

$AC = 2\sqrt{2}a \rightarrow y = \frac{2\sqrt{2}}{3}a$
 $BC \parallel AE \Rightarrow \triangle BFC \sim \triangle AFE$
 $\therefore \frac{FE}{BF} = \frac{AE}{BC} = \frac{AE}{FC} = \frac{1}{3}$
 $BE = \sqrt{9a^2 + a^2} = \sqrt{10}a$
 $EF = \sqrt{10}a \Rightarrow EF = \frac{\sqrt{10}}{4}a$

$\frac{EF}{AF} = \frac{y}{\frac{2\sqrt{2}}{3}a} = \frac{\frac{\sqrt{10}}{4}a}{\frac{2\sqrt{2}}{3}a} = \frac{\sqrt{10}}{8\sqrt{2}} = \frac{\sqrt{5}}{4}$
 $= \frac{\sqrt{5}}{4}$ ✓

$\frac{r}{a+1} = \frac{a}{10} \Rightarrow a = 5$ ✓
 $\triangle ADE \sim \triangle ABC$

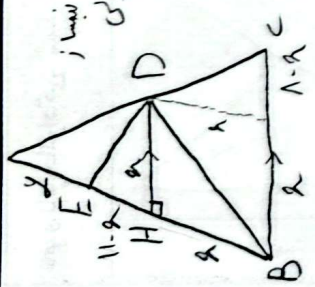
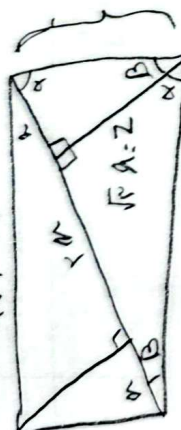
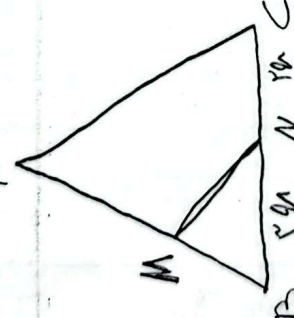
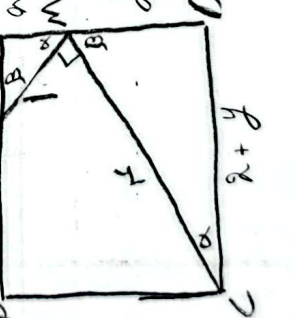
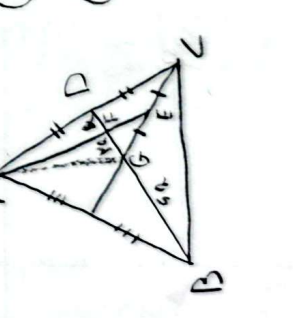
$\frac{r}{a+1} = \frac{a}{10} \Rightarrow a^2 + a - 10 = 0 \Rightarrow (a+5)(a-2) = 0$
 $a = 2$ (since $a = -5$ is not possible)

$a = 5k$
 $y = 2k$
 $\frac{5a}{5a+2a} = \frac{5k}{9k} = \frac{1}{3}$
 $a = \frac{5}{3} = 1\frac{2}{3}$
 $BC = 9\frac{1}{3}$ ✓

$BC = 2\sqrt{5}$
 $AB = 1\sqrt{5}$
 $\frac{AB}{BC} = \frac{1\sqrt{5}}{2\sqrt{5}} = \frac{1}{2}$ ✓

$\triangle BAF \sim \triangle ECF \rightarrow \frac{BF}{EF} = \frac{AF}{CF}$
 $\rightarrow \frac{y}{a} = \frac{1+a}{1} \rightarrow a(a+1) = 1a$
 $\rightarrow a = 1 \rightarrow AF = 1+a = 2$ ✓

$10a = \frac{a}{1} = \frac{y}{1+a} \Rightarrow a^2 + 11a - 10 = 0 \Rightarrow (a+12)(a-1) = 0$
 $a = 1$ (since $a = -12$ is not possible)
 $AF = 1+a = 2$ ✓

 $BD \rightarrow HD = BH = a$ $\rightarrow a^2 = a(11-a)$ $11a - 11a = 0$ $11a(11-a) = 0$ $a = 0$ or $a = 11$ $a = 11$ $\frac{y + \Delta y}{11 + y} = \frac{0.18}{11}$ $\Rightarrow 11y + 11 \times 0.18 = 0.18 + 11y$ $\Rightarrow 11 \times 0.18 = 0.18$ $\Rightarrow 1.98 = 0.18$	 $\tan \theta = \frac{y}{x} = \frac{z}{x} \Rightarrow z = \sqrt{2}y$ $\frac{S_{\triangle ABC}}{S_{\triangle ADE}} = \frac{1}{2} \times \frac{1 \times 1}{x \times x} = \frac{1}{2} \times \frac{1}{x^2}$	 $\frac{S_{\triangle ABC}}{S_{\triangle AMN}} = \frac{1}{2} \times \frac{1 \times 1}{x \times x} = \frac{1}{2} \times \frac{1}{x^2}$ $\Rightarrow \frac{AB}{BM} = \frac{1}{x} \rightarrow \frac{AB - BM}{BM} = \frac{1 - x}{x}$ $\rightarrow \frac{AM}{BM} = \frac{1}{x} \rightarrow \frac{BM}{AM} = x$ $AEF \sim CDE$ $\frac{1}{x} = \frac{1}{x} \rightarrow x = 1$ $CDE \sim \triangle ABC \Rightarrow \frac{CD}{AC} = \frac{CE}{BC} = \frac{DE}{AB}$ $\rightarrow AD = 1 - x = 0$	 $\frac{1}{x} = \frac{1}{x} \rightarrow x = 1$ $CDE \sim \triangle ABC \Rightarrow \frac{CD}{AC} = \frac{CE}{BC} = \frac{DE}{AB}$ $\rightarrow AD = 1 - x = 0$	 $GD, AE \rightarrow F \rightarrow \frac{1}{x} = \frac{1}{x} \rightarrow x = 1$ $G \rightarrow \frac{1}{x} = \frac{1}{x} \rightarrow x = 1$ $\Rightarrow \frac{BD}{FD} = \frac{1}{x} = 1$
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