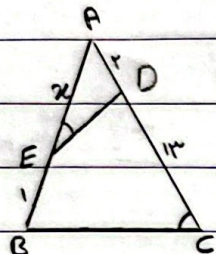


$$ED = 2AE \quad \frac{EF}{AF} = ?$$

$$\frac{BF}{FE} = \frac{CF}{AF} = 2 \Rightarrow \begin{cases} BF = 2y, FE = y \\ CF = 2z, AF = z \end{cases}$$

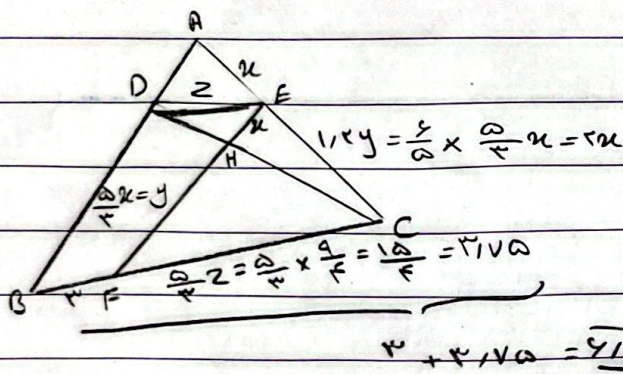
$$\triangle AEF: (2y)^2 = 2^2 + 1^2 \Rightarrow 4y^2 = 5 \Rightarrow y = \frac{\sqrt{5}}{2}$$

$$\Rightarrow \frac{y}{2} = \frac{\frac{\sqrt{5}}{2}}{\frac{2\sqrt{5}}{2}} = \frac{\sqrt{5}}{4\sqrt{5}} = \frac{\sqrt{5}}{4} = \frac{EF}{AF}$$



$$\frac{AD}{AB} = \frac{AE}{AC} \Rightarrow \frac{2}{2+1} = \frac{2}{19} \Rightarrow 20 = 2^2 + 2 \Rightarrow 2^2 + 2 - 20 = 0$$

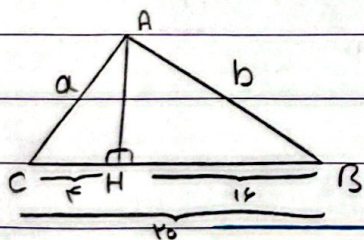
$$\Rightarrow (2+4)(2-19) = 0 \Rightarrow \begin{cases} 2 = -4 \rightarrow \text{قيد} \\ 2 = 19 \rightarrow \text{قيد} \end{cases}$$



$$\frac{2}{2+1} = \frac{2}{19} \Rightarrow 20 = 2^2 + 2 \Rightarrow 2^2 + 2 - 20 = 0$$

$$\Rightarrow \frac{2}{2+1} = \frac{2}{19} \Rightarrow 20 = 2^2 + 2 \Rightarrow 2^2 + 2 - 20 = 0$$

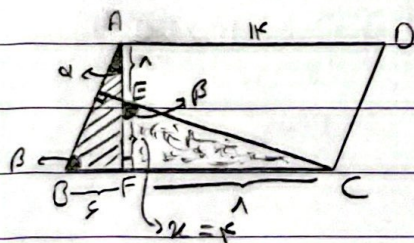
$$2 + 2 + 19 = 23$$



$$b^2 = 14 \times 20$$

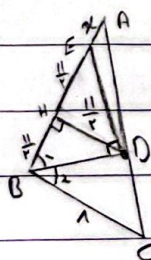
$$a^2 = 8 \times 20$$

$$\Rightarrow \frac{14 \times 20}{8 \times 20} = \frac{b^2}{a^2} \Rightarrow \frac{b}{a} = 2$$



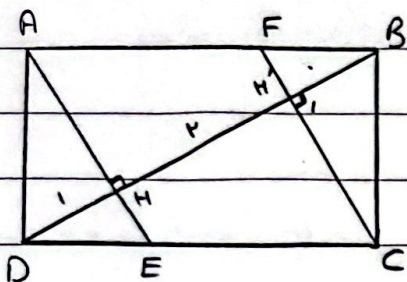
$$\frac{2}{2+1} = \frac{2}{19} \Rightarrow 20 = 2^2 + 2 \Rightarrow 2^2 + 2 - 20 = 0 \Rightarrow \begin{cases} 2 = 2 \rightarrow \checkmark \\ 2 = -19 \rightarrow \times \end{cases}$$

$$AE + EF = AF \Rightarrow 1 + 2 = 3$$



$$\hat{B}_1 = \hat{B}_2 = 90^\circ \quad DH = BH = EH = \frac{11}{2}$$

$$\frac{AH}{AB} = \frac{DH}{BC} \Rightarrow \frac{2+11}{2+11} = \frac{11}{11} \Rightarrow 2 = 11/8$$



$$AH^2 = 1 \times r \Rightarrow AH = \sqrt{r}$$

$$AD^2 = (\sqrt{r})^2 + 1^2 = r \Rightarrow AD = \sqrt{r}$$

$$r^2 = r^2 + AB^2 \Rightarrow AB = r\sqrt{r}$$

$$\frac{AH}{HE} = \frac{AB}{DE} = \frac{BH}{DH} \Rightarrow \frac{\sqrt{r}}{HE} = \frac{r\sqrt{r}}{DE} = \frac{r}{1} \Rightarrow HE = \frac{\sqrt{r}}{r}$$

$$\Rightarrow \frac{S_{\square}}{S_{\Delta min}} = \frac{r\sqrt{r} \times r}{\frac{1}{r} \times \frac{\sqrt{r}}{r} \times 1} = \frac{r\sqrt{r}}{\frac{\sqrt{r}}{r}} = \boxed{\frac{r^2}{\sqrt{r}}}$$

$$S_{\Delta} = \frac{h \times 2l}{r} = \frac{\sqrt{r} \times r}{r}$$

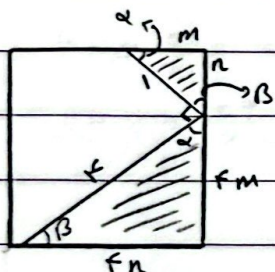
$$rBN = rNC \Rightarrow \frac{BN}{BC} = \frac{r}{a}$$

$$\frac{S_{BMN}}{S_{ABC}} = \frac{BM}{BA} \times \frac{BN}{BC}$$

$$\Rightarrow \frac{1}{r} = \frac{BM}{BA} \times \frac{r}{a} \Rightarrow \frac{BM}{BA} = \frac{a}{r}$$

$$\frac{S_{ABC}}{S_{ABC}} = \frac{1}{r}$$

$$\frac{AM}{BA} = 1 - \frac{a}{r} = \frac{r-a}{r} \quad \frac{BM}{AM} = \frac{\frac{a}{r}}{\frac{r-a}{r}} = \frac{a}{r-a} \Rightarrow \boxed{\frac{BM}{AM} = \frac{a}{r-a}}$$

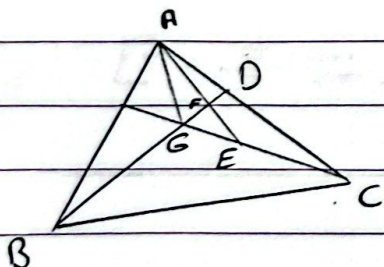


$$r^2 + n^2 = r^2 \Rightarrow r^2 = r^2$$

$$(rn)^2 + (rn)^2 = r^2 \Rightarrow m^2 + n^2 = 1 \xrightarrow{m = \frac{rn}{r}} \left(\frac{rn}{r}\right)^2 + n^2 = 1$$

$$\Rightarrow \frac{9n^2}{19} + n^2 = 1 \Rightarrow \frac{10n^2}{19} = 1 \Rightarrow n^2 = \frac{19}{10}$$

$$S = (rn)^2 = 19n^2 \Rightarrow S = 19 \times \frac{19}{10} = \boxed{10.19}$$



$$AG = rGM = \frac{r}{r} AM$$

$$GM = \frac{1}{r} AG = \frac{1}{r} AM$$

$$GI = \frac{1}{r} BD(1)$$

$$FI = \frac{1}{r} GI \xrightarrow{(1)} FI = \frac{1}{r} \times \frac{1}{r} BD \Rightarrow 9FI = BD$$

$$\Rightarrow \boxed{\frac{BD}{FI} = 9}$$