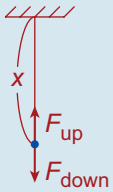
Q. 7. $F_{up} = k(l - l_0)$

$= 49(x - 1)$

$= 49x - 49$ N



$F_{down} = mg$

$= 10(9.8)$

$= 98$ N

But $F_{up} = F_{down}$ (in equilibrium)

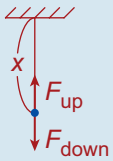
$\therefore 49x - 49 = 98$

$\Rightarrow x = 3$ m

Q. 8. $F_{up} = k(l - l_0)$

$= 7(x - 2)$

$= 7x - 14$ N



$F_{down} = mg$

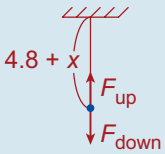
$= 2(9.8)$

$= 19.6$

$F_{up} = F_{down}$

$\Rightarrow 7x - 14 = 19.6$

$\Rightarrow x = 4.8$ m



$F_{up} = k(l - 0)$

$= 7(4.8 + x - 2)$

$= 19.6 + 7x$

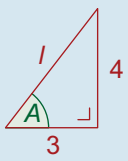
$F_{down} = mg = 2(9.8) = 19.6$

Nett force $= F_{up} - F_{down}$

$= 19.6 + 7x - 19.6 = 7x$

Q. 9. (i) $l^2 = 4^2 + 3^2$

$\Rightarrow l = 5$ m

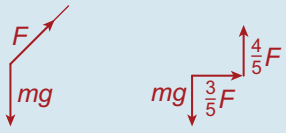


$\therefore$ Extension $= 5 - 3$

$= 2$ m

$\left(\text{also } \cos A = \frac{3}{5}, \sin A = \frac{4}{5}\right)$

(ii) **Forces** **Resolved**



$F = k(l - l_0) = k(5 - 3) = 2k$

1. $F_{up} = F_{down} \Rightarrow \frac{4}{5}F = mg$

$\Rightarrow \frac{4}{5}(2k) = mg \Rightarrow k = \frac{5mg}{8}$

(iii) 2. Centripetal force $= m\omega^2 r$

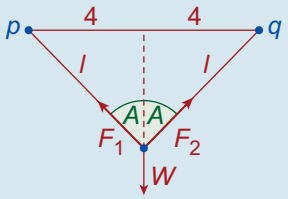
$\Rightarrow \frac{3}{5}F = m\omega^2(3)$

But $F = 2k = 2\left(\frac{5mg}{8}\right) = \frac{5mg}{4}$

$\therefore \frac{3}{5}\left(\frac{5mg}{4}\right) = m\omega^2(3)$

$\Rightarrow \omega^2 = \frac{g}{4} \Rightarrow \omega = \sqrt{\frac{g}{4}}$ rads/s

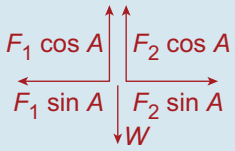
Q. 10. (i)



$F_1 = k(l - l_0) = 10(l - 2) = (10l - 20)$ N

$F_2 = k(l - l_0) = 7(l - 1) = (7l - 7)$ N

Forces **(Resolved)**



1. $F_{left} = F_{right} \Rightarrow F_1 \sin A = F_2 \sin A$

$\Rightarrow F_1 = F_2 \Rightarrow 10l - 20 = 7l - 7$

$\Rightarrow l = \frac{13}{3}$

Now $\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{4}{\frac{13}{3}} = \frac{12}{13}$

(ii) $\therefore \cos A = \frac{5}{13}$

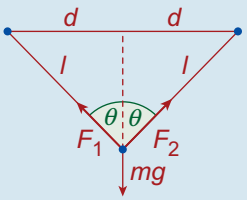
2. $F_1 = 10l - 20 = \frac{130}{3} - 20 = \frac{70}{3}$ N

$F_2 = F_1 = \frac{70}{3}$ N

$F_{up} = F_{down} \Rightarrow F_1 \cos A + F_2 \cos A = W$

$\Rightarrow W = \left(\frac{70}{3}\right)\left(\frac{5}{13}\right) + \left(\frac{70}{3}\right)\left(\frac{5}{13}\right) = \frac{700}{39}$ N

Q. 11. **Forces**



Resolved