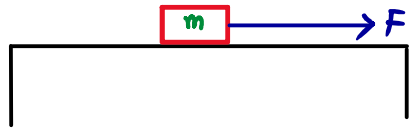
Application of Laws Motion

28 September 2025 17:00

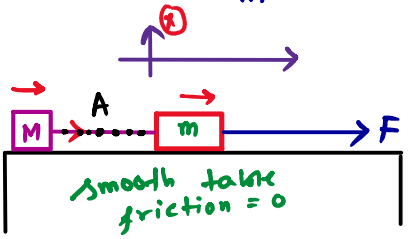
BLOCK THREAD SYSTEM

(1)



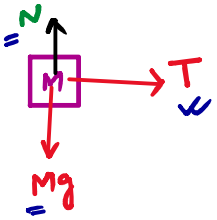
acceleration = $\frac{F}{m}$

(2)



(i) acceleration = $\frac{F}{M+m}$

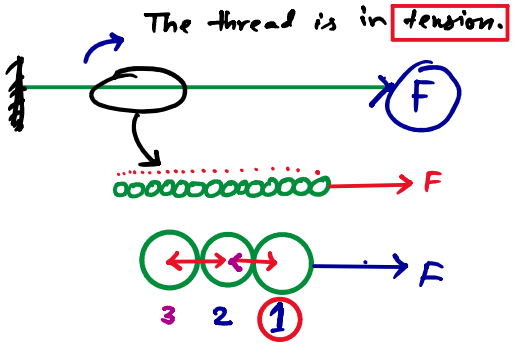
(ii) Tension at point A?



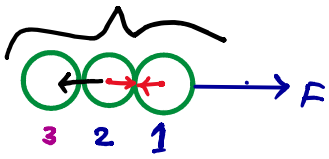
$F_{net} = Ma$

$T = Ma$

The thread is in tension.



intermolecular force

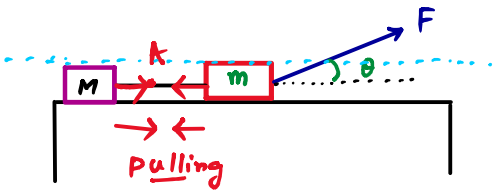


Tension force on molecule 2 by molecule 1 is along $\hat{i}$

Tension force on molecule 2 by molecule is along $(\hat{i})$

Tension force on molecule 1 by molecule 2 is along $(-\hat{i})$

(3)

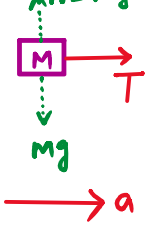


(i) Acceleration (ii) Tension at A. (T)

(iii) Tension on block of mass m.

(i) Acceleration, $a = \frac{\{F\cos\theta\}}{M+m}$ ← pulling force.

(ii)

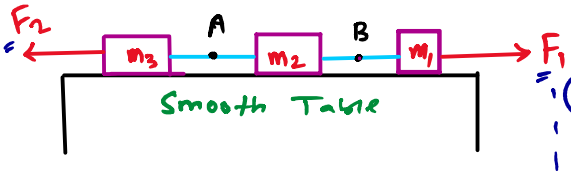


$F_{net} = M.a$

$T = M.\frac{F\cos\theta}{M+m}$

(iii) $T =$

④



(i) Acceleration, $a = ?$

(ii) Tension at A and B ?

(iii)

(i) Acceleration of the system $= \dfrac{\text{Net pulling Force}}{\text{Total mass}}$

$$= \frac{(F_1 - F_2)}{m_1 + m_2 + m_3}$$

(ii)

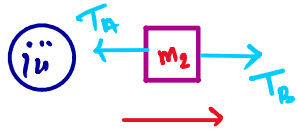
$$a = \frac{F_1 - F_2}{m_1 + m_2 + m_3}$$

$$\begin{cases} F_{net} = Ma \\ \Rightarrow T_A - F_2 = m_3 \cdot \dfrac{F_1 - F_2}{m_1 + m_2 + m_3} \end{cases}$$

$$T_A = F_2 + \frac{m_3}{m_1 + m_2 + m_3}(F_1 - F_2)$$

$$T_A = F_2 + m_3 \cdot a$$

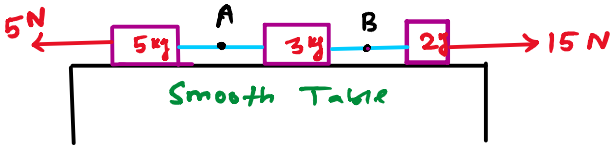
(iii)



$$\begin{cases} F_{net} = m_2 \cdot a \\ \Rightarrow T_B - T_A = m_2 a \\ \Rightarrow T_B = T_A + m_2 a \end{cases}$$

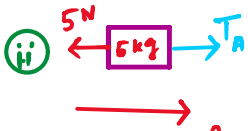
$\longrightarrow a = 1\ m/s^2$

⑤



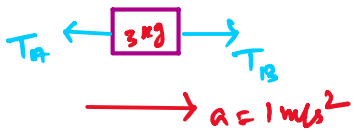
(i) Acceleration, $a = \dfrac{\text{net pulling force}}{\text{Total mass}} = \dfrac{15 - 5}{2+3+5} = \dfrac{10}{10} = 1\ m/s^2$

(ii)



$$\begin{cases} F_{net} = ma \\ T_A - 5 = 5 \times 1 \\ \Rightarrow T_A = 5 + 5 = 10\ N \end{cases}$$

(iii) Total tension force on 3 kg block ?



$F_{net} = m \cdot a$

$\Rightarrow$ Total tension force $= 3 \times 1$

$= 3\ N$

(iv) Find T_B.

$F_{net} = ma$

$T_B - T_A = 3 \times 1$

$\Rightarrow T_B = T_A + 3$

$= 10 + 3$

$= 13\ N$

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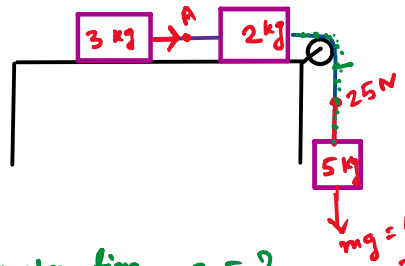


(i) acceleration, a = ?

(ii) Tension on 5 kg block ?

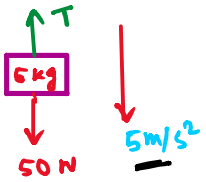
(iii) Tension on 2 kg block ?

(iv) Tension on 3 kg block ?

(v) Net force on the pulley !

(i) $a = \frac{\text{net pulling force}}{\text{Total mass}} = \frac{50}{10} = 5\ m/s^2$

(ii)



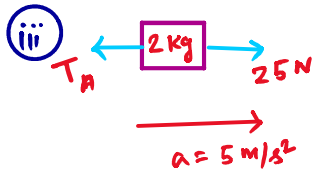
$F_{net} = ma$

$50 - T = 5 \times 5$

$\Rightarrow T = 50 - 25$

$= 25\ N$

(iii)



$F_{net} = ma$

$25 - T_A = 2 \times 5$

$\Rightarrow T_A = 25 - 10 = 15\ N$

(iv) 15 N $\quad T = T_A = 3 \times 5 = 15\ N$

(v)

$F_{net} = \sqrt{25^2 + 25^2} = \sqrt{625 + 625}$

$= \sqrt{2}\ 25\ N \quad = \sqrt{1250}$

F, F, $\theta = 90°$

$R = \sqrt{2}F$

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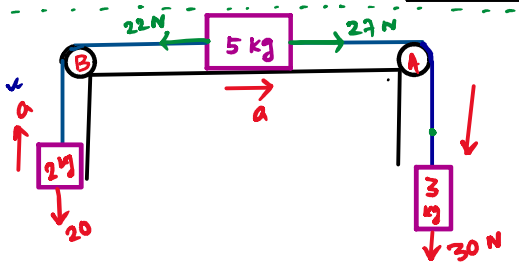


(i) acceleration of the system ?

(ii) Find net force on 2 kg, 5 kg and 3 kg.

(iii) Tension on 2kg block.

(iv) Tension on 3 kg block.

(v) Total tension on 5kg block.

(vi) Net force on pulley A.

(vi) net force on pulley B.

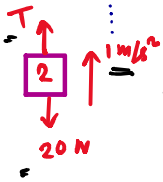
↳ $\sqrt{2} \times 22\ N$

FIND

(i) $a = \frac{30 - 20}{10} = 1\ m/s^2$

(ii) for 2kg, $F_{net.} = 2 \times 1 = 2\ N$

(iii)

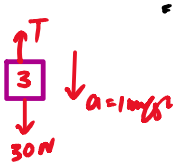


$F_{net} = ma$

$\Rightarrow T - 20 = 2 \times 1$

$\Rightarrow T = 2 + 20 = 22\ N$

(iv)

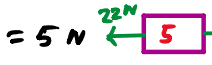


$F_{net} = ma$

$\Rightarrow 30 - T = 3 \times 1$

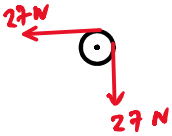
$\Rightarrow T = 30 - 3 = 27\ N$

(v) $F_{net} = ma = 5 \times 1 = 5\ N$



$F_{net} = (27 - 22) = 5N$

(vi)



$F_{net} = \sqrt{2} \times 27\ N$

PULLEY BLOCK SYSTEM

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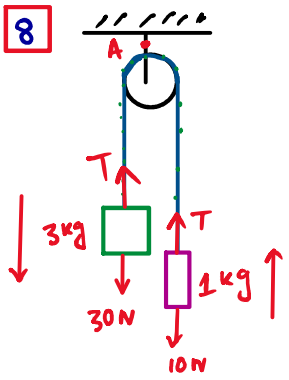


(i) Acceleration, $a = \frac{30-10}{3+1} = \frac{20}{4} = 5\ m/s^2$

(ii) Tension on 1 kg block :

$T - 10 = 1 \times 5$

$\Rightarrow T = 10 + 5 = \underline{15\ N}$

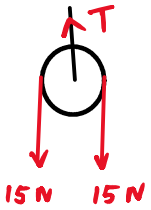
(iii) Tension on 3 kg block :

$30 - T = 3 \times 5$

$\Rightarrow T = 30 - 15 = \underline{15\ N}$

(iv) Net force on pulley = 0 Newton.

(v) Tension at point A :



$\Rightarrow 15 + 15 = T$

$\Rightarrow T = 30\ N$

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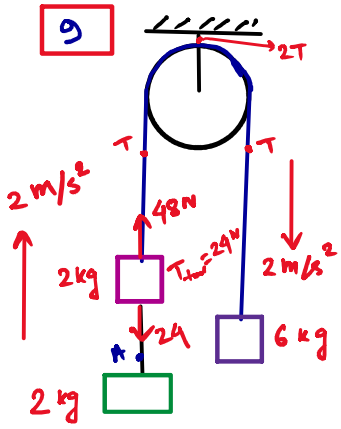


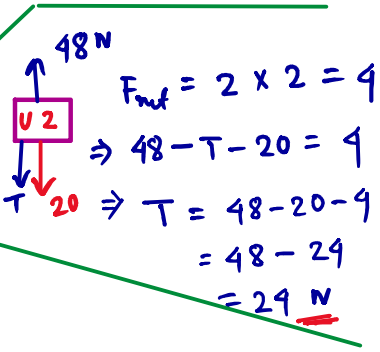
(i) acceleration, $a = \frac{60-40}{2+2+6} = \frac{20}{10} = 2\ m/s^2$

(ii) Tension on 6 kg block :

$60 - T = 6 \times 2$

$\Rightarrow T = 60 - 12 = 48\ N$

(iii) Tension on 2 (upper) kg block



$F_{net} = 2 \times 2 = 4$

$\Rightarrow 48 - T - 20 = 4$

$\Rightarrow T = 48 - 20 - 4$

$= 48 - 24$

$= \underline{24\ N}$

(iv) Tension on 2 (lower) kg block :

$\underline{24\ N}$.

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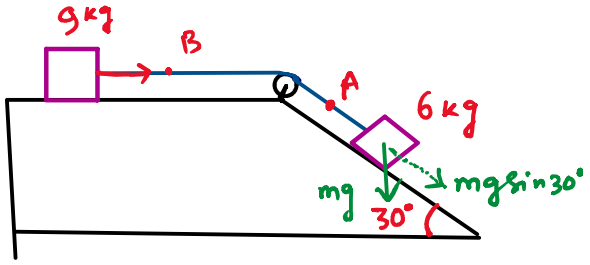
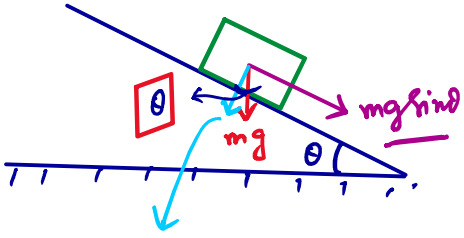
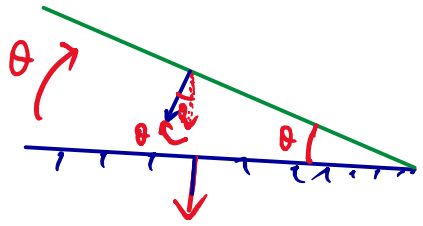




(i) acceleration, $a = \frac{mg\sin 30°}{9+6}$

$$= \frac{60 \times \frac{1}{2}}{15}$$

$$= \frac{30}{15} = 2 \text{ m/s}^2$$



(ii) Tension at point A :

$$T_A = T_B = F_{net,B} = ma = 9 \times 2 = 18 \text{ N}$$

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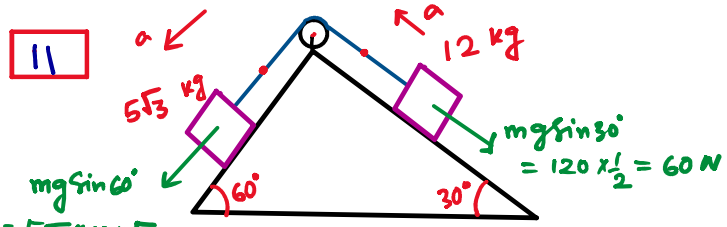

(i) acceleration, $a = \frac{75 - 60}{5\sqrt{3} + 12}$

$$= \frac{15}{5\sqrt{3} + 12} \text{ m/s}^2$$