

$$S_{BCE} = \frac{1}{2} \times BC \times EH$$

$$S_{BDE} = \frac{1}{2} \times DE \times BH$$

DE و BC در خط موازی = EH = BH

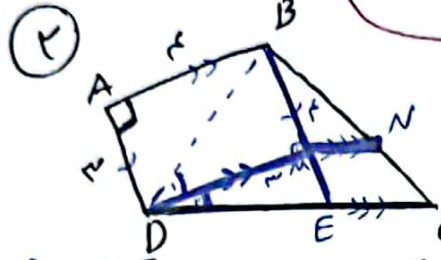
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بارز جباتگیره / بارز هم سر A

DE || BC تقسیم قضیه تالس

$$\frac{AB}{AD} = \frac{BC}{DE} = \frac{12}{d}$$

$$\frac{S_{BCE}}{S_{BDE}} = \frac{BC}{DE} \Rightarrow \frac{S_{BCE}}{S_{BDE}} = \frac{12}{d}$$



$$AD || BM$$

$$AB || DM$$

$$\hat{A} = 90^\circ$$

$$\Rightarrow ABMD \Rightarrow \begin{cases} AB = DM = r \\ AD = BM = r \\ \hat{M}_1 = 90^\circ \end{cases}$$

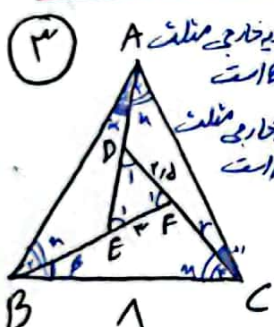
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$$BDC = BDM + MDC$$

$$BDC = r + BDM$$

$$BDM = MDC \Rightarrow DM \text{ نیمساز زاویه BDC} \Rightarrow BM^2 + DM^2 = BD^2 \Rightarrow (r)^2 + (r)^2 = BD^2 \Rightarrow 9 + 9 = 2d \Rightarrow BD = d$$

$$\hat{M}_1 = 90^\circ \Rightarrow \text{ارتفاع وارد بر ضلع BE} \Rightarrow \text{نیمساز زاویه BDE} \Rightarrow BDE \text{ قائم الزامی است} \Rightarrow BD = DE$$



$$\hat{F}_1 = \hat{B}_1 + \hat{C}_1 = n + \beta$$

$$\hat{B} = \hat{B}_1 + \hat{B}_2 = n + \beta$$

$$\hat{E}_1 = \hat{B}_2 + \hat{A}_1 = n + \alpha$$

$$\hat{A} = \hat{A}_1 + \hat{A}_2 = n + \alpha$$

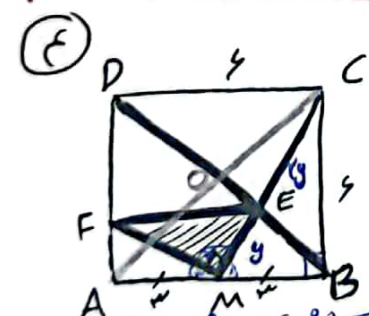
$$\Rightarrow \hat{F}_1 = \hat{B}$$

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

$$\Rightarrow DEF \sim CAB$$

$$\frac{DE}{AC} = \frac{EF}{AB} = \frac{DF}{CB}$$

$$\Rightarrow AB = \frac{AC \times r}{r + d} = \frac{12 \times 3}{3 + 8} = \frac{36}{11} = 3.27$$



$$\hat{B} = \hat{M}_1 = 90^\circ$$

$$\hat{C} = \hat{M}_2$$

$$\Rightarrow BCM \sim AMF$$

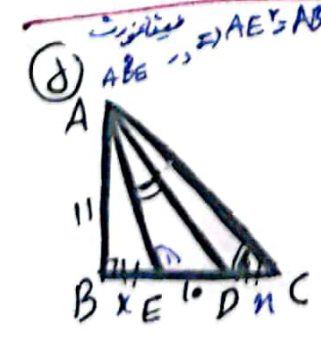
$$\frac{BC}{AM} = \frac{CM}{MF} = \frac{BM}{AF} \Rightarrow MF = \frac{BM \times \sqrt{5}}{AF}$$

$$CM^2 = BM^2 + BC^2 = 3^2 + 9 = 18$$

$$\Rightarrow CM = \sqrt{18}$$

$$CM = CE + EM = r + y = \sqrt{18} \Rightarrow y = \sqrt{18} - r$$

$$S_{FME} = \frac{FM \times ME}{2} = \frac{\sqrt{5} \times \sqrt{5}}{2} = \frac{5}{2}$$



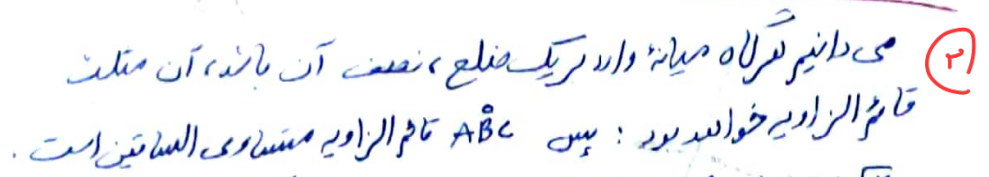
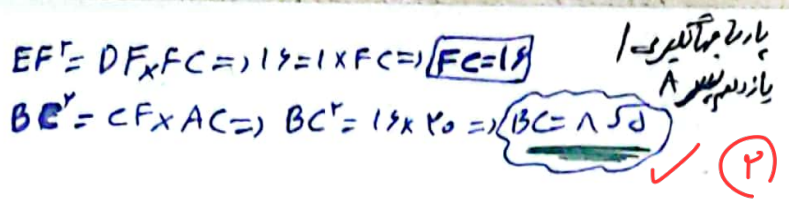
$$\hat{E}_1 = \hat{E}_1$$

$$\hat{EAD} = \hat{ACE}$$

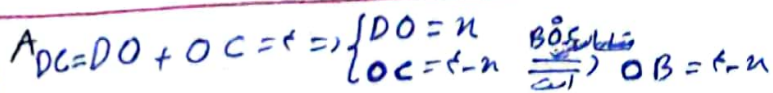
$$\Rightarrow AED \sim CEA \Rightarrow \frac{AE}{CE} = \frac{ED}{EA} \Rightarrow AE^2 = CE \cdot ED$$

$$\Rightarrow x^2 + 17 = (x + 10)(10) \Rightarrow x^2 + 17 = 10x + 100 \Rightarrow x^2 - 10x + 17 = 0$$

$$\Rightarrow (x - 3)(x - 17) = 0 \Rightarrow \begin{cases} x = 3 \\ x = 17 \end{cases}$$



ای دانیم میانها و داد بر لاق که مثلث مستطوی الساقین بالعم برارند



فینانسرش $\Rightarrow BO^r = BD^r + DO^r \Rightarrow (F-n)r = (r)r + (n)r \Rightarrow \cancel{nr} - \cancel{nr} + nr = \cancel{nr} + nr$
 $\Rightarrow nr = nr \Rightarrow n = rd \Rightarrow \begin{cases} DO = rd \\ OC = rd \end{cases}$

OE در مثلث BOC ارتفاع وارد بر ضلع BC می باشد و می دانیم در مثلث متساوی الساقین،
ارتفاع وارد بر وتر، نیمساز نیز می باشد (اثبات با هم نهشتی در مثلث BOE و COE به حالت وتر و
تک ضلع (OE) پس $\theta_1 = \theta_2$.

$$\left. \begin{array}{l} \hat{O}_1 = \hat{O}_2 \\ BO = CO \\ OA = OA \end{array} \right\} \Rightarrow \begin{array}{l} \triangle AOB \cong \triangle AOC \\ \text{IL} \end{array} \Rightarrow \begin{array}{l} s_{AOB} = s_{AOC} \\ \text{(II)} \end{array}$$

$BD^2 + DC^2 = BC^2 \Rightarrow BC = \sqrt{16+9} = 5$
 $BC = CE + BE \Rightarrow BE = CE = 2.5$

$$S_{BOC} = \frac{OE \times BC}{r} = \frac{BD \times OC}{r} \Rightarrow OE \times r\sqrt{2} = r \times r/d = d \Rightarrow OE = \frac{\sqrt{d}}{r}$$

طابق و رابط طولی مثلث ACE : $CE^2 = OE \times EA \Rightarrow d = \frac{\sqrt{5}}{2} \times EA \Rightarrow EA = 2\sqrt{5}$
 قائم الزاویه ACD : $AC^2 = CO \times CD \Rightarrow AC^2 = 20 + d = 22 \Rightarrow AC = d$

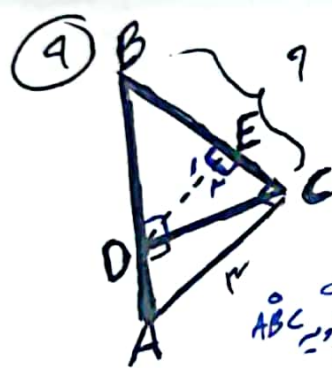
$AE \text{ عوارضات} : AC^r = AE^r + EC^r \Rightarrow AC^r = r_0 + d = r_d \Rightarrow \frac{AC}{r} = \frac{AE}{r} + \frac{EC}{r}$

$$\Rightarrow S_{ABOC} = \cancel{r} \times \frac{dx \times r/d}{\cancel{r}} = 1 \times r/d$$

$$S_{BOC} = \frac{BD \times OC}{r} = \frac{r \times r}{r}$$

$$AE = AE, \hat{E}_1 = \hat{E}_2 = 90^\circ, BE = CE \Rightarrow \triangle ABE \cong \triangle ACE \Rightarrow \angle ABE = \angle ACE$$

$$\Rightarrow r_{S_{ABE}} = 10 \Rightarrow \boxed{S_{ABE} = 0} \quad \checkmark$$



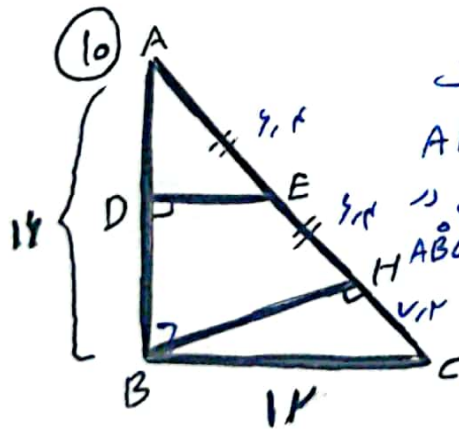
پاراگراف تفسیر / یاد دہی

فیتاگورث $\Rightarrow AB^2 = AC^2 + BC^2 = 16 + 9 = 25 \Rightarrow AB = \sqrt{25} = 5$ (2)

طبق روابط طولی در مثلث قائم الزاویہ ABC : $BC^2 = BD \times AB \Rightarrow 16 = BD \times 5 \Rightarrow BD = \frac{16}{5}$

$DE \parallel AC$ $\Rightarrow DE \perp BC \Rightarrow \angle E_1 = \angle E_2 = 90^\circ$
 $AC \perp BC$

$\frac{16 \times 4}{5} = BE \times 5 \Rightarrow BE = \frac{16}{5}$ ✓



فیتاگورث $\Rightarrow AC^2 = AB^2 + BC^2 = 144 + 256 = 400 \Rightarrow AC = 20$ (2)

طبق روابط طولی در مثلث قائم الزاویہ ABC : $BC^2 = CH \times AC \Rightarrow 16 \times 16 = CH \times 20 \Rightarrow CH = 12.8$

$AC = AH + CH \Rightarrow AH = AC - CH = 20 - 12.8 = 7.2$
 $AH = AE + EH$
 $AE = EH$

$\Rightarrow AE = 3.6$

$DE \perp AB$ $\Rightarrow DE \parallel BC$ (تعمیم فیثاگورث)
 $BC \perp AB$ $\Rightarrow \frac{DE}{BC} = \frac{AE}{AC} \Rightarrow \frac{DE}{16} = \frac{3.6}{20} \Rightarrow DE = 2.88$ ✓