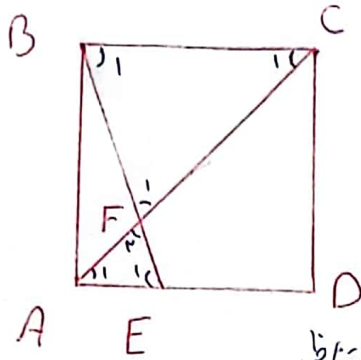




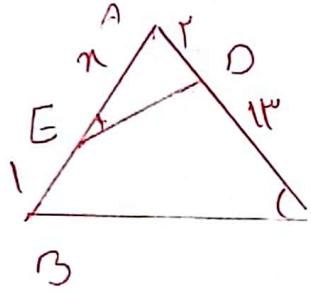
سوال (1)
 $ED = AE \Rightarrow AD = AE + DE = 2AE$
 $BC \parallel AD \Rightarrow \angle BCF = \angle AFE$
 $\angle BFC = \angle AEF$
 $\Rightarrow \triangle BCF \sim \triangle AFE$ (2)

نسبت اجزای متناظر

$$\frac{BC}{AE} = \frac{CF}{AF} = \frac{BF}{EF} \Rightarrow \frac{2AE}{AE} = \frac{CF}{AF} = \frac{BF}{EF}$$

$2AF = CF \Rightarrow AC = AF + CF = 3AF$
 $2EF = BF \Rightarrow BE = BF + FE = 3EF$
 $\Rightarrow \begin{cases} AC^2 = CD^2 + AD^2 \\ BE^2 = AB^2 + AE^2 \end{cases}$

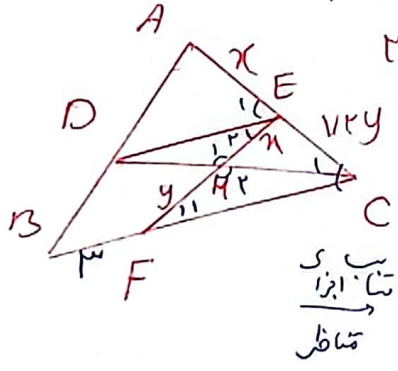
$$\Rightarrow \begin{cases} 4AF^2 = a^2 + a^2 \\ 4EF^2 = a^2 + (\frac{a}{2})^2 \end{cases} \Rightarrow \begin{cases} 4AF = \sqrt{2}a \\ 4EF = \frac{\sqrt{2}}{2}a \end{cases} \Rightarrow \frac{EF}{AF} = \frac{\frac{\sqrt{2}}{2}a}{\sqrt{2}a} = \frac{1}{2}$$



$\triangle AED \sim \triangle ACB$
 $\hat{A} = \hat{A}$
 $\hat{ADE} = \hat{ACB}$
 $\hat{AED} = \hat{ABC}$

نسبت اجزای متناظر
 $\frac{AE}{AC} = \frac{AD}{AB} = \frac{ED}{BC} \Rightarrow \frac{x}{10} = \frac{y}{x+1}$

$\Rightarrow x^2 + x = 10 \Rightarrow x^2 + x - 10 = 0 \Rightarrow (x+4)(x-5) = 0$
 $\Rightarrow x = -4$ (غیرممکن)
 $\Rightarrow x = 5$ (ممکن)
 $xy = 10 \Rightarrow x = \frac{10}{y}$



$DE \parallel BC \Rightarrow \hat{E} = \hat{C}$
 $\hat{A} = \hat{A}$
 $\Rightarrow \triangle AED \sim \triangle ACB$ (2)

نسبت اجزای متناظر
 $\frac{AE}{AC} = \frac{AD}{AB} = \frac{DE}{BC} \Rightarrow \frac{x}{10} = \frac{y}{x+1}$

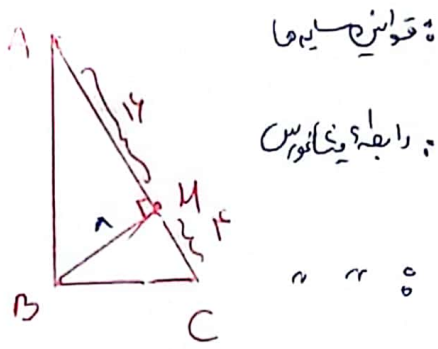
$DE \parallel BC \Rightarrow \hat{E} = \hat{C}$
 $\hat{A} = \hat{A}$
 $\Rightarrow \triangle ADE \sim \triangle ACB$

نسبت اجزای متناظر
 $\frac{DE}{CF} = \frac{EH}{FH} = \frac{DH}{CH} \Rightarrow \frac{DE}{FC} = \frac{x}{y} = \frac{1}{5} \Rightarrow DE = \frac{1}{5}FC$

$\frac{\frac{1}{5}y}{\frac{1}{5}y + 10y} = \frac{\frac{1}{5}FC}{FC + 10} \Rightarrow \frac{1}{51} = \frac{FC}{FC + 10} \Rightarrow 11FC = FC + 10 \Rightarrow 10FC = 10 \Rightarrow FC = 1$

راہ ادالہ

سوال (۴)



۱۔ قوتیں سیوا
 $BH^2 = AH \times CH = 14 \times 4 = 56 \Rightarrow BH = 1$

(۲)

۲۔ رابطہ دیکھو

$$AB^2 = AH^2 + BH^2 = (14)^2 + (1)^2 = 196 + 1 = 197$$

$$AB = 1\sqrt{5}$$

" " :

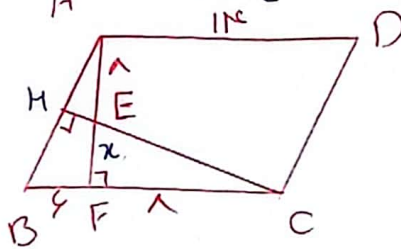
$$BC^2 = CH^2 + BH^2 = (4)^2 + (1)^2 = 17$$

$$BC = \sqrt{17}$$

$$\frac{AB}{BC} = \frac{1\sqrt{5}}{\sqrt{17}} = 2 \quad \checkmark$$

راہ دوم :

$$\frac{AB}{BC} = \frac{\sqrt{AH \times AC}}{\sqrt{AH \times HC}} = \sqrt{\frac{AC}{HC}} = \sqrt{\frac{17}{4}} = 2$$



$$\left. \begin{array}{l} \hat{B} = \hat{D} \\ \hat{F} = \hat{H} = 90^\circ \end{array} \right\} \Rightarrow \triangle FEC \sim \triangle FDB$$

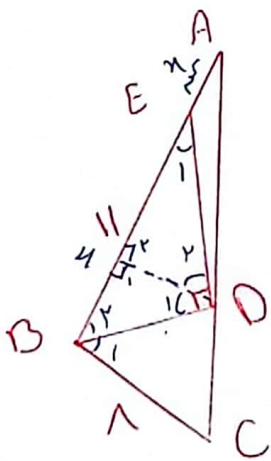
$$\frac{FC}{AF} = \frac{EF}{BF} \Rightarrow \frac{1}{1+x} = \frac{x}{4}$$

سوال (۵)

(۲)

$$\rightarrow 4(1-x) + 1x \Rightarrow x^2 + 1x - 4 = 0 \quad (x+4)(x-1) = 0 \rightarrow \begin{cases} x = -4 \\ x = 1 \end{cases}$$

$$AF = 1 + 4 = 5 \quad \checkmark$$



سوال (۶)

$$\left. \begin{array}{l} DH \parallel BC \\ \hat{B} = \hat{D} \end{array} \right\} \Rightarrow \hat{D}_1 = \hat{B}_1$$

$$\left. \begin{array}{l} \hat{C} = \hat{D} \\ \hat{B} = \hat{D} \end{array} \right\} \Rightarrow \hat{D}_1 = \hat{B}_1 = 90^\circ$$

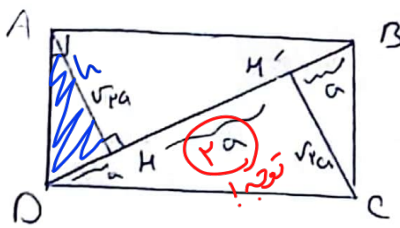
$$\left. \begin{array}{l} \hat{D}_1 + \hat{D}_2 = 90^\circ \Rightarrow \hat{D}_2 = 90^\circ \\ \hat{H}_2 = 90^\circ \end{array} \right\} \Rightarrow \hat{E}_1 = 90^\circ$$

$$\frac{BE}{2} = EM = BM = 5/5 \Rightarrow MD = 5$$

$$HD \parallel BC \quad \frac{AH}{AB} = \frac{MD}{BC} = \frac{AD}{AC}$$

$$\frac{x+5/5}{x+1} = \frac{5/5}{1} \Rightarrow 14x + 11 = x + 1$$

$$13x = 10 \Rightarrow x = \frac{10}{13} = 0.77 \quad \checkmark$$



قوانین مشابه

$$AH = DH \times BH = a \times 2a = 2a^2 \Rightarrow AH = \sqrt{2}a$$

$$CH' = BH' \times DH' = a \times 2a = 2a^2 \Rightarrow CH' = \sqrt{2}a$$

طبقه اولیای بیاضی

$$CH'^2 + BH'^2 = BC^2 \Rightarrow 2a^2 + a^2 = a^2 \Rightarrow BC = \sqrt{2}a$$

$$AH^2 + BH^2 = AB^2 \Rightarrow 2a^2 + a^2 = a^2 \Rightarrow AB = \sqrt{2}a$$

مساحت مثلث AHD

$$S_{AHD} = \frac{1}{2} \times 2a \times a = a^2$$

$$S_{\text{مربع}} = \sqrt{2}a \times \sqrt{2}a = 2a^2$$

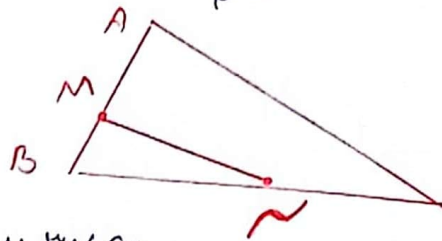
$$S_{\text{مربع}} = \frac{ha}{2} = \frac{\sqrt{2}a^2}{2}$$

$$S_{\text{مربع}}$$

$$\frac{S_{\text{مربع}}}{S_{AHD}} = \frac{2a^2}{a^2} = 2$$

$$S_{\square} = 2S_{AHD} = 2 \times \frac{\sqrt{2}a \times a}{2} = \sqrt{2}a^2$$

$$\frac{\sqrt{2}a^2}{\frac{\sqrt{2}a^2}{2}} = 2$$



$$2BN = 3NC \Rightarrow BC = BN + NC$$

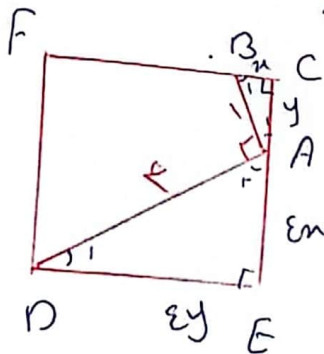
$$NC = \frac{2}{3}BN \Rightarrow BC = \frac{5}{3}BN$$

$$\frac{S_{ABC}}{S_{BMN}} = \frac{AB \times BC \times \sin \hat{B} \times \frac{1}{2}}{BM \times BN \times \sin \hat{B} \times \frac{1}{2}} = \frac{1}{1}$$

$$\frac{AB \times \omega}{BM \times 1} = \frac{1}{1} \Rightarrow$$

$$\Rightarrow \frac{BM + AM}{BM} = \frac{1}{\omega} \Rightarrow 1 + \frac{AM}{BM} = \frac{1}{\omega}$$

$$\Rightarrow \frac{AM}{BM} = \frac{1}{\omega} \Rightarrow \frac{BM}{AM} = \omega$$



$$\hat{C} = 90^\circ \Rightarrow \left. \begin{matrix} \hat{B}_1 + \hat{A}_1 = 90^\circ \\ \hat{A}_1 + \hat{A}_1 = 90^\circ \end{matrix} \right\} \Rightarrow \hat{B}_1 = \hat{A}_1$$

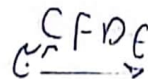
$$\hat{E} = 90^\circ \Rightarrow \left. \begin{matrix} \hat{D}_1 + \hat{A}_1 = 90^\circ \\ \hat{A}_1 + \hat{A}_1 = 90^\circ \end{matrix} \right\} \Rightarrow \hat{A}_1 = \hat{D}_1$$

$$\hat{E} = \hat{C} = 90^\circ$$

$$\Rightarrow \triangle BCA \sim \triangle EAD \xrightarrow{\text{نسب اجزای متناظر}} \frac{BC}{AE} = \frac{AC}{DE} = \frac{BA}{DA} = \frac{1}{\omega}$$

$$\begin{cases} BC = x \\ AC = y \end{cases} \rightarrow \frac{x}{AE} = \frac{1}{\omega} \Rightarrow AE = \omega x$$

$$\frac{y}{DE} = \frac{1}{\omega} \Rightarrow DE = \omega y$$



$$FD = CE = DE = CF$$

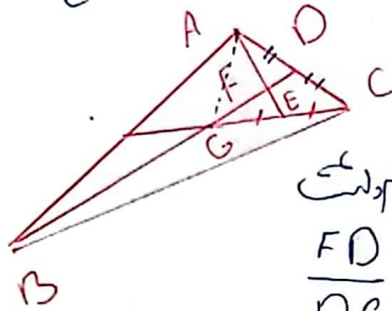
$$y + \omega x = \omega y \Rightarrow \omega x = \omega y$$

ادامه

$$AE = EN = 4y \text{ طبق رابطه نیستم} \quad AE^2 + DE^2 = AD^2 = (4y)^2 + (3y)^2 = 14$$

$$25y^2 = 14 \Rightarrow y = \frac{14}{25} \Rightarrow y = \frac{4}{5} \Rightarrow DE = 4y = 4\left(\frac{4}{5}\right) = \frac{14}{5}$$

$$S_{\triangle GDE} = DE^2 = \frac{14}{5} \times \frac{14}{5} = \frac{196}{25} \checkmark$$



سوال ۱۰) ابتدا از A به G وصل می‌کنیم.

نقطه F محل تلاقی دو میانه GD و AE در وسط AG است پس خواص دلتا

$$\frac{FD}{DG} = \frac{1}{3} \Rightarrow DG = 3FD$$

(مرکز ثقل) (۲)

همچنین نقطه G محل تلاقی میانه‌ها در وسط AG است پس خواص دلتا

$$\frac{DG}{BD} = \frac{1}{3} \quad II$$

$$II \Rightarrow I \quad \frac{3FD}{BD} = \frac{1}{3} \Rightarrow \frac{FD}{BD} = \frac{1}{9} \Rightarrow \frac{BD}{FD} = 9 \checkmark$$