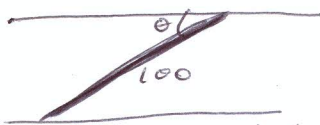


1995 (6)

To Return as Required.



Let v be speed travelled along this path

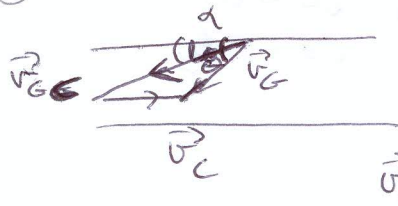
$$\vec{v}_G = (v \cos \alpha \vec{i} + v \sin \alpha \vec{j})$$

$$\vec{v}_G = \left(v \frac{3}{5} \vec{i} + v \frac{4}{5} \vec{j} \right)$$

$$\vec{v}_C = 9 \vec{i} = \frac{45}{100} \vec{i}$$

But $|\vec{v}_{GC}| = 3 = \frac{3}{5}$

$$\vec{v}_{GC} = -\frac{3}{5} \cos \alpha \vec{i} - \frac{3}{5} \sin \alpha \vec{j}$$



$$\vec{v}_G = \vec{v}_{GC} + \vec{v}_C$$

$$\Rightarrow -\frac{3}{5} v \vec{i} - \frac{4}{5} v \vec{j} = -\frac{3}{5} \cos \alpha \vec{i} - \frac{3}{5} \sin \alpha \vec{j} + \frac{45}{100} \vec{i}$$

$$\text{(i)} \Rightarrow -\frac{3}{5} v = -\frac{3}{5} \cos \alpha + \frac{45}{100} \quad (1)$$

$$\text{(j)} \Rightarrow -\frac{4}{5} v = -\frac{3}{5} \sin \alpha \quad (2)$$

Solve

$$\therefore (2) \Rightarrow \frac{4v}{3} = \sin \alpha \Rightarrow \text{Pythag} \Rightarrow \frac{3}{4v} \Rightarrow \cos \alpha = \frac{\sqrt{9-16v^2}}{3}$$

$$\therefore (1) \Rightarrow -\frac{3}{5} v = -\frac{3}{5} \left(\frac{\sqrt{9-16v^2}}{3} \right) + \frac{45}{100}$$

$$\times \left(\frac{-5}{3} \right) \Rightarrow v = \frac{\sqrt{9-16v^2} - 0.75}{3}$$

$$\Rightarrow v + 0.75 = \frac{\sqrt{9-16v^2}}{3}$$

$$\Rightarrow 3v + 2.25 = \sqrt{9-16v^2}$$

$$()^2 \Rightarrow (3v + 2.25)^2 = 9 - 16v^2$$

$$\Rightarrow 9v^2 + 13.5v + 5.0625 = 9 - 16v^2$$

$$\Rightarrow 25v^2 + 13.5v + (5.0625 - 9)$$

$$\Rightarrow 25v^2 + 13.5v - 3.9375 = 0$$

$$\div 25 \Rightarrow v^2 + 0.54v - 0.1575 = 0$$

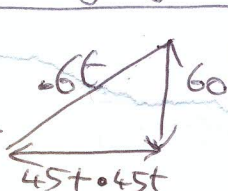
$$\therefore v = \frac{-0.54 \pm \sqrt{(0.54)^2 - 4(1)(-0.1575)}}{2(1)} = \frac{-0.54 \pm \sqrt{0.2916 + 0.63}}{2} = \frac{-0.54 \pm \sqrt{0.9216}}{2}$$

$$\Rightarrow v = \frac{-0.54 \pm 0.96}{2} \Rightarrow v = \frac{0.42}{2} \text{ (or neg)} \Rightarrow v = 0.21$$

$$\therefore \text{Time} = \frac{\text{dist along path}}{\text{speed along path}} = \frac{0.75}{0.21} = 357.14 \text{ seconds}$$

Note = Marks a(i) [15] a(ii) [10] b(i) [15] b(ii) [10] Average mark was 35/50 as hardly anyone got b(i) out but most people got rest out!

b(ii) Alternative: Let t be time to return



ASK

$$(6t)^2 = (60)^2 + (45t + 45)^2$$

$$\Rightarrow 36t^2 = 3600 + 2025t^2 + 0.54t + 2025$$

$$\Rightarrow 0.1575t^2 - 40.5t - 5625 = 0$$

$$\Rightarrow t = 357.14 \text{ sec (SPORT!)}$$