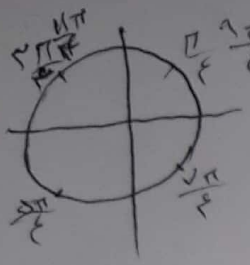
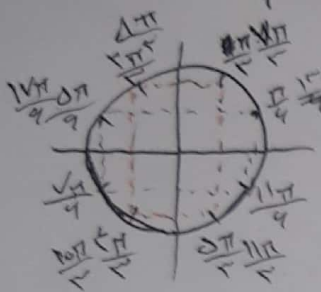
سوال ۱:

الف) $\tan\frac{11\pi}{4}+\sin\frac{15\pi}{4}\times\cos\frac{12\pi}{4}=-1+\frac{-\sqrt{2}}{2}\times\frac{-\sqrt{2}}{2}$



$=-1+\frac{1}{2}=-\frac{1}{2}$

ب) $\tan\frac{17\pi}{4}\times\sin\frac{11\pi}{3}+\cos\frac{10\pi}{3}$

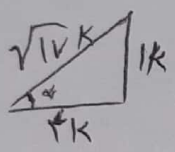


$\frac{-1}{\sqrt{2}}\times\frac{-\sqrt{2}}{2}+-\frac{1}{2}=-\frac{1}{\sqrt{2}}\times-\frac{\sqrt{2}}{2}=\frac{1}{2}+\left(-\frac{1}{2}\right)=0$

سوال ۲:

$\cot\alpha=2$

$\frac{2\cos\alpha-\sin\alpha}{\cos\alpha+\sin\alpha}=?$



$1k^2+(2k)^2=1k^2+4k^2=17k^2$

$\sqrt{17k^2}=\sqrt{17}k$

$\rightarrow\frac{2\cos\alpha-\sin\alpha}{\cos\alpha+\sin\alpha}=\frac{2\times\frac{2k}{\sqrt{17}k}-\frac{1k}{\sqrt{17}k}}{\frac{2k}{\sqrt{17}k}+\frac{1k}{\sqrt{17}k}}=\frac{\frac{4k}{\sqrt{17}k}-\frac{1k}{\sqrt{17}k}}{\frac{3k}{\sqrt{17}k}}=\frac{\frac{3}{\sqrt{17}}}{\frac{3}{\sqrt{17}}}=1$

سوال ۳:

$\sin\alpha=2\cos\alpha$ $\quad\alpha\rightarrow$ ربع سوم $\quad\cos\alpha=?$

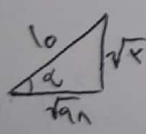
$\sin^2\alpha+\cos^2\alpha=1\longrightarrow(2\cos\alpha)^2+\cos^2\alpha=1$

$=4\cos^2\alpha+\cos^2\alpha=1\rightarrow5\cos^2\alpha=1\rightarrow\cos^2\alpha=\frac{1}{5}\rightarrow\cos\alpha=\pm\frac{\sqrt{1}}{\sqrt{5}}$

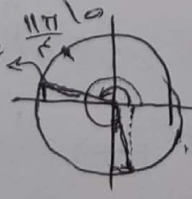
$\xrightarrow[\text{ربع سوم}]{\cos\alpha-}\cos\alpha=-\sqrt{\frac{1}{5}}\rightarrow$ ربع سوم

سوال ۴:

الف) $\alpha\rightarrow$ ربع دوم $\quad\sin\alpha=\frac{\sqrt{2}}{10}\quad\cos\left(\frac{11\pi}{4}+\alpha\right)$



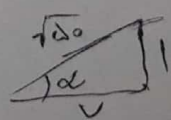
کسینوس بیشتر از سینوس



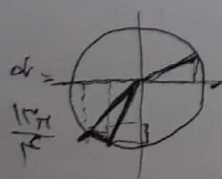
$\rightarrow\cos\left(\frac{11\pi}{4}+\alpha\right)$ مثبت است، در ناحیه دوم منفی می‌شود، پس قرینه می‌گیرد

$\rightarrow\cos\left(\frac{11\pi}{4}+\alpha\right)=\sin\alpha=\frac{\sqrt{2}}{10}$

ب) $\alpha\rightarrow$ ناحیه اول $\quad\tan\alpha=\frac{1}{7}\quad\sin\left(\frac{13\pi}{4}+\alpha\right)=?$



$\sin\alpha=\frac{1}{\sqrt{50}}\quad\cos\alpha=\frac{7}{\sqrt{50}}$



$\frac{13\pi}{4}+\alpha=\alpha'$ منتهی انتهای

$\sin\alpha=\sin\frac{13\pi}{4}\rightarrow\sin\alpha=-\frac{\sqrt{2}}{2}-\frac{1}{\sqrt{50}}$

بنابراین $\sin\left(\frac{13\pi}{4}+\alpha\right)=-\cos\alpha=\left(-\frac{7}{\sqrt{50}}\right)$

سوال ۵:

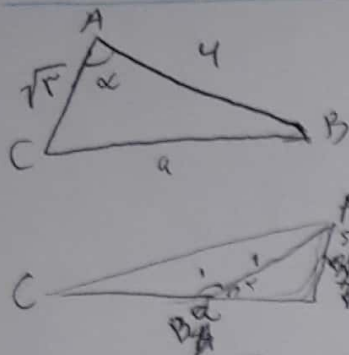
$3\sin^2\alpha + \cos^2\alpha = \frac{5}{3}$ $\quad \tan^2\alpha = ?$

$3\sin^2\alpha + \cos^2\alpha = \sin^2\alpha + \underbrace{\sin^2\alpha + \cos^2\alpha}_{1} = \frac{5}{3} \rightarrow \sin^2\alpha + 1 = \frac{5}{3} \rightarrow \sin^2\alpha = \frac{1}{3}$

$\rightarrow \sin\alpha = \pm\sqrt{\frac{1}{3}}$ $\quad \cos^2\alpha = \frac{2}{3} \rightarrow \cos\alpha = \pm\sqrt{\frac{2}{3}}$ $\quad \frac{\sin^2\alpha}{\cos^2\alpha} = \tan^2\alpha$

$\frac{\frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$ $\quad \tan^2\alpha = \frac{1}{2}$

سوال ۶:



$S_{ABC} = 2,5$ $\quad \frac{1}{2}\sin\alpha \times \sqrt{2} \times 4 = 2,5$

$\frac{4\sqrt{2}}{2} \times \sin\alpha = 2,5$ $\quad \frac{4\sqrt{2}}{4\sqrt{2}} = \sin\alpha$ $\quad \sin\alpha = \frac{2\sqrt{2}}{3}$

$\sin\alpha_1 = \sin\alpha_2$ $\quad \frac{1}{2} \times 4 \times 2\sqrt{2} \times \sin\hat{A} = 2,5 \Rightarrow \sin\hat{A} = \frac{2,5}{2\sqrt{2}}$

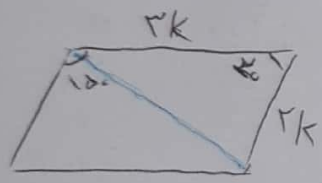
$= \frac{1,5}{\sqrt{2}} = \frac{\sqrt{9}}{2\sqrt{2}} = \frac{\sqrt{2}}{2} \rightarrow \hat{A} = 45^\circ$ $\quad \hat{A} + \hat{B} + \hat{C} = 180^\circ \rightarrow B + C + 45 = 180$

$\Rightarrow B + C = 135$

$\frac{a}{\frac{\sqrt{2}}{2}} = \frac{4}{\sin C} = \frac{\sqrt{2}}{\sin B} \rightarrow \begin{cases} a\sin C = 2\sqrt{2} \\ a\sin B = \frac{2}{2} \end{cases} \begin{cases} a_{max} = 4 \\ a_{min} = \frac{2}{2} \end{cases}$

$\frac{4}{\frac{\sqrt{2}}{2}} = 4$

سوال ۷:



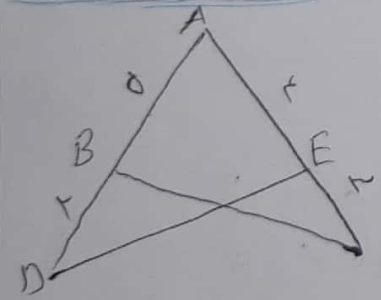
$\rightarrow \frac{1}{2}\underbrace{\sin 2}_{\frac{1}{2}} \times 2k \times 2k \times 2 = 36$

$\rightarrow \frac{1}{2} \times 4k \times 2k = 36$ $\quad 2k^2 = 36$ $\quad k^2 = 18$

$\sqrt{18} = \sqrt{2} \times \sqrt{9} = 3\sqrt{2}$ $\quad k = \sqrt{18}$ $\quad 10\sqrt{18} = (3+7) \times 2 = 10k$ $\quad 10 \times \sqrt{18} = 10\sqrt{18}$

$= 30\sqrt{2}$

سوال ۸:



$S_{ABE} - S_{ADE} = 1,75$ $\quad \tan\hat{A} = ?$

~~$\frac{1}{2}\sin\hat{A} \times 5 \times 7 = \frac{1}{2}\sin\hat{A} \times 4 \times 7 + 1,75$~~

~~$\rightarrow \frac{1}{2}\sin\hat{A} \times 5 \times 7 = \frac{1}{2}\sin\hat{A} \times 7 \times 3 + 1,75 \rightarrow \frac{7}{2}\sin\hat{A} \times 7 \times 3 = \frac{7}{2}\sin\hat{A} \times 7 \times 5$~~

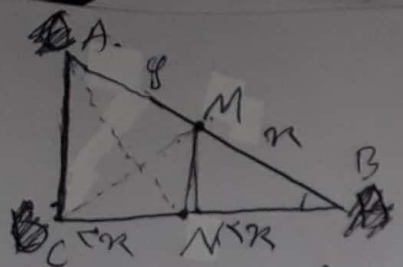
$\rightarrow \frac{1}{2}\sin\hat{A} \times 5 \times 7 = \frac{1}{2}\sin\hat{A} \times 4 \times 7 + 1,75 = 5\sin\hat{A} = 4\sin\hat{A} + 1,75$

~~$\sin\hat{A} = 1,75 \times \frac{7}{4}$~~ $\quad S_{ABC} - S_{ADE} = 1,75 \rightarrow \frac{1}{2}\sin\hat{A} \times 5 \times 7 - \frac{1}{2}\sin\hat{A} \times 7 \times 4 = 1,75$

$\frac{1}{2}\sin\hat{A} \times 35 - \frac{1}{2}\sin\hat{A} \times 28 = 1,75$ $\quad \frac{35}{2}\sin\hat{A} - \frac{28}{2}\sin\hat{A} = \frac{7}{4} \rightarrow \frac{1}{2}\sin\hat{A} = \frac{1}{4} \rightarrow \sin\hat{A} = \frac{1}{2}$

$\rightarrow \hat{A} = 30^\circ$ $\quad \tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

سوال ۹:



$2\overline{BN} = 2\overline{NC}$ $\quad \frac{BM}{AM} = ?$

$S_{ABC} = 2S_{BMN}$

$S_{\hat{ABC}} : \frac{1}{2} \times (y+x) \times 2x \times \sin\beta$ $\quad S_{\hat{BMN}} = \frac{1}{2} \times x \times 2x \times \sin\beta$

$2 \times \frac{1}{2} \times x \times 2x \times \sin\beta = \frac{1}{2} \times (x+y) \times 2x \times \sin\beta$

$\rightarrow \frac{2 \times \frac{1}{2} \times x \times 2x \times \sin\beta}{\frac{1}{2} \times (x+y) \times 2x \times \sin\beta} = \frac{4x}{2x+2y} = 1 \rightarrow 4x = 2x + 2y$

$\rightarrow x = 2y \quad \frac{BM}{AM} = \frac{x}{y} = \frac{2y}{y} = 2$

سوال ۱۰:

$\frac{1}{\sqrt{\cos^2\alpha}} - \tan\alpha = \frac{1+\sin\alpha}{|\cos\alpha|}$, $\frac{|\sin\alpha|}{\cos\alpha} = -\frac{1}{\cot\alpha}$,

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$\frac{|\sin\alpha|}{\cos\alpha} = -\frac{1}{\cot\alpha}$

$= \tan\alpha = -\tan\alpha$ $\quad -\frac{\cos\beta}{\sin\beta}$ $\quad \frac{1}{\frac{\cos}{\sin}} = \frac{\sin}{\cos} = \tan$ $\rightarrow \sin < 0$ ①

$\frac{1}{\sqrt{\cos^2\alpha}} - \tan\alpha = \frac{1+\sin\alpha}{|\cos\alpha|}$

$\sin\alpha - \tan\alpha = \frac{1+\sin\alpha}{|\cos\alpha|}$ $\quad \frac{1}{\cos\alpha} + \frac{\sin\alpha}{|\cos\alpha|} = \sin\alpha + \tan\alpha = \sin\alpha + \tan\alpha$

$\rightarrow \cos\alpha < 0$ ② ② ① $\rightarrow$ $\alpha \rightarrow$ ناحیه سوم