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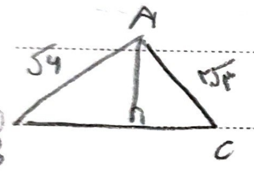
۱)

الف) $(\sin 135^\circ + \sin 300^\circ)(\cos 315^\circ - \cos 150^\circ) = \left(\frac{\sqrt{2}}{2} - \frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2}\right) =$

$\frac{1}{2} - \frac{3}{4} = \boxed{-\frac{1}{4}}$

ب) $\frac{1 + 3\tan^2 210}{4\cos^2 30 + 2\cos^2 225} = \frac{1 + 3\times\left(\frac{1}{\sqrt{3}}\right)^2}{4\times\left(\frac{\sqrt{3}}{2}\right)^2 + 2\times\left(\frac{\sqrt{2}}{2}\right)^2} = \frac{2}{4} = \boxed{\frac{1}{2}}$

۲) الف) HC?



ضلع مقابل ۴۵ = $\frac{\sqrt{2}}{2} \times$ وتر →

$AH = \frac{\sqrt{2}}{2} \times \sqrt{6} = \boxed{\sqrt{3}}$

فیثاغورس $\overset{\Delta}{AHC} = (2\sqrt{3})^2 - (\sqrt{3})^2 = 12 - 3 = 9$

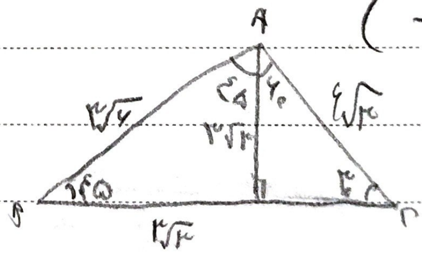
$HC = \sqrt{9} = \boxed{3}$

ب)

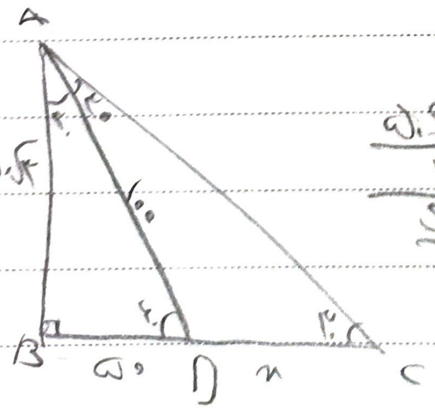
$HC = \frac{\sqrt{3}}{2} \times$ وتر → $\frac{9}{\frac{\sqrt{3}}{2}} =$ وتر → $\frac{18}{\sqrt{3}} = 6\sqrt{3}$

$AH = (6\sqrt{3})^2 - (9)^2 = 108 - 81 = 27$

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



۳) الف)



$BD = \frac{1}{2} \times$ وتر

$\frac{\frac{50\sqrt{3}}{1}}{\frac{\sqrt{3}}{2}} = 100$

$AD = DC = 100$

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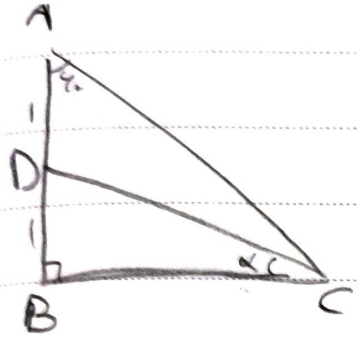
(ب)



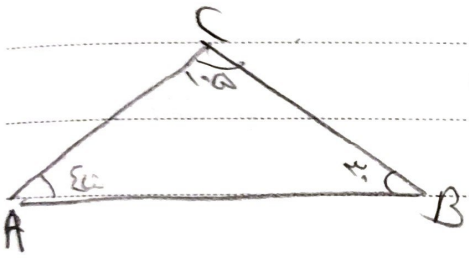
$(۲)^۲+\left(\frac{\sqrt{۲}}{۲}x\right)^۲=x^۲ \rightarrow ۴+\frac{۲}{۴}x^۲=x^۲$

$x^۲=۱۶ \rightarrow \boxed{x=۴}$

$B\hat{C}D=(۱)^۲+(۲\sqrt{۳})^۲=۱+۱۲=۱۳$

$DC=\sqrt{۱۳}$

$\sin\alpha=\frac{۱}{\sqrt{۱۳}}$



$۶۰+۴۵=۱۰۵$

$\sin ۱۰۵=\sin(۶۰+۴۵)=\sin۶۰\cos۴۵+\sin۴۵\cos۶۰$

$\frac{AB}{\sin۱۰۵}=\frac{AC}{\sin۴۵}=\frac{BD}{\sin۴۵} \rightarrow$

$\frac{AB}{AC}=\frac{\sin۱۰۵}{\sin۴۵} \Rightarrow \frac{\frac{\sqrt{۳}}{۲}\times\frac{\sqrt{۲}}{۲}+\frac{\sqrt{۲}}{۲}\times\frac{۱}{۲}}{\frac{۱}{۲}}=$

$\frac{\frac{\sqrt{۲}}{۲}\left(\frac{\sqrt{۳}}{۲}+\frac{۱}{۲}\right)}{\frac{۱}{۲}}=\left(\frac{\sqrt{۳}+۱}{۲}\right)\sqrt{۲}=\boxed{\frac{\sqrt{۶}+\sqrt{۲}}{۲}}$

$\frac{S_{ABE}}{S_{BED}}=\frac{\frac{۱}{۲}\times۲+۴\times\sin\theta}{\frac{۱}{۲}\times۳\times۴\times\sin\theta}=\boxed{\frac{۴}{۹}}$

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(۴)

الف) $a \times b \times \sin\theta \rightarrow 2 \times 4 \times \frac{\sqrt{2}}{2} = \boxed{4\sqrt{2}}$

ب) $3 \times 4 \times \frac{1}{2} \times \sin\alpha = 4 \times \frac{\sqrt{2}}{2} = 2\sqrt{2}$

(۷)

$\tan\theta =$ شیب

① $\text{شیب} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2}{4} = \frac{1}{2}$

② $1 + \tan^2 = \frac{1}{\cos^2}$

$1 + \frac{1}{4} = \frac{1}{\cos^2} \rightarrow \frac{5}{4} = \cos^2$

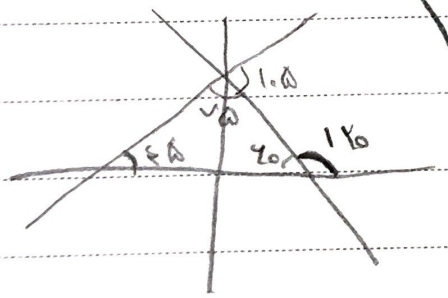
$\boxed{\cos = \frac{2}{\sqrt{5}}}$

(۸)

عرض از مبدأ $: b = \frac{5}{2}$

$y = mx + b \rightarrow y = mx + \frac{5}{2}$

$y = x + \frac{5}{2}$



شیب $= \tan\theta = 1 \rightarrow 45^\circ$

$\tan 120^\circ = -\sqrt{3} = m$

$mb = (-\sqrt{3}) \times \left(\frac{5}{2}\right) = \boxed{-\frac{5\sqrt{3}}{2}}$

(۹)

$F(x) = -\cos x + \cos x + \cot x = \cot x$

$\cot 150^\circ = \boxed{-\sqrt{3}}$

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$$+\frac{\cos x - \sin x}{-\cos x + \sin x} = \frac{(\cos x - \sin x)}{-(\cos x - \sin x)} = \boxed{-1}$$