

$$\text{الف) } 27^\circ = (x) \text{ rad} \leadsto \frac{27}{180} = \frac{x}{\pi} \Rightarrow x = \frac{27\pi}{180} = \frac{3\pi}{20}$$

$$\text{ب) } 145^\circ = (x) \text{ rad} \leadsto \frac{145}{180} = \frac{x}{\pi} \Rightarrow x = \frac{145\pi}{180} = \frac{29\pi}{36}$$

$$\text{ج) } \frac{5\pi}{12} \text{ rad} = (x)^\circ \leadsto \frac{x}{180} = \frac{5\pi}{12\pi} \Rightarrow x = \frac{180 \times 5}{12} = 75^\circ$$

$$\text{د) } \frac{4\pi}{9} \text{ rad} = (x)^\circ \leadsto \frac{x}{180} = \frac{4\pi}{9\pi} \Rightarrow x = \frac{4 \times 180}{9} = 80^\circ$$

$$\frac{145a}{9 \times 180} = \frac{D_1}{180} \leadsto D_1 = \frac{145a \times 180}{9 \times 180} = 145a^\circ \quad \left\{ \begin{array}{l} \frac{a\pi}{180} = \frac{D_2}{180} \leadsto D_2 = \frac{180a}{1} = 180a^\circ \end{array} \right.$$

$$10a + 145a + 180a = 45a = 180 \leadsto a = 4^\circ$$

$$\text{الف) } \cos 40^\circ \cos 30^\circ - \sin 40^\circ \sin 30^\circ - \tan 40^\circ + 2 \cot 40^\circ = \frac{1}{4} \times \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} \times \frac{1}{4} - 1 + 2 = 1$$

$$\text{ب) } \frac{\tan^2 30^\circ + \tan^2 40^\circ + \tan^2 50^\circ}{\cot^2 30^\circ - \cot^2 40^\circ} = \frac{\left(\frac{\sqrt{3}}{3}\right)^2 + (1)^2 + (\sqrt{3})^2}{\sqrt{3} - \frac{\sqrt{3}}{3}} = \frac{\frac{1}{3} + 1 + 3}{\frac{2\sqrt{3}}{3}} = \frac{\frac{13}{3}}{\frac{2\sqrt{3}}{3}} = \frac{13}{2\sqrt{3}} = \frac{13\sqrt{3}}{6}$$

$$-\sin 30^\circ \cos 40^\circ + \cos 30^\circ \sin 40^\circ = \sin \theta \leadsto -\frac{1}{4} \times \frac{1}{4} + \frac{\sqrt{3}}{4} \times \frac{\sqrt{3}}{4} = \frac{-1}{16} + \frac{3}{16} = \frac{2}{16} = \frac{1}{8} = \sin \theta \leadsto \sin \theta = \frac{\sqrt{2}}{4}$$

$$\cos^2 \theta = 1 - \frac{1}{16} = \frac{15}{16} \leadsto \cos \theta = \frac{\sqrt{15}}{4} \Rightarrow \tan \theta = 1$$

[θ < 90°] و [θ > 90°]

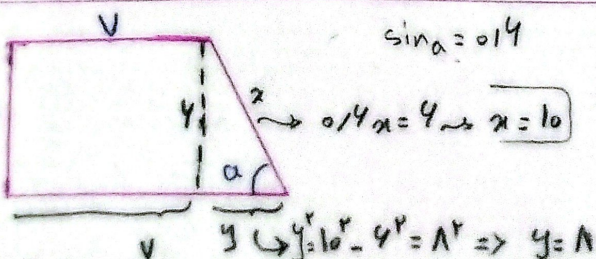
$$\frac{2 \tan^2 30^\circ (1 - \tan^2 30^\circ)}{(1 - \cot^2 40^\circ)^2} = \tan \theta \leadsto \frac{2 \frac{\sqrt{3}}{3} (1 - (\frac{\sqrt{3}}{3})^2)}{(1 - (\frac{\sqrt{3}}{3})^2)^2} = \frac{2 \frac{\sqrt{3}}{3}}{(1 - \frac{1}{3})^2} = \frac{2 \frac{\sqrt{3}}{3}}{\frac{4}{9}} = \frac{3\sqrt{3}}{2} = \tan 40^\circ$$

$$\frac{40}{180} = \frac{\text{Rad}}{\pi} \leadsto \frac{\pi}{9}$$

$$\tan \theta = 4 \leadsto 1 + \tan^2 \theta = \frac{1}{\cos^2 \theta} \leadsto 17 = \frac{1}{\cos^2 \theta} \leadsto \cos \theta = \pm \frac{1}{\sqrt{17}}, \sin \theta = \tan \theta \cos \theta = \pm \frac{4}{\sqrt{17}}$$

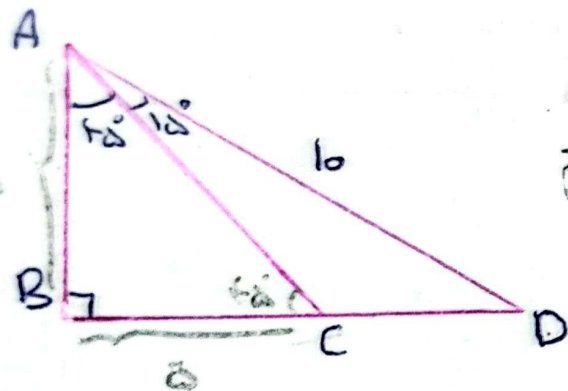
$$\frac{17 \sin \theta - \cos \theta}{\sin \theta - 4 \cos \theta} = \frac{(\pm 17) - (\pm 1)}{(\pm 4) - (\pm 1)} = \frac{17-1}{4-1} = 16 \quad \text{or} \quad \frac{-17+1}{-4+1} = 16$$

$$\Rightarrow \frac{17 \sin \theta - \cos \theta}{\sin \theta - 4 \cos \theta} = 16$$



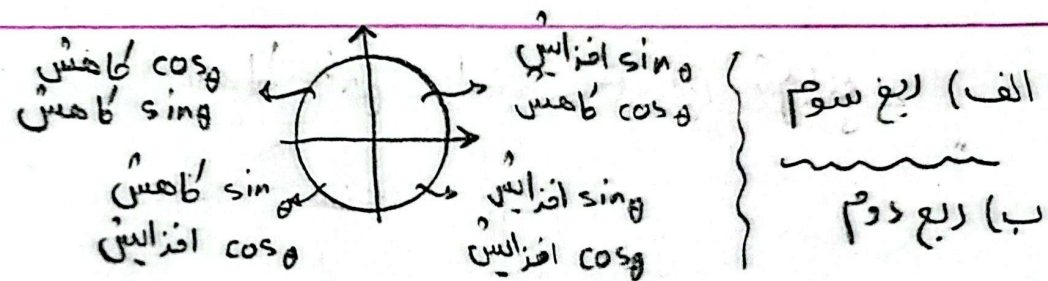
$$P = V + 4 + V + 16 + 10 = 38$$

دورانه



$$\overline{AB} = \sin_{15} \times 10 = 5 \rightarrow \overline{AB} = \overline{BC} = 5$$

$$\overline{BD} = \sin_{45} \times 10 = 5\sqrt{3} \rightarrow \overline{CD} = \overline{BD} - \overline{BC} = 5\sqrt{3} - 5 = 5(\sqrt{3} - 1)$$



$$\tan \alpha = \frac{1}{4} \rightarrow 1 + \tan^2 \alpha = \frac{1}{\cos^2 \alpha} \rightarrow 1 + \frac{1}{16} = \frac{1}{\cos^2 \alpha} \rightarrow \cos^2 \alpha = \frac{16}{17} \rightarrow \cos \alpha = \pm \frac{4}{\sqrt{17}}$$

$$\sin \alpha = \tan \alpha \cos \alpha = \frac{1}{4} \times \frac{4}{\sqrt{17}} = \frac{1}{\sqrt{17}}$$