

1

$\frac{AE}{AD} = \frac{x}{3x} = \frac{1}{3}$
 $BE^2 = AE^2 + AB^2 = x^2 + 9x^2 = 10x^2$ ، $BE = \sqrt{10}x$ / $AC = \text{قطر مربع} \Rightarrow 3x\sqrt{2}$
 $\rightarrow$ فیثاغورس
 $AEF \sim FBC$ $\xrightarrow{\text{نسبت تناسب}}$ $\frac{AE}{BC} = \frac{1}{3} \Rightarrow \frac{AF}{AC} = \frac{1}{3} \Rightarrow \frac{AF}{3x\sqrt{2}} = \frac{1}{3} \Rightarrow \frac{AF}{3x\sqrt{2}} = \frac{1}{3}$
 $\frac{EF}{BE} = \frac{1}{3} \Rightarrow \frac{EF}{\sqrt{10}x} = \frac{1}{3} \Rightarrow \frac{EF}{\sqrt{10}x} = \frac{1}{3}$
 $\Rightarrow \frac{EF}{AF} = \frac{\frac{\sqrt{10}x}{3}}{\frac{\sqrt{2}x}{3}} = \frac{\sqrt{5}}{3}$
 برای دو زاویه برابر
 $C_1 = A_1$ و $F_1 = F_2$
 متناسب بر اساس خط موازی و در ضلع داری

2

$AED = ABC \Rightarrow A = A$ ، $E = C$ ، $B = D$

نسبت تناسب $\frac{y}{x+1} = \frac{x}{15} \Rightarrow 15y = x^2 + x$ ، $x(x+1) = 15 \Rightarrow x = 5$

3

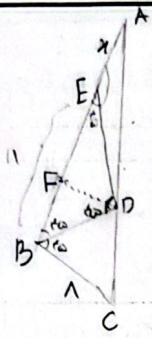
$3y = 5x \Rightarrow x = \frac{3}{5}y$
 $DE \parallel BC \xrightarrow{\text{متناسب}}$ $\frac{AD}{BD} = \frac{AE}{EC} = \frac{x}{1+y} = \frac{1}{3} \Rightarrow AD = BD$ ، $\frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{3}$
 $DE \parallel BC$ $\xrightarrow{\text{متناسب بر اساس دو زاویه برابر}}$ $\frac{DE}{FC} = \frac{EH}{FH} = \frac{x}{y} = \frac{3}{5} \Rightarrow DE = \frac{3}{5}FC \Rightarrow \frac{DE}{BC} = \frac{\frac{3}{5}FC}{3+FC} = \frac{1}{3}$
 $\frac{3}{5}FC = 3 \Rightarrow FC = \frac{15}{3} = 5$ ، $BC = FC + BF = \frac{15}{3} + 3 = 8$ ، $5 < 8$

4

$x + y = 10$ ، $x = 4$ ، $y = 14$
 $a^2 = CH \times AC = 4 \times 20 = 80$ ، $b^2 = AH \times AC = 14 \times 20 = 280$
 $\frac{a}{b} = \frac{\sqrt{80}}{\sqrt{280}} = \sqrt{\frac{1}{3.5}} = \frac{1}{2}$

5

$ABF \sim FCE$
 $\xrightarrow{\text{نسبت تناسب}}$ $\frac{BF}{EF} = \frac{AF}{FC} \Rightarrow \frac{4}{x} = \frac{x+1}{14} \Rightarrow 4 \times 14 = x^2 + 14x$ ، $x^2 + 14x - 56 = 0$ ، $x = -12$ ، $x = 4$
 $\Rightarrow FE = x = 4$ ، $AF = AE + EF = 4 + 4 = 8$

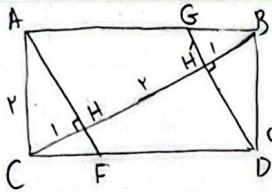


در صورتی که ارتفاع وار در قطع BE با BC موازی باشد زاویه B و 90° درجه باشد.
 BD منبسط است پس $EF \parallel BD$ و E و D بر یک خط مستقیم هستند. ارتفاع BD متساوی الساقین
 بیاید آن هم است در نتیجه $EF \parallel BD$

$$\frac{AF}{AB} = \frac{FD}{BC} \rightarrow \frac{x+5}{11+x} = \frac{5}{8}$$

$$8x + 40 = 55 + 5x \rightarrow 3x = 15 \rightarrow x = 5$$

6



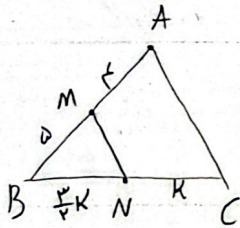
$$AH^2 = CH \times HB = 1 \times 3 = 3 \Rightarrow AH = \sqrt{3}$$

$$AC^2 = AH^2 + CH^2 = (\sqrt{3})^2 + 1^2 = 4 \Rightarrow AC = 2$$

$$BC^2 = AB^2 + AC^2 \Rightarrow 14 = AB^2 + 4 \Rightarrow AB^2 = 10 \Rightarrow AB = \sqrt{10} = 2\sqrt{5}$$

$$ABH \sim CFH \Rightarrow \frac{AH}{FH} = \frac{BH}{CH} = \frac{1}{1} \Rightarrow FH = \frac{\sqrt{3}}{1} = \sqrt{3} \Rightarrow \frac{1}{\sqrt{3}} \times \frac{\sqrt{3}}{1} = 1$$

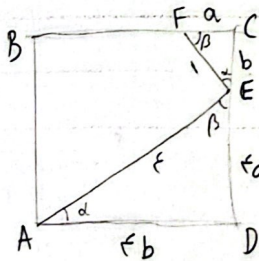
$$2 \cdot BM \cdot NC \Rightarrow BN = \frac{1}{2} NC \Rightarrow BN = \frac{1}{3} BC$$



$$S_{BMN} = BM \times BN \quad , \quad S_{ABC} = AB \times BC$$

$$\frac{S_{ABC}}{S_{BMN}} = \frac{AB \times BC}{BM \times \frac{1}{3} BC} = 3 \Rightarrow \frac{AB}{BM} = \frac{9}{1} \Rightarrow \frac{BM}{AB} = \frac{1}{9} \Rightarrow \frac{BM}{AM} = \frac{1}{8}$$

8

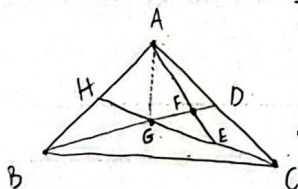


$$ADE \sim ECF \Rightarrow \frac{FE}{AE} = \frac{1}{4} \Rightarrow ED = 4FC = 4a$$

$$AD = 4CE = 4b \quad / \quad (4a+b) = 4b \Rightarrow 4a = 3b \Rightarrow a = \frac{3}{4}b$$

$$a^2 + b^2 = 1 \Rightarrow a^2 + \frac{16}{9}a^2 = 1 \Rightarrow \frac{25}{9}a^2 = 1 \Rightarrow a^2 = \frac{9}{25} \Rightarrow a = \frac{3}{5}$$

9



$$\frac{HG}{HC} = \frac{1}{3} \quad , \quad \frac{DG}{BD} = \frac{1}{4} \quad (1)$$

آراس A را به G وصل کنیم مثلثی دیگر درست می آید که AE و GD میانهای آن و F مرکز ثقل آن است.

$$\frac{DF}{DG} = \frac{1}{3} \quad (2) \Rightarrow \frac{DF}{BD} = \frac{1}{3} \times \frac{1}{4} = \frac{1}{12} \Rightarrow \frac{BD}{FD} = 12$$

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