

$$AE = x \Rightarrow ED = 2x$$

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$$\left. \begin{array}{l} \hat{A}_1 = \hat{C}_1 \\ \hat{F}_1 = \hat{F}_2 \end{array} \right\} \begin{array}{l} \text{خطوط موازی} \\ \text{و متوازی} \end{array} \Rightarrow \left. \begin{array}{l} (ج) \\ \text{نسبت متساوی} \end{array} \right\} \begin{array}{l} BCF \sim AEF \\ K = \frac{2x}{x} = 2 \end{array}$$

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$$BE = \sqrt{2^2 + 1^2} x = \sqrt{5} x \Rightarrow EF = \frac{1}{2} \times \sqrt{5} x = \frac{\sqrt{5}}{2} x$$

$$AC = 2\sqrt{2} x \Rightarrow AF = \frac{1}{2} \times 2\sqrt{2} x = \sqrt{2} x$$

$$\frac{EF}{AF} = \frac{\frac{\sqrt{5}}{2} x}{\sqrt{2} x} = \frac{\sqrt{5}}{2\sqrt{2}} = \frac{\sqrt{10}}{4} \checkmark$$

$$\left. \begin{array}{l} \hat{A} = \hat{A} \\ \hat{AED} = \hat{ACB} \end{array} \right\} (ج) \Rightarrow ADE \sim ABC \quad \frac{AE}{AC} = \frac{AD}{AB} = \frac{DE}{BC}$$

$$\Rightarrow \frac{x}{10} = \frac{5}{2x+1} \Rightarrow 20 = x^2 + x \Rightarrow x^2 + x - 20 = 0 \Rightarrow x = \frac{-1 \pm \sqrt{1+160}}{2} = \frac{-1 \pm 13}{2} \Rightarrow x = 6 \checkmark$$

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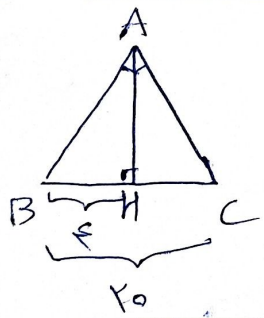
$$\left. \begin{array}{l} \hat{H}_1 = \hat{H}_2 \\ \hat{DEH} = \hat{HFC} \end{array} \right\} \begin{array}{l} \text{خطوط موازی} \\ \text{و متوازی} \end{array} \Rightarrow \left. \begin{array}{l} (ج) \\ \text{نسبت متساوی} \end{array} \right\} \begin{array}{l} DEH \sim CFH \\ \frac{x}{y} = \frac{DF}{CF} = \frac{5}{0} \end{array}$$

$$\Rightarrow DE = 3a \quad CF = 2a \quad BC = 5 + 2a$$

$$\Rightarrow \frac{3a}{5+2a} = \frac{x}{x+1,2y} = \frac{x}{2x} = \frac{1}{2} \Rightarrow 6a = 5 + 2a \Rightarrow 4a = 5 \Rightarrow a = \frac{5}{4}$$

$$BC = 5 + 2a = 5 + 2 \times \frac{5}{4} = 5 + 2,5 = 7,5 \checkmark$$

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$$AB^2 = BH \times BC = 4 \times 10 = 40$$

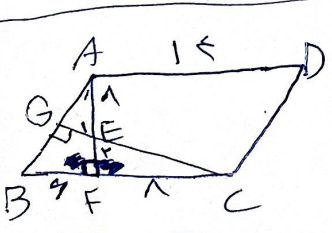
$$\Rightarrow AB = \sqrt{40} = 2\sqrt{10}$$

$$AC^2 = CH \times BC = 6 \times 10 = 60$$

$$\Rightarrow AC = \sqrt{60} = 2\sqrt{15}$$

$$\frac{AB}{AC} = \frac{2\sqrt{10}}{2\sqrt{15}} = \frac{\sqrt{10}}{\sqrt{15}} = \frac{1}{\sqrt{3}} \checkmark$$

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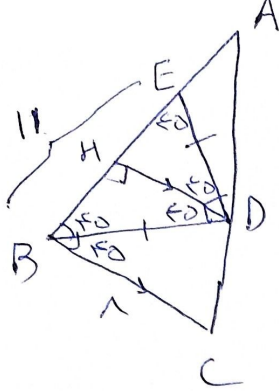


$$\left. \begin{array}{l} \hat{E}_1 = \hat{E}_2 \\ \hat{G}_1 = \hat{F}_2 = 90^\circ \end{array} \right\} (ج) \Rightarrow AEG \sim CEF$$

$$\Rightarrow \hat{A}_1 = \hat{C}_1 \Rightarrow \left. \begin{array}{l} \hat{A}_1 = \hat{C}_1 \\ \hat{F}_2 = \hat{F}_2 = 90^\circ \end{array} \right\} (ج) \Rightarrow ABF \sim CEF$$

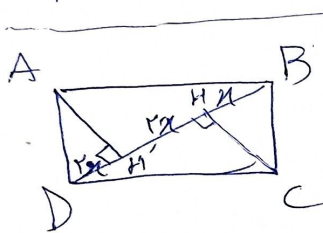
$$\frac{AF}{CF} = \frac{BF}{EF} = \frac{AB}{CE} \Rightarrow \frac{1+EF}{1} = \frac{4}{EF} \Rightarrow 1 \cdot EF + EF^2 = 4 \Rightarrow EF^2 + EF - 4 = 0 \Rightarrow EF = \frac{-1 \pm \sqrt{1+16}}{2} = \frac{-1 \pm \sqrt{17}}{2} \Rightarrow AF = AE + EF = 1 + \frac{-1 + \sqrt{17}}{2} = \frac{1 + \sqrt{17}}{2} \checkmark$$

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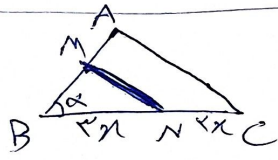


$\widehat{BDE} = 40^\circ \Rightarrow \widehat{B} = 40^\circ$
 $\widehat{B}_1 = 40^\circ \Rightarrow \widehat{D}_1 = 40^\circ$
 $\widehat{B}_1 = \widehat{E}_1 \Rightarrow \widehat{D} = 40^\circ$
 $\widehat{BDE} = 110^\circ - 40^\circ - 40^\circ = 30^\circ$
 $\widehat{E}_1 = 40^\circ$
 $\widehat{B}_1 = \widehat{E}_1 \Rightarrow BDE \Rightarrow EH = HB = 2,0$
 $\widehat{D} = 40^\circ$

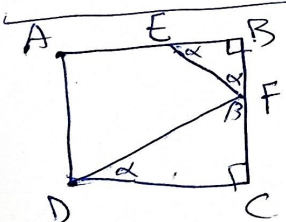
$HD = EH \times HB = 2,0 \times 2,0 = 4,0$
 $\frac{HD}{BC} = \frac{AH}{AB} \Rightarrow \frac{4,0}{11} = \frac{AE + 2,0}{AE + 11}$
 $4,0 AE = 14,0 \Rightarrow AE = 3,5$



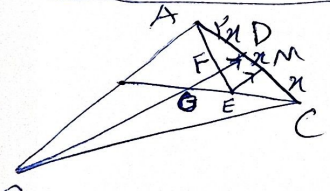
$AH' = x \times \sqrt{2} = \sqrt{2}x \Rightarrow AH' = \sqrt{2}x$
 $S_{ABCD} = 2 \times S_{ABD} = 2 \times \frac{\sqrt{2}x \times \sqrt{2}x}{2} = 2x^2$
 $S_{ADH'} = \frac{x \times \sqrt{2}x}{2} = \frac{\sqrt{2}}{2}x^2 \Rightarrow \frac{S_{ADH'}}{S_{ABCD}} = \frac{\frac{\sqrt{2}}{2}x^2}{2x^2} = \frac{\sqrt{2}}{4}$



$\frac{S_{ABC}}{S_{BMN}} = \frac{\frac{1}{2} \times BC \times AB \times \sin \alpha}{\frac{1}{2} \times BN \times BM \times \sin \alpha} = \frac{BC \times AB}{BN \times BM}$
 $\frac{2x \times AB}{\sqrt{2}x \times BM} = \frac{2}{\sqrt{2}} \times \frac{AB}{BM} = \sqrt{2} \Rightarrow \frac{AB}{BM} = \frac{1}{\sqrt{2}} \Rightarrow \frac{BM}{AB} = \sqrt{2}$



$\alpha + \beta + 90^\circ = 180^\circ$
 $\widehat{BEF} \sim \widehat{CDF} \Rightarrow \frac{EF}{DF} = \frac{BE}{CF} = \frac{BF}{CD} = \frac{1}{\sqrt{2}}$
 $\Rightarrow CD = \sqrt{2}BF$
 $CF = CD - BF = \sqrt{2}BF - BF = (\sqrt{2} - 1)BF$
 $CD^2 + CF^2 = 14 \Rightarrow (\sqrt{2}BF)^2 + ((\sqrt{2} - 1)BF)^2 = 14$
 $2BF^2 + (2 - 2\sqrt{2} + 1)BF^2 = 14 \Rightarrow (3 - 2\sqrt{2})BF^2 = 14$
 $BF = \frac{1}{\sqrt{2}} \Rightarrow CD = \sqrt{2} \times \frac{1}{\sqrt{2}} = 1$



$EM \parallel BD \Rightarrow \frac{EM}{GD} = \frac{CM}{CD} = \frac{1}{2}$
 $\Rightarrow \frac{FD}{EM} = \frac{AD}{AM} = \frac{1}{\sqrt{2}}$
 $\Rightarrow \frac{FD}{BD} = \frac{FD}{EM} \times \frac{EM}{BD} = \frac{1}{\sqrt{2}} \times \frac{1}{2} = \frac{1}{2\sqrt{2}}$