When Bodies are connected with string :→

String

Massless

$m_s = 0$

Each and Every Point have same Tension

$T_1 = T_2 = T_3$

mass

$m_s \neq 0$

Diff. Points have diff. Tensions

$T_1 \neq T_2 \neq T_3$

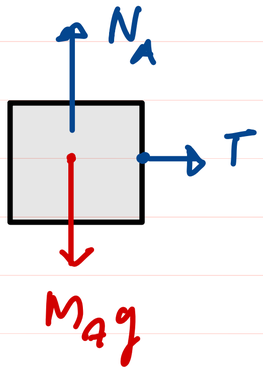
Ex.

Find (i) Acceleration of each block

(ii) Tension in string

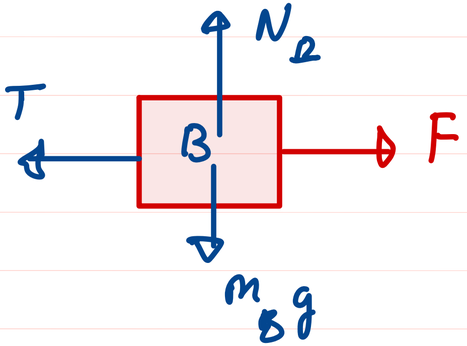
(i) $a = \dfrac{F_{net}}{M_T} = \dfrac{F}{M_A + M_B}$

(ii) F.B.D of A



$T = M_A a$

F.B.D of B



$F - T = m_B a$

$$T = \frac{m_A F}{m_A + m_B}$$

Ans.

Ex

$(g = 10 m/s^2)$

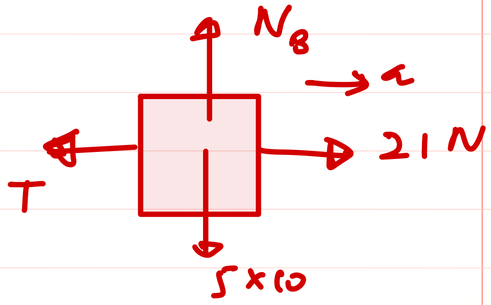
Find (1) Acc. of each blocks

(2) Tension in string

(1) $a = \dfrac{F_{net}}{M_{Total}} = \dfrac{21-7}{2+5}$

$a = \dfrac{14}{7} \Rightarrow \boxed{a = 2 m/s^2}$

F.B.D of B



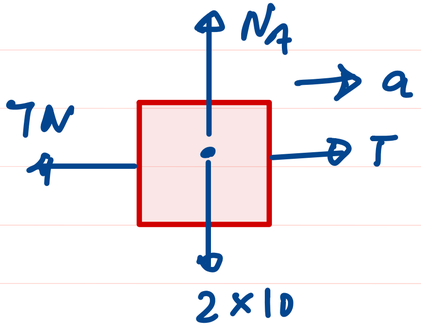
$21 - T = 5 \times a$

$21 - T = 5 \times 2$

$21 - 10 = T$

$\boxed{T = 11N}$ Ans

(2) F.B.D of A

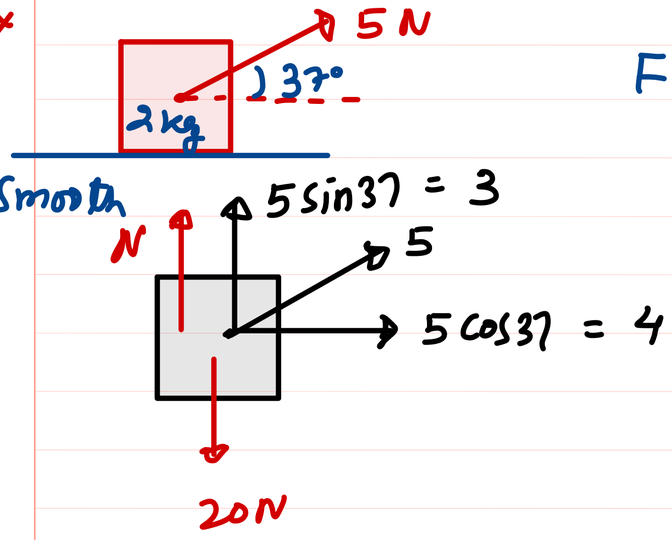


$T - 7 = 2 \times a$

$T - 7 = 2 \times 2$

$\boxed{T = 11N}$ Ans

Ex



Find Acc of block and Normal of ground

$\Sigma F_x = ma$

$4 = ma$

$4 = 2a$

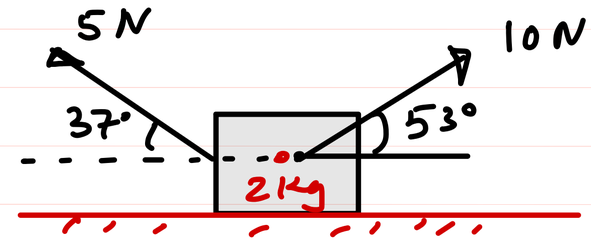
$\boxed{a = 2 m/s^2}$

$\Sigma f_y = 0$

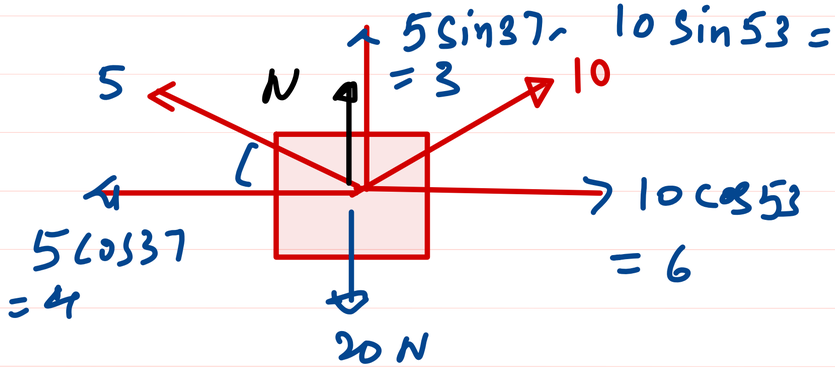
$N + 3 - 20 = 0$

$\boxed{N = 17\ N}$ Ans

Ex



Find Acc and Normal



$\Sigma F_x = ma$

$6 - 4 = 2 \times a$

$2 = 2a$

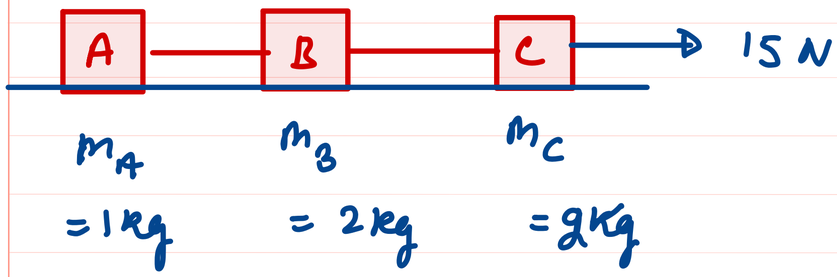
$\boxed{a = 1 m/s^2}$ Ans

$\Sigma f_y = 0$

$N + 8 + 3 - 20 = 0$

$\boxed{N = 9\ Newton}$ Ans

Ex



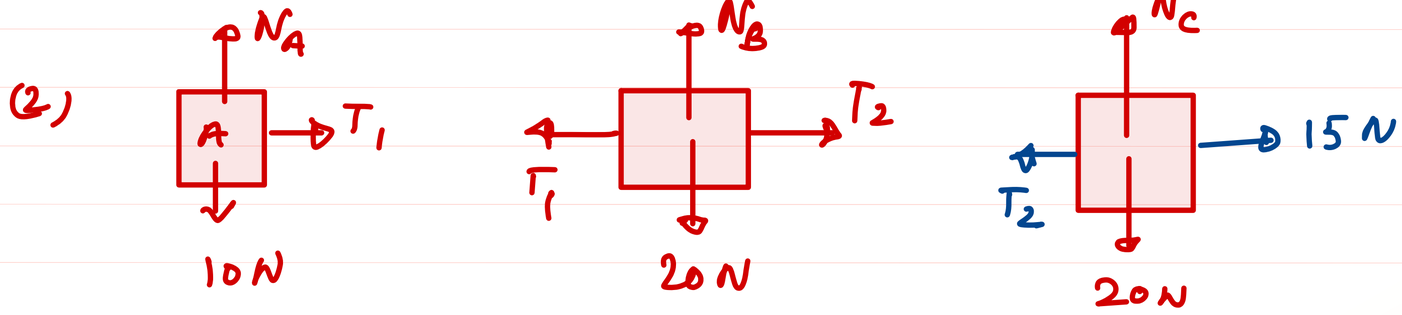
Find ① acc. of each block

② Tension b/w string A & B and B & C

(1) $a = \frac{F_{net}}{M_T} = \frac{15}{1+2+2}$

$a = \frac{15}{5} = 3\,m/s^2$

(2)



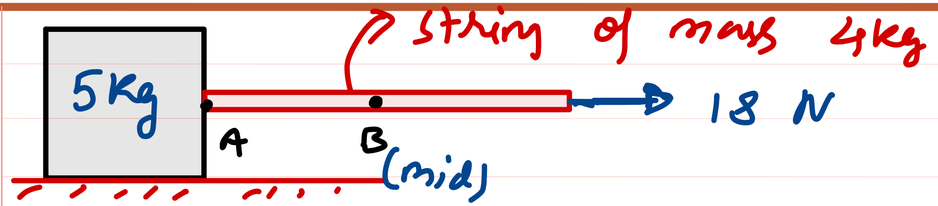
$T_1 = 1 \times a$

$\boxed{T_1 = 3N}$ Ans

$T_2 - T_1 = 2 \times a$

$T_2 - 3 = 2 \times 3 \Rightarrow \boxed{T_2 = 9N}$ Ans

Ex



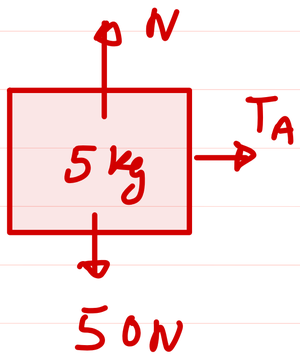
Find (i) Acc. of block

(ii) T_A & T_B

(i) $a = \dfrac{F_{net}}{M_T} = \dfrac{18}{5+4}$

$\boxed{a = 2\ m/s^2}$

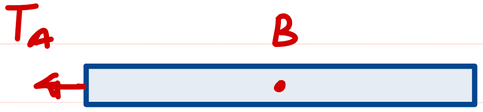
(2)



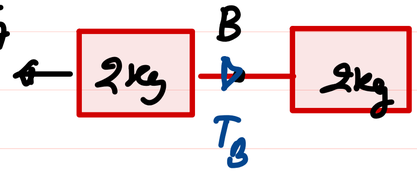
$T_A = 5 \times a$

$= 5 \times 2$

$\boxed{T_A = 10N}$



Assume as block

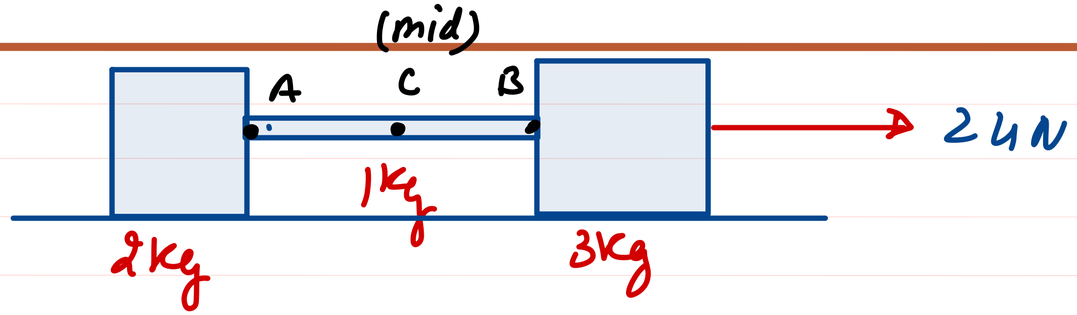


$T_B - T_A = 2 \times a$

$T_B - 10 = 2 \times 2$

$\boxed{T_B = 14\ N}$

Ex



(1) $a = \frac{24}{2+1+3} = \frac{24}{6} = 4\,m/s^2$

(2) $T_A = 2 \times a$

$T_A = 8\,N$

$T_B = (2+1)\,a$

$T_B = 12\,N$ Ans

$T_C = 2.5 \times a$

$T_C = 10\,N$

Find (1) Acc. of each block

(2) $T_A = ?$

$T_B = ?$

$T_C = ?$

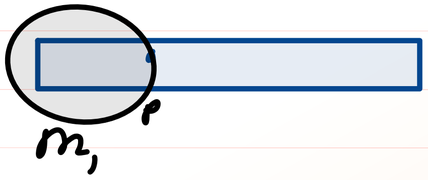
(length)

string of mass (m) and (l)

Ex

Tension at point P

$a = F/m$



$T_P = m_1 a$

l —— m

1 —— $\frac{m}{l}$

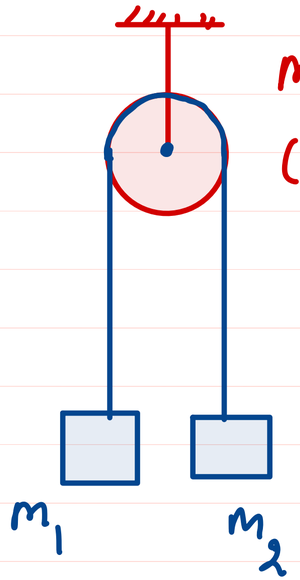
x —— $\frac{m}{l}x = m_1$

$T_P = \frac{m}{l} \cdot x \cdot \frac{F}{m} \Rightarrow$ $T_P = \frac{F}{l}x$ Ans

When Bodies are connected via string and passing through pullies :→

↳ massless ↳ mass less and friction less

Ex =



$m_2 > m_1$

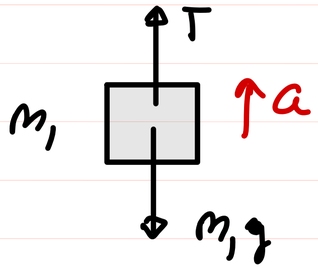
(Atwood machine)

Ground

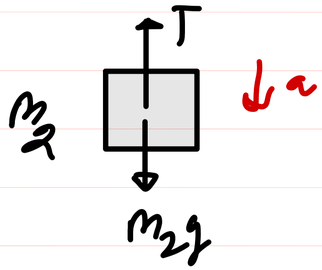
Find ① acc. of each block

② Tension in string

F.B.D of A



F.B.D of B



$T - m_1 g = m_1 a$ — ①

$m_2 g - T = m_2 a$ — ②

add ① + ②

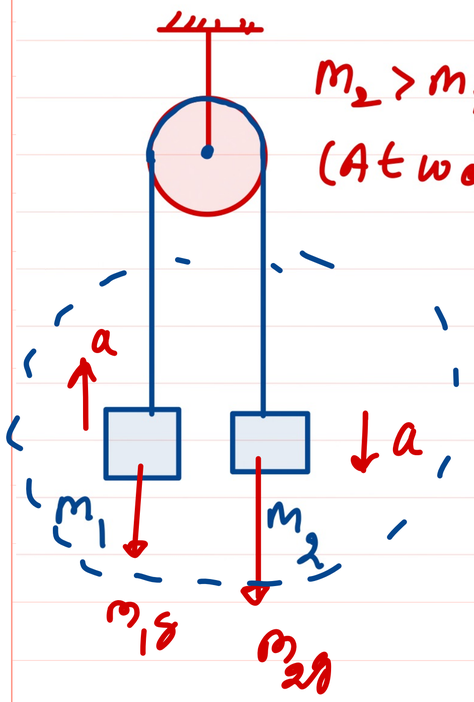
$m_2 g - m_1 g = (m_1 + m_2) a$

$$a = \frac{(m_2 - m_1) g}{m_1 + m_2}$$ Ans =

Put a in Eq ① and Find T

$T = m_1 g + m_1 a$

$$T = \frac{2 m_1 m_2}{m_1 + m_2} \cdot g$$

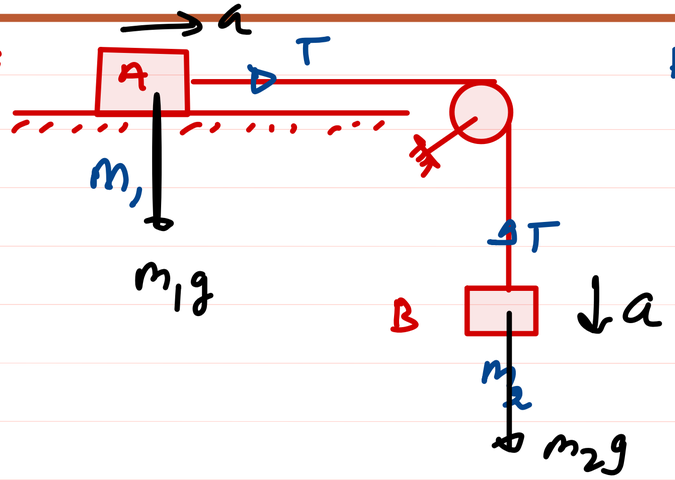


Concept

$$a = \left(\frac{\text{Net Force towards acc.} - \text{Net force opposite acc.}}{m_{total}} \right)$$

$$a = \frac{m_2 g - m_1 g}{m_1 + m_2}$$

Ex



① $a = \left(\frac{m_2 g - 0}{m_1 + m_2}\right)$

$$a = \frac{m_2}{m_1 + m_2} \cdot g$$

Ans

② FOR - A

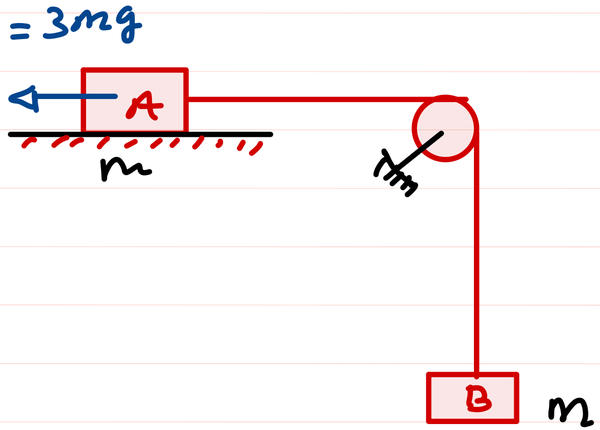
$$T = m_1 a$$

$$T = \frac{m_1 m_2}{m_1 + m_2} g$$

Find ① Acc of blocks

② Tension in string

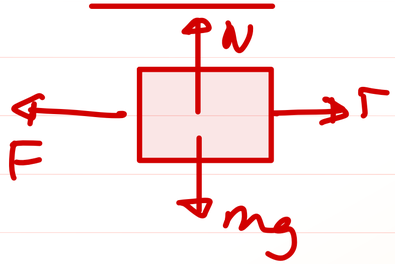
Ex



Find ① acc. of blocks

② Tension in string

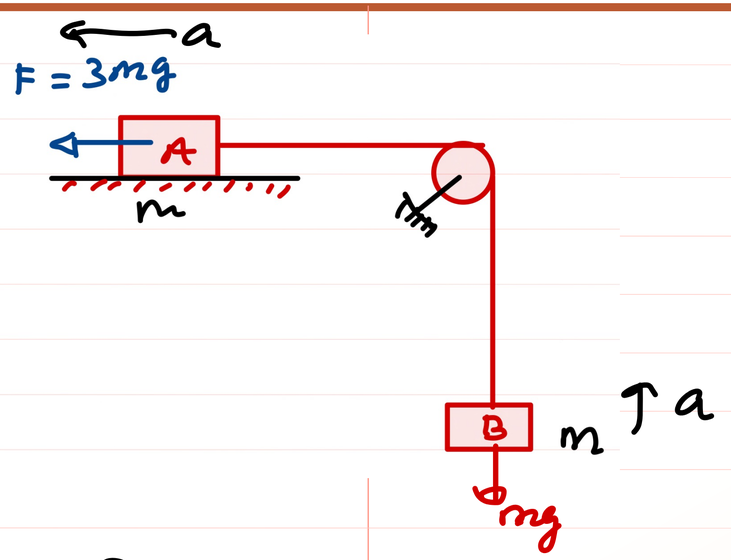
② FOR - A



$F - T = ma$

$3mg - T = mg$

$T = 2mg$ Ans



① $a = \frac{3mg - mg}{2m}$

$a = \frac{2mg}{2m} \Rightarrow a = g$

$a = 10\ m/s^2$