

1

$\frac{AE}{AD} = \frac{x}{3x} = \frac{1}{3}$
 $BE^2 = AE^2 + AB^2 = x^2 + 9x^2 = 10x^2$ و $BE = \sqrt{10}x$ / $AC = \text{قطر مربع} \Rightarrow 3x\sqrt{2}$
 $AEF \sim FBC \xrightarrow{\text{نسبت تناسب}} \frac{AE}{BC} = \frac{1}{3} \Rightarrow \frac{AF}{AC} = \frac{1}{3} \Rightarrow \frac{AF}{3x\sqrt{2}} = \frac{1}{3} \Rightarrow \frac{EF}{BE} = \frac{1}{3} \Rightarrow \frac{EF}{\sqrt{10}x} = \frac{1}{3}$
 براساس دوازده برابر
 $\Rightarrow \frac{EF}{AF} = \frac{\frac{\sqrt{10}x}{3}}{\frac{3x\sqrt{2}}{3}} = \frac{\sqrt{5}}{3}$
 متناسب براساس خط‌های موازی و دوطرفه‌ای
 $C_1 = A_1$ و $F_1 = F$

2

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

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

3

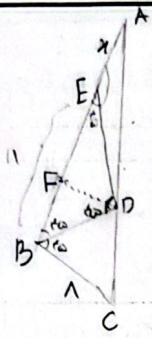
$3y = 5x \Rightarrow x = \frac{3}{5}y$
 $DE \parallel BC \xrightarrow{\text{متناسب}} \frac{AD}{BD} = \frac{AE}{EC} = \frac{x}{1.2y} = \frac{1}{y} \Rightarrow AD = BD$ و $\frac{AD}{AB} = \frac{DE}{BC} = \frac{1}{3}$
 $DEH, FCH \xrightarrow{\text{متناسب براساس دوازده برابر}} \frac{DE}{FC} = \frac{EH}{FH} = \frac{x}{y} = \frac{3}{5} \Rightarrow DE = \frac{3}{5}FC \Rightarrow \frac{DE}{BC} = \frac{\frac{3}{5}FC}{3+FC} = \frac{1}{3}$
 $\frac{3}{5}FC = 3 \Rightarrow FC = \frac{15}{3} = 5$ و $BC = FC + BF = \frac{15}{3} + 3 = 8$ و 15

4

$x + y = 10$ و $x = 4$ ، $y = 14$
 $a^2 = CH \times AC = 4 \times 10 = 40$ و $b^2 = AH \times AC = 14 \times 10 = 140$
 $\frac{a}{b} = \frac{\sqrt{40}}{\sqrt{140}} = \sqrt{\frac{1}{3.5}} = \frac{1}{\sqrt{3.5}}$

5

$ABF \sim FCE$
 $\xrightarrow{\text{نسبت تناسب}} \frac{BF}{EF} = \frac{AF}{FC} \Rightarrow \frac{y}{x} = \frac{x+1}{1} \Rightarrow x^2 = x^2 + 1x$ و $x = -12$ ، $x = 12$
 $\Rightarrow FE = x = 12$ ، $AF = AE + EF = 1 + 12 = 13$

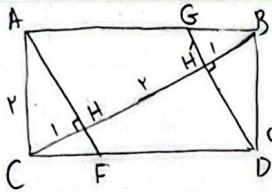


در صورتی که ارتفاع وار در ضلع BC با BE موازی باشد زاویه B و 90° درجه باشد.
 BD منبسط است پس $EF \parallel BD$ و E و F در BD هستند. و ارتفاع BD متساوی الساقین
 بنابر آن هم است در نتیجه $EF \parallel BD$

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

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

6

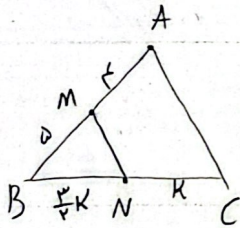


کوچکترین مکعب: GBH و CHF
 $AH^2 = CH \times HB = 1 \times 3 = 3 \Rightarrow AH = \sqrt{3}$
 $AC^2 = AH^2 + CH^2 = (\sqrt{3})^2 + 1^2 = 4 \Rightarrow AC = 2$

بنابر $AC \times AB = 2 \times 2\sqrt{3} = 4\sqrt{3}$ و مساحت مستطین $AB \times BC = 2 \times 3 = 6$
 $BC^2 = AB^2 + AC^2 = 4 + 4 = 8 \Rightarrow BC = 2\sqrt{2}$

$$ABH \sim CFH \Rightarrow \frac{AH}{FH} = \frac{BH}{CH} = \frac{1}{3} \Rightarrow FH = \frac{\sqrt{3}}{4} \Rightarrow \frac{1}{4} \times \frac{\sqrt{3}}{4} = \frac{\sqrt{3}}{16}$$

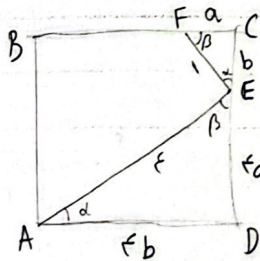
$$2 \times BM \times NC \Rightarrow BN = \frac{1}{2} NC \Rightarrow BN = \frac{1}{3} BC$$



$$S_{BMN} = BM \times BN \text{ و } S_{ABC} = AB \times BC$$

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

8

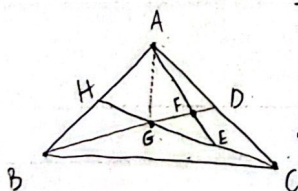


$$ADE \sim ECF \Rightarrow \frac{FE}{AE} = \frac{1}{f} \Rightarrow ED = f \cdot FC = fa$$

$$AD = f \cdot CE = fb \text{ / } fa + fb = fb \Rightarrow 3b = fa, b = \frac{f}{3}a$$

$$a^2 + b^2 = 1 \rightarrow a^2 + \frac{1}{9}a^2 = 1 \rightarrow \frac{10}{9}a^2 = 1 \Rightarrow a^2 = \frac{9}{10} \Rightarrow a = \frac{3}{\sqrt{10}}$$

9



$$\frac{HG}{HC} = \frac{1}{3} \text{ و } \frac{DG}{BD} = \frac{1}{3} \quad (1)$$

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

$$\frac{DF}{DG} = \frac{1}{3} \quad (2) \Rightarrow \frac{DF}{BD} = \frac{1}{3} \times \frac{1}{3} = \frac{1}{9} \Rightarrow \frac{BD}{FD} = 9$$

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