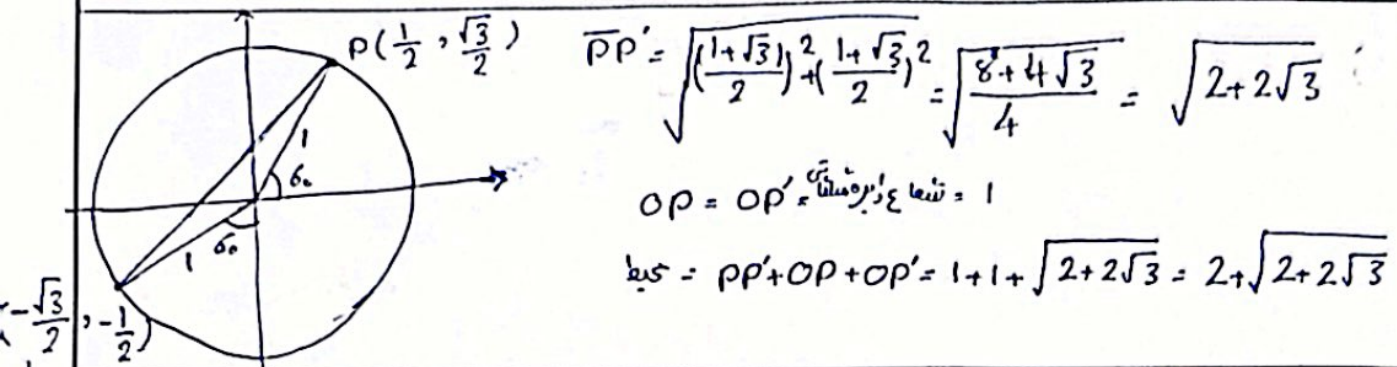


$$\begin{aligned} \sin \frac{4\pi}{3} &= -\frac{\sqrt{3}}{2} \\ \cos \frac{7\pi}{6} &= -\frac{\sqrt{3}}{2} \\ \sin \frac{11\pi}{6} &= -\frac{1}{2} \\ \sin \frac{\pi}{3} &= \frac{1}{2} \\ \tan \frac{5\pi}{6} &= -\frac{\sqrt{3}}{3} \end{aligned}$$

$$\begin{aligned} -\frac{\sqrt{3}}{2}a - \frac{\sqrt{3}}{2}b &= -\frac{\sqrt{3}}{2}(a+b) = -\frac{\sqrt{3}}{3} \rightarrow \frac{-\sqrt{3}(a+b)}{b-a} = -\frac{\sqrt{3}}{3} \\ -\frac{1}{2}a + \frac{1}{2}b &= \frac{1}{2}(b-a) \\ -3\sqrt{3}(a+b) &= -\sqrt{3}(b-a) \rightarrow 3a+3b=b-a \\ 4a &= -2b \rightarrow \frac{b}{a} = -2 \end{aligned}$$

1



2

یادگیری تغییرات عقرب ساعت شمار و ارتفاع دقت دقیقه است - پس ساعت 2:40

باقی به اینک هر ساعت 30° است هر یک ساعت بگذشته

$\frac{\pi}{9} = \frac{D}{180} \rightarrow D = 20 \rightarrow$

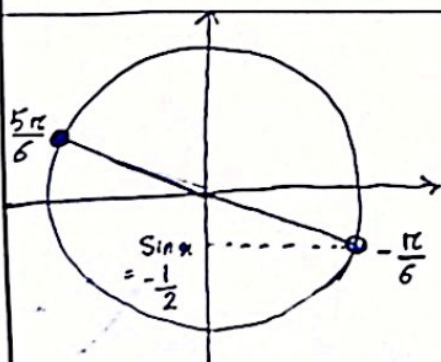
3

$$\left| \frac{11}{2}M - 30H \right| \rightarrow \left| \frac{11}{2}M - 90 \right| = 20$$

I) $\frac{11}{2}M - 90 = 20 \rightarrow \frac{11}{2}M = 110 \rightarrow M = 20 \rightarrow$ بارند

II) $\frac{11}{2}M - 90 = -20 \rightarrow \frac{11}{2}M = 70 \rightarrow M = \frac{140}{11}$

4



طبق شکل: $-\frac{1}{2} < \sin x < 1$

5

$$\frac{\sin(\frac{\pi}{2} + 15) + k \cos(\frac{3\pi}{2} - 15)}{\cos(\pi - 15) + 2 \sin(\pi + 15)} = \frac{\cos 15 - k \sin 15}{-\cos 15 - 2 \sin 15} = 3 \rightarrow -3 \cos 15 - 6 \sin 15 = \cos 15 - k \sin 15$$

$$4 \cos 15 = (k - 6) \sin 15 \rightarrow \frac{4}{k - 6} = \frac{\sin 15}{\cos 15} = \tan 15 \rightarrow \frac{4}{k - 6} = \frac{25}{100} \rightarrow 400 = 25k - 150$$

$$550 = 25k \rightarrow k = 22$$

8

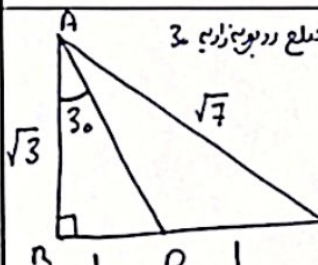
$$\left. \begin{aligned} \tan(\frac{\pi}{2} - x) &= \cot x \\ \cot(\pi - x) &= -\cot x \\ \cot(\frac{3\pi}{2} - x) &= \tan x \\ \tan(2\pi - x) &= -\tan x \end{aligned} \right\} \begin{aligned} \frac{\cot x - (-\cot x)}{\tan x - 2 \tan x} &= \frac{2 \cot x}{-\tan x} = -\frac{2 \cot x}{\tan x} = -2 \cot^2 x \\ \tan x &= \frac{2 \tan \frac{x}{2}}{1 - \tan^2 \frac{x}{2}} = \frac{2\sqrt{2}}{1 - 2} = -2\sqrt{2} \\ \frac{1 - \cos x}{1 + \cos x} &= \tan^2 \frac{x}{2} = 2 \rightarrow \tan \frac{x}{2} = \sqrt{2} \rightarrow \cot x = \frac{-1}{2\sqrt{2}} \rightarrow \cot^2 x = \frac{1}{8} \\ -2 \cot^2 x &= -\frac{1}{4} \end{aligned}$$

9

$$\frac{108}{180} = \frac{R_{\text{real}}}{r} = \frac{6\pi}{10} \quad \frac{6\pi}{10} \times r_A = \frac{9\pi}{10} \times r_B \rightarrow \frac{r_A}{r_B} = \frac{9\pi}{6\pi} = \frac{3}{2}$$

$$\rightarrow \frac{S_A}{S_B} = \frac{r_A^2}{r_B^2} = \left(\frac{r_A}{r_B}\right)^2 = \frac{9}{4}$$

10



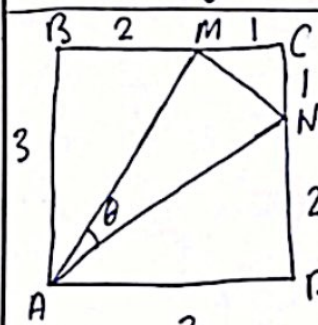
3 قطع در مجرای 3 = $\frac{1}{2} AD \rightarrow AD = 2 \rightarrow AB = \sqrt{3}$

$$S = \frac{AB \times BC}{2} = \frac{\sqrt{3} \times BC}{2} = \sqrt{3} \rightarrow BC = 2$$

$$C \sqrt{(\sqrt{3})^2 + 2^2} = AC = \sqrt{7} \quad \sin 2C = \frac{\sqrt{3}}{7}$$

$$\frac{\sin B}{\sqrt{7}} = \frac{\sin C}{\sqrt{3}} \rightarrow \sin C = \sqrt{\frac{3}{7}}, \cos = \frac{2}{\sqrt{7}} \quad \sin 2C = \frac{1}{2} \sin C \cos C = \frac{1}{2} \times \sqrt{\frac{12}{49}} \rightarrow \frac{2\sqrt{3}}{7} \times \frac{1}{2}$$

11



$$MN = \sqrt{(1)^2 + (1)^2} = \sqrt{2}$$

$$AM = AN = \sqrt{(2)^2 + (3)^2} = \sqrt{13}$$

$$2 \cos \theta: MN^2 = AM^2 + AN^2 - 2(AM)(AN) \cos \theta$$

$$2 = 13 + 13 - 2(\sqrt{13})(\sqrt{13}) \cos \theta$$

$$26 \cos \theta = 24 \rightarrow \cos \theta = \frac{12}{13}$$

$$\sin \theta = \sqrt{1 - \frac{144}{169}} = \sqrt{\frac{25}{169}} \Rightarrow \sin \theta = \frac{5}{13}$$

12