

$AD \parallel BC, AC \cap \rightarrow \hat{C}_1 = \hat{A}_1, \rightarrow \triangle FBC \sim \triangle FAE$ ①
 $AD \parallel BC, BE \cap \rightarrow \hat{E}_1 = \hat{B}_1$

$\frac{AE}{ED} = \frac{1}{2} \rightarrow AE = 1, ED = 2 \rightarrow BC = AD = 3$

① $\rightarrow \frac{AF}{FC} = \frac{FE}{BF} = \frac{AE}{BC} = \frac{1}{3}$

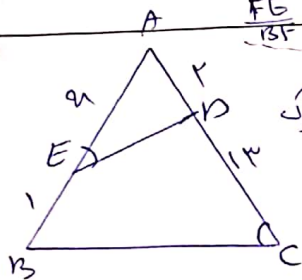
$\frac{AF}{FC} = \frac{1}{2} \rightarrow \frac{AF}{AC} = \frac{1}{3} \rightarrow \frac{AF}{3\sqrt{10}} = \frac{1}{3} \rightarrow AF = \sqrt{10}$

$\frac{FE}{BF} = \frac{1}{2} \rightarrow \frac{FE}{2\sqrt{10}} = \frac{1}{3} \rightarrow FE = \frac{2\sqrt{10}}{3}$

$AC^2 = CD^2 + AD^2 = 3^2 + 9^2 = 90$
 $AC = 3\sqrt{10}$
 $BE^2 = AB^2 + AE^2 = 9^2 + 1^2 = 82$
 $BE = \sqrt{82}$

1

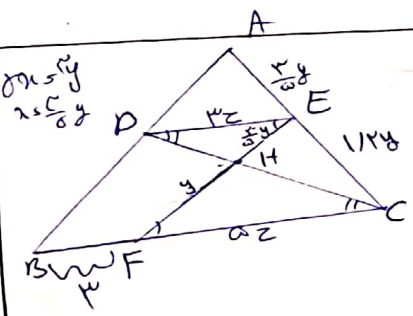
$\frac{\sqrt{10}}{3}$



$\triangle AED = \triangle AEB \rightarrow \triangle AED \sim \triangle ABE$

$\frac{AE}{AC} = \frac{ED}{BC} = \frac{AD}{AB}$
 $\frac{1}{15} = \frac{2}{9+1} \rightarrow 10 = 2 + 9 \rightarrow 10 = 11$
 $(9+1)(n-1) = 10$
 $n = 10$

2

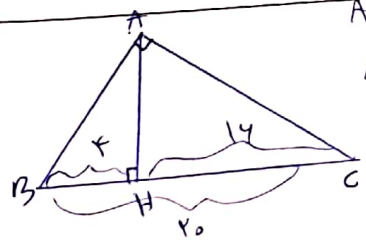


$DE \parallel BC, EF \cap \rightarrow \hat{E}_1 = \hat{F}_1, \rightarrow \triangle HE \sim \triangle HC$

$\frac{EH}{FH} = \frac{DE}{FC} = \frac{1}{2}$

$DE \parallel BC \rightarrow \frac{AE}{AC} = \frac{DE}{BC} \Rightarrow \frac{1}{2} = \frac{1}{2+1} = \frac{1}{3}$
 $2 = 2+1$
 $1 = 1+1$
 $BC = 1+2 = 3$

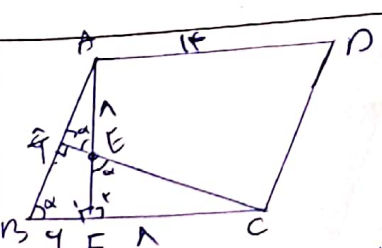
3



$AB^2 = BH \times BE = 1 \times 10 = 10 \rightarrow AB = \sqrt{10} = \sqrt{10}$
 $AE^2 = BC \times CH = 1 \times 10 = 10 \rightarrow AE = \sqrt{10} = \sqrt{10}$

$\frac{AB}{AC} = \frac{1}{2}$

4

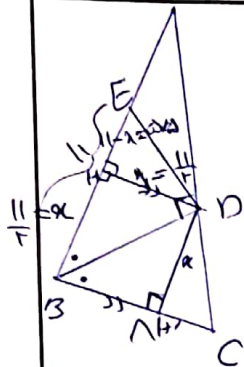


$\hat{F}_1 = \hat{F}_2, \hat{A}_1 = \hat{A}_2 \rightarrow \triangle EFC \sim \triangle ABF \rightarrow \frac{EF}{BF} = \frac{FC}{AF} = \frac{CE}{AB}$

$\frac{EF}{9} = \frac{1}{1+FE} \rightarrow 9 = FE + 1 \rightarrow FE = 8$
 $(FE+1)(FE) = 8$
 $FE = 8$

$AF = FE + AE = 1 + 8 = 9$

$AB = HD = PH = x \rightarrow EH \parallel AC$
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$$E \hat{D} B \rightarrow (11-x)(x) = x^2 \rightarrow 11x - x^2 = x^2 \rightarrow 11x = 2x^2 \rightarrow x(11-2x) = 0$$

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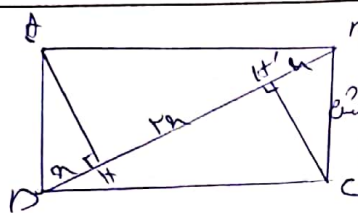
$$x = 11 \text{ or } x = \frac{11}{2}$$

$$EH \parallel AC \rightarrow \frac{BH}{BD} = \frac{DH}{DC} = \frac{DH}{DC} = \frac{11}{14}$$

$$DH \parallel BE \rightarrow \frac{AH}{AB} = \frac{DH}{BE} \rightarrow \frac{11}{14} = \frac{AE + \frac{11}{2}}{AE + 11} \rightarrow 11AE + 11 \cdot \frac{11}{2} = 14AE + 154$$

$$11AE + 60.5 = 14AE + 154 \rightarrow 3AE = 93.5 \rightarrow AE = \frac{187}{6}$$

9

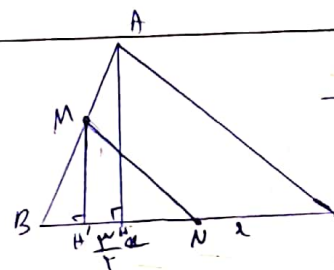


$$S_{\triangle ABC} = \frac{1}{2} \times AC \times BD = \frac{1}{2} \times AC \times \frac{1}{2} \times AC = \frac{1}{4} \times AC^2$$

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$$\frac{S_{\triangle ABC}}{S_{\triangle ACD}} = \frac{\frac{1}{4} \times AC^2}{\frac{1}{2} \times AC \times \frac{1}{2} \times AC} = 1$$

7

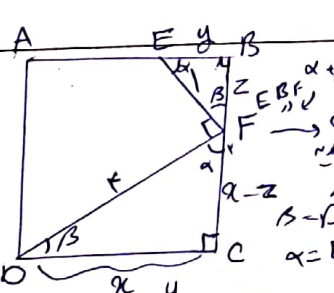


$$\frac{S_{\triangle ABC}}{S_{\triangle AMN}} = \frac{\frac{1}{2} \times AC \times \frac{1}{2} \times AC}{\frac{1}{2} \times MN \times \frac{1}{2} \times MN} = 4 \rightarrow \frac{AC}{MN} = 2 \rightarrow \frac{MN}{AC} = \frac{1}{2}$$

$$\frac{BM}{AB} = \frac{1}{2} \rightarrow BM = \frac{1}{2} \times AB$$

$$\frac{AM}{AB} = \frac{1}{2} \rightarrow AM = \frac{1}{2} \times AB$$

1



$$\alpha + \beta + 90 = 180 \rightarrow \alpha + \beta = 90$$

$$\beta + 90 + \alpha = 180 \rightarrow \beta + \alpha = 90$$

$$\alpha = \beta$$

$$\alpha = \beta = 45$$

$$\frac{EB}{FC} = \frac{BF}{DE} = \frac{EF}{ED}$$

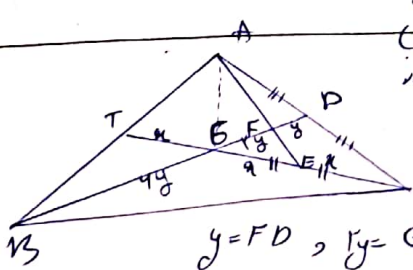
$$\frac{1}{x} = \frac{y}{x-2} = \frac{z}{x} \rightarrow xz = yx$$

$$xz = yx \rightarrow x^2 + (x-2)^2 = y^2 \rightarrow x^2 + x^2 - 4x + 4 = y^2 \rightarrow 2x^2 - 4x + 4 = y^2$$

$$2x^2 - 4x + 4 = y^2 \rightarrow x^2 - 2x + 2 = \frac{y^2}{2}$$

$$x^2 - 2x + 2 = \frac{y^2}{2} \rightarrow x^2 - 2x + 2 = \frac{y^2}{2}$$

9



$$x = CG = CE$$

$$y = FD, y = GF \rightarrow y = \frac{GF}{FD}$$

$$BG = y = GD \rightarrow y = \frac{BG}{GD}$$

$$\frac{BG}{GD} = \frac{GF}{FD} = 9$$

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