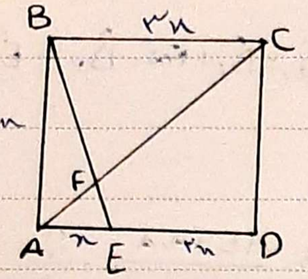
1-


$ED = 2AE \Rightarrow \underrightarrow{AE = x}, AD = 3x \Rightarrow AC = 3\sqrt{2}\,x$

$\Rightarrow BE = \sqrt{10}\,x$

$\frac{EF}{AF} = ?$

$AF = \frac{1}{3}AC \Rightarrow AF = \sqrt{2}\,x$

$FE = \frac{1}{3}BE \Rightarrow FE = \frac{\sqrt{10}}{3}x$

$\Rightarrow \frac{FE}{AF} = \frac{\frac{\sqrt{10}}{3}x}{\sqrt{2}x} = \boxed{\frac{\sqrt{5}}{3}}$

2- $A\hat{E}D = A\hat{C}B \longrightarrow \hat{A} = \hat{A} \Rightarrow \overset{\triangle}{ADE} \sim \overset{\triangle}{ABC} \Rightarrow \frac{AD}{AB} = \frac{AE}{AC} = \frac{ED}{BC}$

$\longrightarrow \frac{3}{1+x} = \frac{x}{15} \Rightarrow x^2 + x - 30 = 0 \Rightarrow (x-5)(x+6) = 0 <$ $x = -6$ غق ، $\boxed{x = 5}$

3- $DE \parallel BC \Rightarrow \frac{AE}{AC} = \frac{AD}{AB} = \frac{DE}{BC}$ (1)

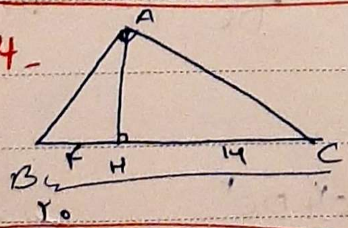
$DE \parallel BC, DC \Rightarrow E\hat{D}C = F\hat{C}D, H = H \Rightarrow \overset{\triangle}{DEH} \sim \overset{\triangle}{FHC} \Rightarrow \frac{EH}{FH} = \frac{DH}{CH} = \frac{DE}{FC} \Rightarrow \frac{x}{y} = \frac{5}{3}$; $3x = 5y$

$3y = 5x \Rightarrow y = \frac{5}{3}x \Rightarrow EC = 2x \Rightarrow$ (1) $\longrightarrow \frac{x}{2x} = \frac{DE}{3+FC} \Rightarrow 2DE = 3 + FC$ (1')

(2) $\longrightarrow \frac{DE}{FC} = \frac{5}{3} \Rightarrow 3DE = 5FC$ (2')

(1') (2') $\Longrightarrow \frac{3+FC}{2} = \frac{5FC}{3} \Rightarrow 10FC = 9 + 3FC$

$\Rightarrow FC = \frac{9}{7} \Rightarrow BC = \frac{30}{7}$

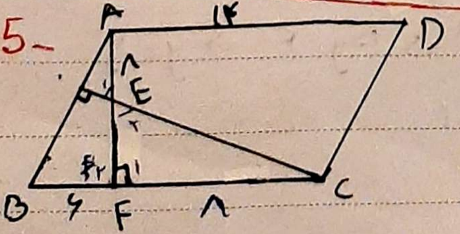
4-


$AH^2 = 4 \times 16 \longrightarrow AH = 2 \times 4 = 8$

$AC^2 = 16 \times 20$

$AB^2 = 4 \times 20$

$\Rightarrow \frac{AB}{AC} = \frac{\sqrt{4 \times 20}}{\sqrt{16 \times 20}} = \frac{1}{2}$

5-


$\hat{E}_1 = \hat{E}_2 = \hat{B}$

$\hat{F}_1 = 90 = \hat{F}_2$

$\Rightarrow \overset{\triangle}{ABF} \sim \overset{\triangle}{CEF} \Rightarrow \frac{CF}{AF} = \frac{EF}{BF} = \frac{CE}{AB}$

$\Rightarrow \frac{8}{8+EF} = \frac{EF}{6} \Rightarrow EF^2 + 8EF - 48 = 0 \longrightarrow (EF-4)(EF+12) = 0 \Rightarrow EF = 4$ ، $EF = -12$ غق

$AF = 8 + 4 = 12$

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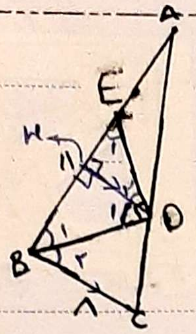

$HD \parallel BC \ , \ BD / \Rightarrow \hat{D}_1 = \hat{B}_1 \ , \ \hat{B}_1 = \hat{B}_2 \Big\} \Rightarrow \hat{D}_1 = \hat{B}_1 = 45 = \hat{B}_2 = \hat{E}_1 = \hat{D}_2$

$HD = HE = HB = 5.5$

$\longrightarrow HD \parallel BC \Rightarrow \frac{AH}{AB} = \frac{HD}{BC} = \frac{AD}{AC} \Rightarrow \frac{AE+5.5}{AE+11} = \frac{\frac{11}{2}}{8}$

$\Rightarrow 16AE + 88 = 11AE + 121$

$\Rightarrow 5AE = 33 \Rightarrow AE = \frac{33}{5}$

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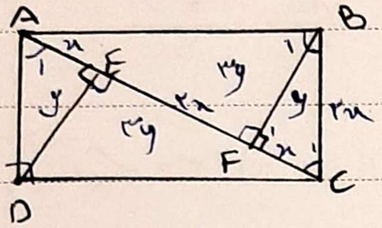

$EF = 2AE = 2FC$

$\hat{B} = 90 \Rightarrow \hat{F}_1 = 90 \ , \ \hat{C}_1 = \hat{C}_1 \Big\} \Rightarrow F\hat{C}B, A\hat{E}D \sim A\hat{B}C, A\hat{D}C$

$\Rightarrow \frac{BC}{AC} = \frac{FC}{BC} = \frac{BF}{AB} \Rightarrow \frac{BC}{4x} = \frac{x}{BC} \Rightarrow BC^2 = 4x^2 \Rightarrow BC = 2x$

$\Rightarrow \frac{2}{4} = \frac{1}{2} = \frac{BF}{AB}$

نسبت مساحت $=$ (نسبت اضلاع)^2 $\Rightarrow \frac{S_{F\hat{B}C}}{S_{A\hat{B}C}} = \frac{1}{4} \Rightarrow \frac{S_{F\hat{B}C}}{S_{ABCD}} = \frac{1}{8} \Rightarrow$ ۸ برابر

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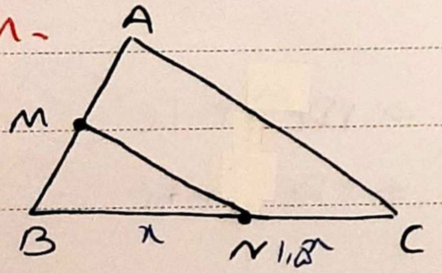

$2BN = 3NC \Rightarrow BN = 1.5NC$

$\Rightarrow \frac{S_{ABC}}{S_{BMN}} = \frac{\frac{1}{2} \times 2.5x \times AB \times \sin B}{\frac{1}{2} \times x \times MB \times \sin B} = 3 \longrightarrow \frac{2.5}{3} = \frac{MB}{AB} = \frac{5}{6}$

$\longrightarrow AM = \frac{1}{6} \Rightarrow \frac{MB}{AM} = \frac{5}{1}$

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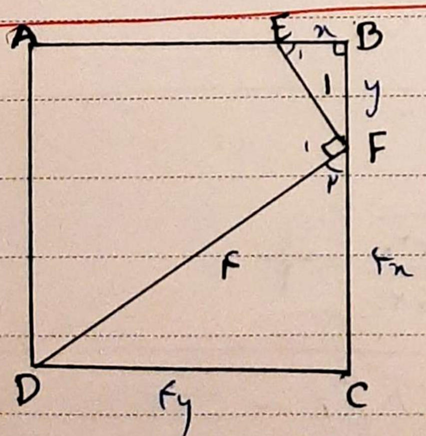

$\hat{B} = \hat{F}_1 = 90 \ , \ \hat{E}_1 = \hat{F}_2 \Big\} \Rightarrow B\hat{E}F \sim F\hat{C}D \Rightarrow \frac{BF}{DC} = \frac{EB}{FC} = \frac{EF}{DF} = \frac{1}{4}$

$\Rightarrow CF = 4x \ , \ DC = 4y$

$FC = 4y - y = 3y \longrightarrow FD^2 = FC^2 + DC^2$

$\Rightarrow 16 = 9y^2 + 16y^2 = 25y^2 \Rightarrow 5y = 4 \Rightarrow y = \frac{4}{5}$

$\Rightarrow S_{\text{مربع}} = 16y^2 = 16 \times \frac{16}{25} = 10.24$

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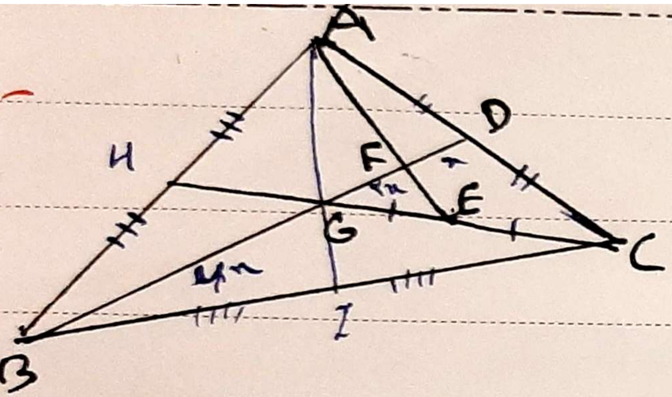

$\overset{\triangle}{AGC} \longrightarrow GD, AE \rightarrow$ من $\Rightarrow \dfrac{FD}{FG} = \dfrac{1}{۲}$

$\overset{\triangle}{ABC} \longrightarrow BD \rightarrow$ من $\Rightarrow \dfrac{GD}{BG} = \dfrac{1}{۲}$

$\Rightarrow \dfrac{BF}{FD} = \dfrac{۸x}{x} = ۸$