

الف) $27^\circ = (x) \text{ rad}$ $\frac{D}{180} = \frac{\text{Rad}}{x}$ $x = \frac{27x}{180} = \frac{3x}{20}$ ✓
 ب) $12^\circ = (x) \text{ rad}$ $\frac{D}{180} = \frac{\text{Rad}}{x}$ $x = \frac{12x}{180} = \frac{2x}{30}$
 ج) $\frac{2x}{11} \text{ rad} = (x)^\circ$ $D = \frac{\text{Rad} \times 180}{x}$ $x = \frac{\frac{2x}{11} \times 180}{x} = 27^\circ$ ✓
 د) $\frac{2x}{9} \text{ rad} = (x)^\circ$ $D = \frac{\text{Rad} \times 180}{x}$ $x = \frac{\frac{2x}{9} \times 180}{x} = 40^\circ$ ✓

$\frac{12a}{9} G = x^\circ$ $\frac{D}{180} = \frac{G}{x}$ $x = \frac{12a \times 180}{9 \times 10} = 24a$
 $\frac{a\pi}{1} \text{ Rad} = x^\circ$ $x = \frac{\frac{a\pi}{1} \times 180}{\pi} = 18a$
 $24a + 18a + 12a = 180$ $54a = 180$ $a = 3^\circ$ ✓

الف) $\cos 40^\circ \cos 30^\circ - \sin 40^\circ \sin 30^\circ - \tan 40^\circ + \cot 40^\circ = \left(\frac{1}{2} \times \frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{3}}{2} \times \frac{1}{2}\right) - 1 + 1 = 0$

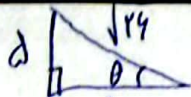
ب) $\frac{\tan^2 30^\circ + \tan^2 40^\circ + \tan^2 50^\circ}{\cot^2 30^\circ - \cot^2 40^\circ} = \frac{\left(\frac{\sqrt{3}}{3}\right)^2 + 1 + (\sqrt{3})^2}{\sqrt{3} - \frac{\sqrt{3}}{3}} = \frac{\frac{4}{3} + 1 + 3}{\frac{2\sqrt{3}}{3}} = \frac{\frac{10}{3}}{\frac{2\sqrt{3}}{3}} = \frac{5}{\sqrt{3}} = \frac{5\sqrt{3}}{3}$ ✓

$-\sin 30^\circ \cos 40^\circ + \cos 30^\circ \sin 40^\circ = \sin^2 \theta$
 $-\frac{1}{2} \times \frac{1}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = \sin^2 \theta$
 $-\frac{1}{4} + \frac{3}{4} = \sin^2 \theta$
 $\frac{2}{4} = \sin^2 \theta$
 $\frac{1}{2} = \sin^2 \theta$
 $\sin \theta = \pm \frac{1}{\sqrt{2}} \Rightarrow \theta = 45^\circ$

$\tan \theta = ?$
 $\sin^2 \theta = \frac{1}{2} \Rightarrow \sin \theta = \pm \frac{1}{\sqrt{2}} \Rightarrow \theta = 45^\circ$
 $\tan \theta = \frac{\sqrt{2}}{\sqrt{2}} = 1$ ✓

$\frac{2 \tan 30^\circ (1 - \tan^2 30^\circ)}{(1 - \cot^2 40^\circ)^2} = \tan \theta$
 $\frac{2 \times \frac{\sqrt{3}}{3} \left(1 - \left(\frac{\sqrt{3}}{3}\right)^2\right)}{\left(1 - \left(\frac{\sqrt{3}}{3}\right)^2\right)^2} = \frac{\frac{2\sqrt{3}}{3} - \frac{2\sqrt{3}}{9}}{1 + \frac{1}{9} - \frac{1}{3}} = \frac{\frac{4\sqrt{3}}{9}}{\frac{5}{9}} = \frac{4\sqrt{3}}{5}$
 $\theta < 90^\circ \Rightarrow \theta = 40^\circ = \frac{\pi}{5}$ ✓

$$\tan \theta = d$$



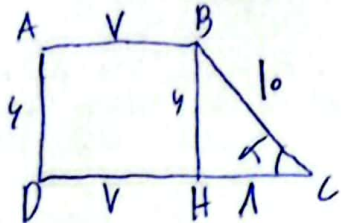
$$\sin \theta = \frac{d}{\sqrt{4}}$$

$$\cos \theta = \frac{1}{\sqrt{4}} \Rightarrow + \frac{1}{\sqrt{4}} \text{ or } - \frac{1}{\sqrt{4}}$$

$$\frac{r \sin \theta - \cos \theta}{\sin \theta - r \cos \theta} = \frac{r \times \frac{d}{\sqrt{4}} - \frac{1}{\sqrt{4}}}{\frac{d}{\sqrt{4}} - \frac{r}{\sqrt{4}}} = \frac{\frac{rk}{\sqrt{4}} - \frac{1}{\sqrt{4}}}{\frac{d}{\sqrt{4}} - \frac{r}{\sqrt{4}}} = \frac{rk - 1}{d - r} = 1k$$

$$\downarrow \frac{r \times \frac{-d}{\sqrt{4}} + \frac{1}{\sqrt{4}}}{\frac{-d}{\sqrt{4}} + \frac{r}{\sqrt{4}}} = \frac{\frac{-rk}{\sqrt{4}} + \frac{1}{\sqrt{4}}}{\frac{-d}{\sqrt{4}} + \frac{r}{\sqrt{4}}} = \frac{-rk + 1}{-d + r} = 1k$$

(P) ✓

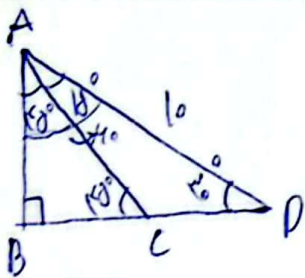


$$\sin \alpha = \frac{BH}{BC} = \frac{4}{10} = \frac{4}{BC} \Rightarrow BC = 10$$

$$CH = \sqrt{100 - 16} = \sqrt{84} = 1$$

$$rP = 4 + 10 + 4 + 1 = 19$$

(P) ✓



$$DC = ?$$

$$BD = \frac{\sqrt{3}}{2} \times 10 = d\sqrt{3}$$

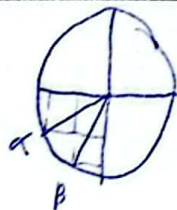
$$AB = \frac{1}{2} \times 10 = d = BC$$

$$DC = BD - BC = d\sqrt{3} - d = d(\sqrt{3} - 1)$$

(P) ✓

اجزاء (الف)

اجزاء (ب)



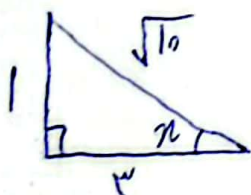
$$\beta > \alpha$$

$$\cos \beta > \cos \alpha, \sin \beta < \sin \alpha$$

$$\beta > \alpha$$

$$\cos \beta < \cos \alpha, \sin \beta < \sin \alpha$$

(P) ✓



$$\text{اجزاء} \Rightarrow \sin \alpha < 0, \cos \alpha < 0$$

$$\sin \alpha = -\frac{1}{\sqrt{10}} = -\frac{\sqrt{10}}{10}$$

(P) ✓