

$$\left. \begin{array}{l} \hat{A}FE = \hat{B}FC \text{ (مقابل: زاویه)} \\ \hat{B}CF = \hat{CAD} \text{ (موازی: زاویه)} \end{array} \right\} \Rightarrow \triangle BFC \sim \triangle AFE$$

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

$$ED = 2AE \rightarrow ED + AE = AD = 3AE \Rightarrow BC = 3AE \quad \left(\Rightarrow \frac{FE}{BE} = \frac{AF}{AC} = \frac{1}{5} \right)$$

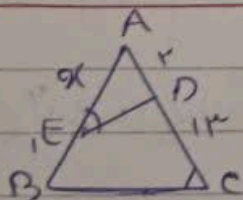
$$\Rightarrow \begin{cases} AE = x \\ AB = 3x \end{cases} \Rightarrow \triangle ABE : AE^2 + AB^2 = BE^2 \Rightarrow x^2 + 9x^2 = 10x^2 = BE^2$$

$$\Rightarrow BE = \sqrt{10}x \Rightarrow FE = \frac{\sqrt{10}}{5}x$$

$$AB = 3x \Rightarrow \begin{cases} CD = 3x \\ AD = 3x \end{cases} \Rightarrow \triangle ADC : AD^2 + CD^2 = AC^2 \Rightarrow 18x^2 = AC^2$$

$$\Rightarrow AC = 3\sqrt{2}x \Rightarrow AF = \frac{3\sqrt{2}}{5}x$$

$$\frac{EF}{AF} = \frac{\frac{\sqrt{10}}{5}x}{\frac{3\sqrt{2}}{5}x} = \frac{\sqrt{10}}{3\sqrt{2}} = \frac{\sqrt{5}}{3} \Rightarrow \frac{EF}{AF} = \frac{\sqrt{5}}{3} \checkmark$$



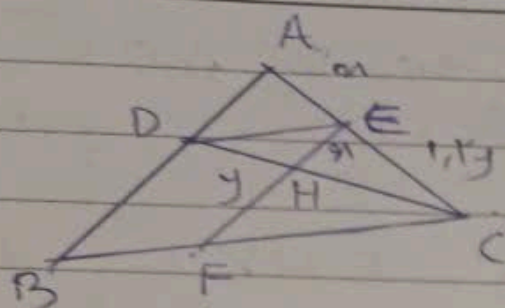
$$\left. \begin{array}{l} \hat{A} = \hat{A} \\ \hat{E} = \hat{C} \end{array} \right\} \Rightarrow \triangle ADE \sim \triangle ABC$$

$$\Rightarrow \frac{AD}{AB} = \frac{ED}{BC} = \frac{AE}{AC}$$

$$\Rightarrow \frac{2}{x+1} = \frac{x}{10} \Rightarrow x(x+1) = 20 \Rightarrow x^2 + x - 20 = 0 \Rightarrow (x+5)(x-4) = 0$$

$$\Rightarrow \begin{cases} x = -5 \times \\ x = 4 \checkmark \end{cases} \Rightarrow x = 4 \checkmark$$

$$xy = \delta a \rightarrow \frac{x}{\delta} y = a$$



$$\begin{aligned} \hat{DHE} &= \hat{FHC} \quad \text{vert. angles} \\ \hat{DEF} &= \hat{EFC} \quad \text{alt. angles} \end{aligned} \Rightarrow \triangle DHE \sim \triangle FHC$$

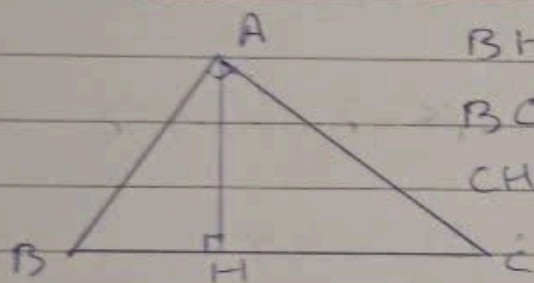
$$\Rightarrow \frac{DE}{FC} = \frac{DH}{HC} = \frac{EH}{FH} = \frac{x}{y} = \frac{r}{a} = 0.4$$

$$DE \parallel BC \rightarrow \frac{AE}{AC} = \frac{DE}{BC} \Rightarrow \frac{a}{a+1.4y} = \frac{0.4y}{1.4y} = \frac{1}{3.5} \Rightarrow a = 0.4y$$

$$\frac{DE}{FC} \times \frac{BC}{DE} = \frac{r}{a} \times r \Rightarrow \frac{BC}{FC} = \frac{9}{a} \Rightarrow \frac{BC}{BC-r} = \frac{9}{a} \Rightarrow \triangle ABC = 9BC - rV$$

$$\Rightarrow rV = 9BC \Rightarrow BC = \frac{rV}{9} = 4.17a \quad \checkmark$$

(r) (psi)



$$BH = r$$

$$BC = r_0$$

$$CH = 14$$

$$BH \cdot BC = AB^2 \Rightarrow r \cdot r_0 = AB^2$$

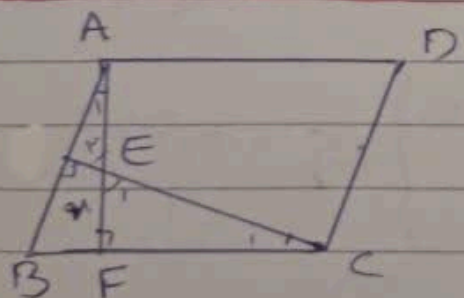
$$\Rightarrow AB = \sqrt{r \cdot r_0} = \sqrt{r \cdot 14} = \sqrt{14r}$$

$$AC^2 = CH \cdot BC \Rightarrow 14 \times r_0 = AC^2 \Rightarrow AC = \sqrt{14r_0} = 11.77 \quad \checkmark$$

$$\sqrt{14}$$

$$\frac{AB}{AC} = \frac{\sqrt{14r}}{11.77} = \frac{\sqrt{14}}{11.77} \times \frac{1}{r} \quad \boxed{\frac{1}{r}}$$

(r) (psi)



$$AD = 17$$

$$BF = 4$$

$$AE = 11$$

$$\hat{E}_1 + \hat{C}_1 = 90^\circ$$

$$\hat{E}_r + \hat{A}_1 = 90^\circ$$

$$\hat{E}_1 = \hat{E}_r$$

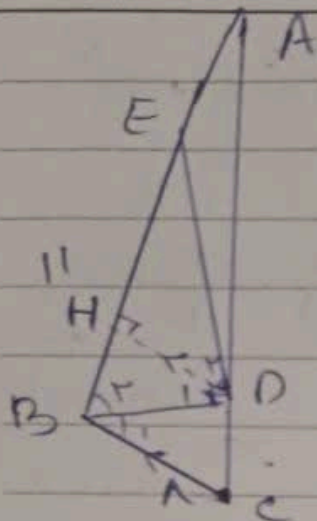
$$\Rightarrow \hat{A}_1 = \hat{C}_1$$

(r) (psi)

$$\left. \begin{aligned} \hat{A}_1 &= \hat{C}_1 \\ \hat{E} &= 90^\circ \end{aligned} \right\} \Rightarrow \triangle EFC \sim \triangle ABF \Rightarrow \frac{EF}{BF} = \frac{FC}{AF} \Rightarrow \frac{a}{4} = \frac{11}{11+a} \Rightarrow 11a + a^2 = 44$$

$$\Rightarrow a^2 + 11a - 44 = 0 \Rightarrow (a+17)(a-6) = 0 \Rightarrow \begin{cases} a = 6 \quad \checkmark \\ a = -17 \quad \times \end{cases}$$

$$AF = AE + a = 11 + 6 = 17 \Rightarrow AF = 17 \quad \checkmark$$



پارو خط HD و BC موازی است و HD بر خط AB عمود است
 $\hat{B} = \hat{H} = 90^\circ \Rightarrow \hat{B}_1 = \hat{B}_2 = 45^\circ$ بنابراین :

$$\hat{H} = 90^\circ \rightarrow \hat{D}_1 = \hat{D}_2 = 45^\circ \Rightarrow \hat{E} = 45^\circ$$

$$\hat{B}_2 = 45^\circ$$

(۲)

پس مثلث BDE قائم الزامیه متساوی الساقین است

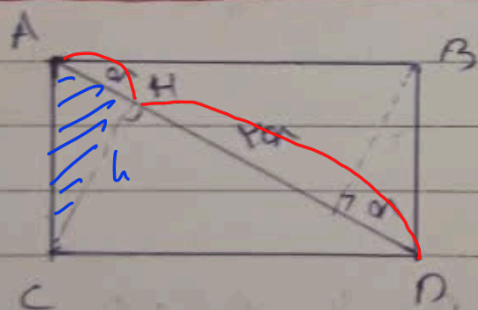
بنابراین : $BH = HE = ۵,۵$

از طرف : $DH^2 = BH \times HE \Rightarrow DH^2 = ۵,۵ \times ۵,۵ \Rightarrow DH = ۵,۵$

با فرض $AE = x$ و نوشتن رابطه تقسیم النسب داریم :

$$HD \parallel BC \Rightarrow \frac{x + ۵,۵}{x + ۱۱} = \frac{۵,۵}{۱۱} \Rightarrow ۱۱x + ۶۰,۵ = ۵,۵x + ۶۰,۵$$

$$\Rightarrow ۶,۵x = ۱۴,۵ \Rightarrow x = \frac{۱۴,۵}{۶,۵} = ۲,۲ \Rightarrow AE = ۲,۲ \checkmark$$



دقت!

$$CH^2 = x \times ۳x = ۳x^2 \rightarrow CH = \sqrt{۳}x$$

$$S_{\triangle HEC} = x \times \sqrt{۳}x \times \frac{1}{2} = \frac{\sqrt{۳}}{2} x^2$$

$$S_{\triangle HEC} = \frac{h \times r}{2} = \frac{\sqrt{۳} x^2}{2}$$

$$CP^2 = ۳x \times ۴x = ۱۲x^2 \rightarrow CP = ۲\sqrt{۳}x$$

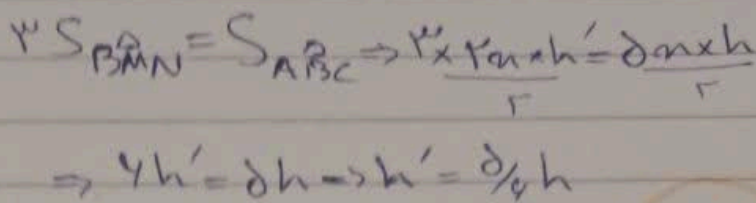
$$AC^2 = x \times ۴x = ۴x^2 \rightarrow AC = ۲x$$

$$\Rightarrow S = \frac{1}{2} \sqrt{۳} x^2 \checkmark$$

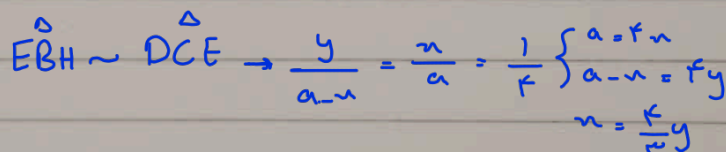
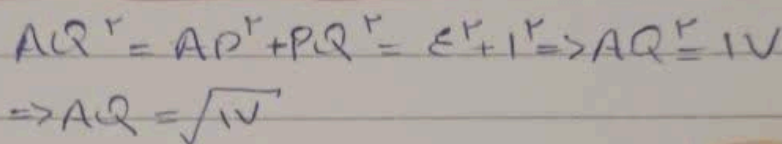
(۳)

$$\frac{S_{ABCD}}{S_{\triangle HEC}} = \frac{۴\sqrt{۳}}{\frac{\sqrt{۳}}{2}} = \frac{۸\sqrt{۳}}{\sqrt{۳}} = \frac{۸\sqrt{۴}}{۲} = ۴\sqrt{۴} = ۱۶$$

مساحت مستطیل $۴\sqrt{۴}$ برابر مساحت کوچکترین مثلث ایجاد شده در آن است



$$10 \rightarrow \frac{BM}{AM} \leftarrow \frac{\delta y}{y} = \omega$$



$$DCE \xrightarrow{\text{نيٽو غوس}} (f)^r = (a-r) + (a)^r \quad \begin{cases} n = \frac{r}{\delta} \\ a = \frac{14}{\delta} \end{cases}$$

$$S_{\square} = a^r = \frac{254}{25}$$



$GE = EC$ $\therefore$ AE

$$AF = Y_F E^-$$

$$A \bar{E} = \bar{F} E$$

$$GF = YFD \Rightarrow GD = Y^*FD$$

۳ مرکز نقل و حرکت AGC است.

$$\Rightarrow 1312 = 9F12 \Rightarrow \frac{1312}{F12} = 9 \quad \checkmark$$

$$\frac{S_{ABC}}{S_{BMN}} = \frac{\cancel{\frac{1}{2}} AB \times \overset{\Delta}{\cancel{BC}} \times \cancel{\sin B}}{\cancel{\frac{1}{2}} BM \times \underset{\Delta}{\cancel{BN}} \times \cancel{\sin B}} = r \rightarrow \frac{AB}{BM} = \frac{r}{\Delta}$$

$$\frac{AB - BM}{BM} = \frac{r - \Delta}{\Delta} = \frac{r}{\Delta}$$

$$\frac{BM}{AM} = \boxed{\frac{\Delta}{r}}$$

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