \rightarrow DE \parallel AC \rightarrow \frac{AE}{AC} = \frac{DE}{BC} \rightarrow \frac{5.1}{20} = \frac{DE}{14}$$

$$\Rightarrow DE = \frac{14 \times 5.1}{20} = \boxed{3.57}$$

5

10