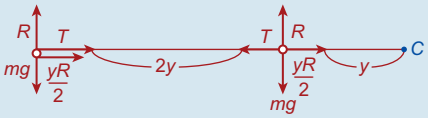
Q. 11. (i)



(ii) **The left hand particle:**

1: $R = mg$

2: $F_c = m\omega^2 r$

$\Rightarrow T + \frac{yR}{2} = m\omega^2(3y)$

$\Rightarrow T + \frac{ymg}{2} = 3m\omega^2 y$ … **Equation A**

The right hand particle:

1: $R = mg$

2: $F_c = m\omega^2 r$

$\Rightarrow \frac{yR}{2} - T = m\omega^2 y$

$\Rightarrow \frac{ymg}{2} - T = m\omega^2 y$ … **Equation B**

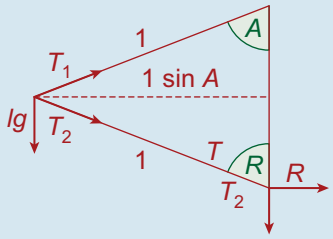
Adding equations **A** and **B** gives

$ymg = 4m\omega^2 y$

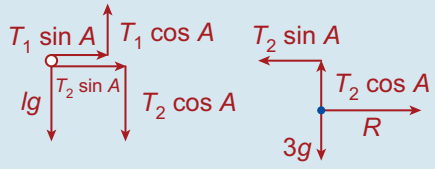
$\Rightarrow \omega^2 = \frac{g}{4}$

$\Rightarrow \omega = \frac{\sqrt{g}}{2}$

Q. 12. **Forces**



Resolved



The 1 kg particle:

① Ups = Downs

$\Rightarrow T_1 \cos A = T_2 \cos A + g$

② $F_c = m\omega^2 r$

$\Rightarrow T_1 \sin A + T_2 \sin A = (1)(14)^2(1 \sin A)$

$\Rightarrow T_1 + T_2 = 196$

The 3 kg particle:

③ Ups = Downs

$\Rightarrow T_2 \cos A = 3g$

④ Lefts = Rights

$\Rightarrow T_2 \sin A = R$

③ $\Rightarrow g = \frac{1}{3}T_2 \cos A$

Putting this into equation ① gives:

$T_1 \cos A = T_2 \cos A + \frac{1}{3}T_2 \cos A$

$\Rightarrow T_1 = \frac{4}{3}T_2$

$\therefore$ Equation ② reads:

$\frac{4}{3}T_2 + T_2 = 196$

$\Rightarrow T_2 = 84$ N

$\Rightarrow T_1 = 112$ N

Equation ③ reads:

$T_2 \cos A = 3g$

$\Rightarrow 84 \cos A = 3(9.8)$

$\Rightarrow \cos A = \frac{29.4}{84}$

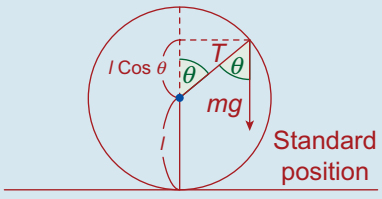
$= \frac{7}{20}$

$= 0.35$

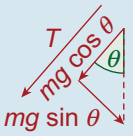
$\therefore A = 70°$

Exercise 11D

Q. 1. **Forces**



Resolved



Let θ = the angle with the upward vertical.