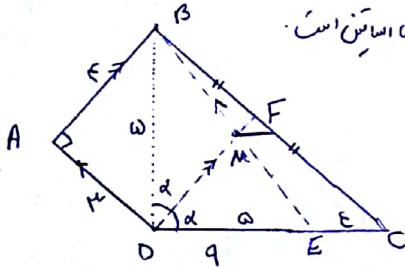


$$Eh = Bh'$$

$$\frac{S_{BCE}}{S_{BDE}} = \frac{\frac{EK \cdot BC}{2}}{\frac{Bh' \cdot DE}{2}} = \frac{BC}{DE}$$

$$\frac{AD}{AB} = \frac{DE}{BC} = \frac{AE}{AC} \rightarrow \frac{BC}{DE} = \left(\frac{12}{5}\right)$$



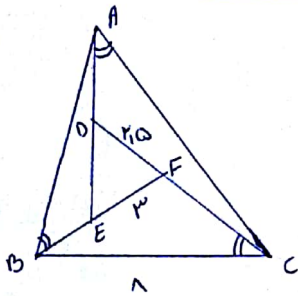
مربع مساوی ($BD^2 = 2BD \cdot DM$) نیز BDE است. ارتفاع هم نیست پس این مثلث مساوی است.

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

$$EC = 5 - 3 = 2$$

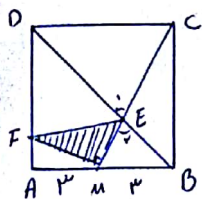
ارتفاع DM میان خط نیست $BM = ME = 3$

$$\frac{BM}{ME} = \frac{BF}{FC} \quad (MF \parallel EC) \rightarrow \frac{MF}{E} = \frac{3}{2} \Rightarrow MF = 3$$



$$DEF \sim ABC$$

$$\left. \begin{array}{l} \hat{A} = \hat{E} \\ \hat{B} = \hat{F} \\ \hat{C} = \hat{D} \end{array} \right\} \rightarrow \frac{AB}{3} = \frac{1}{\frac{1}{4}} \rightarrow 12 = 3 \cdot AB \Rightarrow \boxed{AB = 4}$$

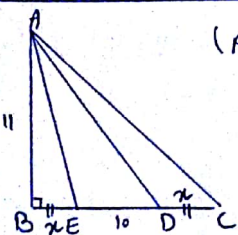


$$BM \parallel DC, \hat{E}_1 = \hat{E}_2 \rightarrow DM \parallel CE \Rightarrow \frac{ME}{CE} = \frac{BE}{DE} = \frac{BM}{DC} = \frac{3}{4}$$

$$(BMC) \rightarrow MC^2 = MB^2 + BC^2 \Rightarrow MC^2 = 4^2 + 3^2 \Rightarrow MC = 5 \Rightarrow ME = 3, EC = 2$$

$$AM \parallel BC \rightarrow \frac{AM}{BC} = \frac{MF}{MC} \rightarrow MF = \frac{3 \cdot 3}{5} = \frac{9}{5}$$

$$S_{MFE} = \frac{1}{2} \times ME \times MF = \frac{1}{2} \times 3 \times \frac{9}{5} = \frac{27}{10} \Rightarrow \boxed{\frac{27}{10}}$$

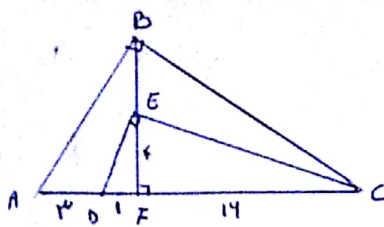


$$(ABE) \rightarrow AE^2 = AB^2 + BE^2 = 11^2 + 3^2 \rightarrow AE = \sqrt{121 + 9}$$

$$AEC \sim ACD \rightarrow \frac{AE}{ED} = \frac{EC}{AE} \rightarrow EC \times ED = AE^2 = (11 + m) \times 10 = 121 + m^2 \Rightarrow 10m + 110 = 121 + m^2$$

$$m^2 - 10m + 11 = 0 \rightarrow (m-4)(m-11) = 0$$

$$\boxed{\begin{array}{l} x = 4 \\ x = 11 \end{array}}$$



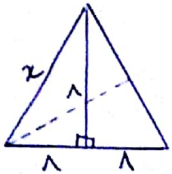
$$DE^2 = DF^2 + EF^2 \rightarrow DE^2 = 1 + 14 \Rightarrow DE = \sqrt{15}$$

$$EF^2 = DF \times FC \rightarrow 14 = 1 \times FC + FC = 14$$

$$BF^2 = AF \times FC \rightarrow BF^2 = 1 \times 14 = 14 \Rightarrow BF = \sqrt{14}$$

$$(BFC) \rightarrow BF^2 + FC^2 = BC^2 \Rightarrow 14 + 144 = 158 \rightarrow BC = \sqrt{158}$$

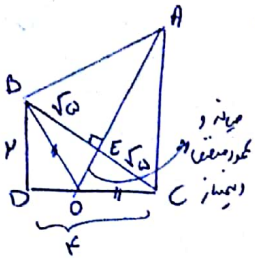
4



$$1^2 + 14^2 = 15^2 \Rightarrow 15 = \sqrt{1+196} = \sqrt{197}$$

$$BC = \sqrt{(15\sqrt{2})^2 + (15\sqrt{2})^2} = \sqrt{15^2 + 15^2} = \sqrt{450} = 15\sqrt{2}$$

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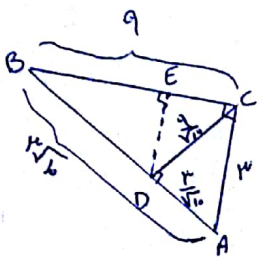


$$BC^2 = BD^2 + DC^2 \rightarrow BC = \sqrt{1^2 + 14^2} = \sqrt{197}$$

$$\triangle AEC \sim \triangle BCD \rightarrow \frac{r}{\sqrt{a}} = \frac{E}{AE} = \frac{r\sqrt{a}}{a} \Rightarrow AE = \frac{r\sqrt{a}}{r} = \sqrt{a}$$

$$S_{ABE} = \frac{1}{2} \times AE \times BE = \frac{1}{2} \times \sqrt{a} \times \sqrt{a} = \frac{a}{2}$$

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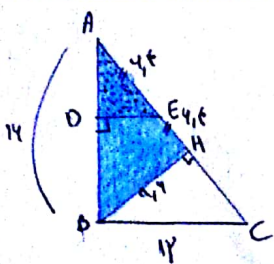
$$AB^2 = BC^2 + AC^2 \rightarrow AB = \sqrt{11 + 9} = \sqrt{20}$$

$$\triangle ADC \sim \triangle ABC \rightarrow \frac{AC}{AB} = \frac{AD}{BC} \rightarrow AD = \frac{1 \times \sqrt{20}}{\sqrt{20}} = 1, DC = \frac{9}{\sqrt{20}} = \frac{9}{\sqrt{20}}$$

$$DC^2 = BD \times AD \rightarrow \frac{1}{10} = BD \times \frac{1}{\sqrt{10}} \Rightarrow BD = \frac{\sqrt{10}}{10}$$

$$\triangle ABC \sim \triangle BDE \rightarrow \frac{DC}{BE} = \frac{AD}{DE} = \frac{AC}{BD} \rightarrow DE = \frac{\frac{1}{\sqrt{10}} \times \frac{9}{\sqrt{10}}}{\frac{1}{10}} = \frac{11}{10} = \frac{11}{10}$$

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$$AC^2 = AB^2 + BC^2 \rightarrow AB = \sqrt{14^2 + 14^2} = 14\sqrt{2}$$

$$AB \times BC = BH \times AC \rightarrow 14 \times 14 = BH \times 14 \Rightarrow BH = 14$$

$$AB^2 = AH \times AC \rightarrow 14^2 = AH \times 14 \Rightarrow AH = 14 \Rightarrow AE = EH = 14$$

$$\triangle ADE \sim \triangle BHA \rightarrow \frac{AH}{AD} = \frac{BH}{DE} = \frac{AB}{AE}$$

$$\frac{14}{14} = \frac{14}{DE} \rightarrow DE = \frac{14 \times 14}{14} = 14$$

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