Nishant Jindal

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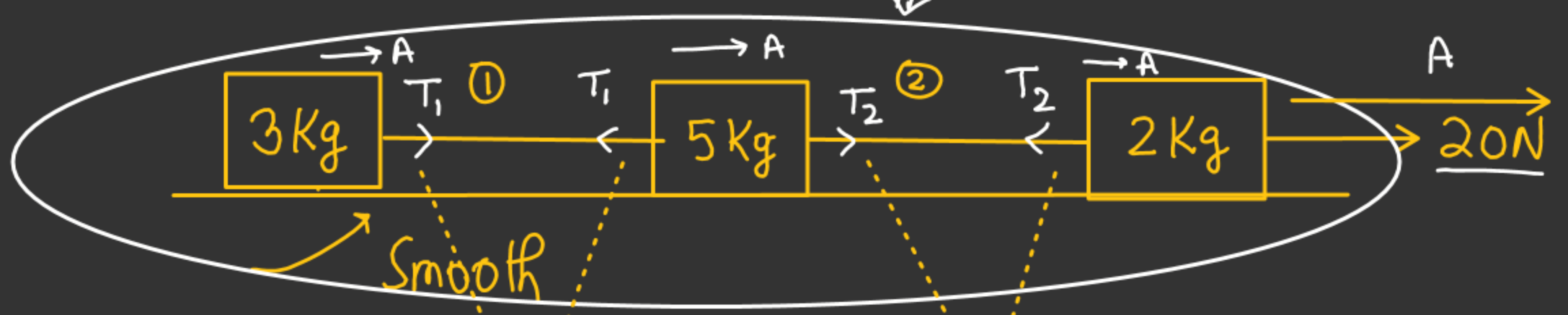
Find tension in String ① & ②

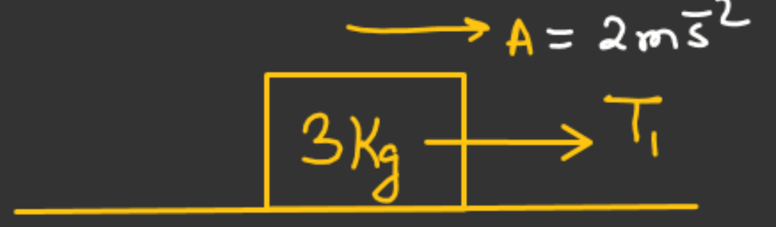
System boundary



Internal force

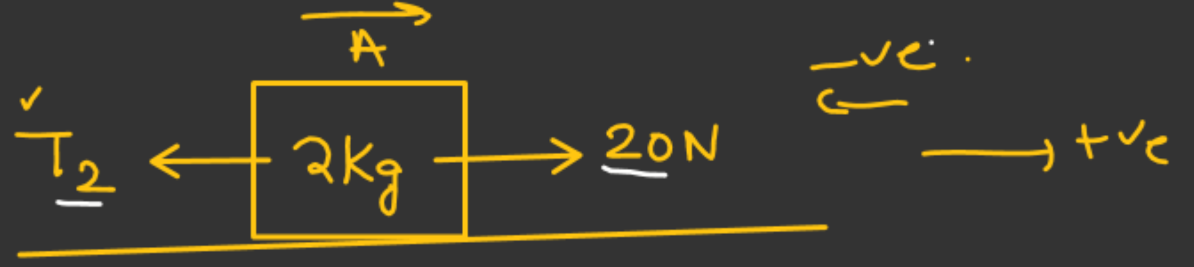
Internal force

F.B.D of 3Kg



Netwon's 2nd Law

$$T_1 = 3\times 2 = 6N$$



$$T_2 - T_1 = 5\times A$$

$$F = (3+5+2)A$$

$$A = \frac{20}{10} = 2ms^{-2}$$

$$[20 - T_2 - 2\times A = 0.] \checkmark$$

??

This is not a force. this is Cause of force

$$20 - T_2 = 2A$$

$$T_2 = 20 - 2\times 2$$

$$= 20 - 4$$

$$= 16N$$

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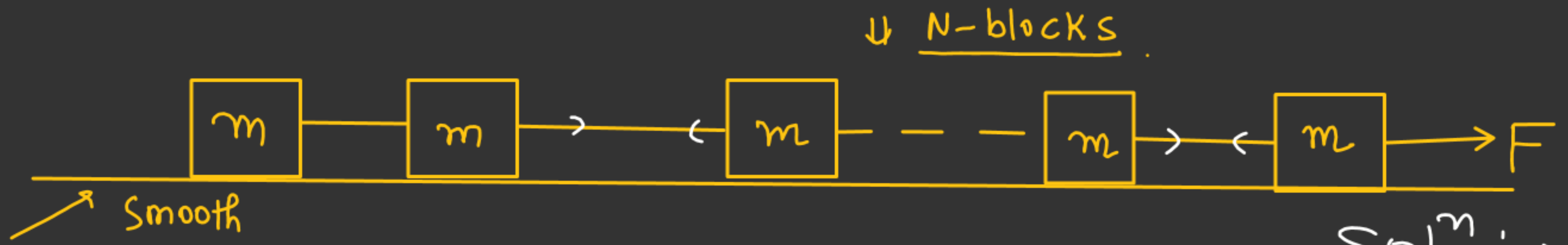


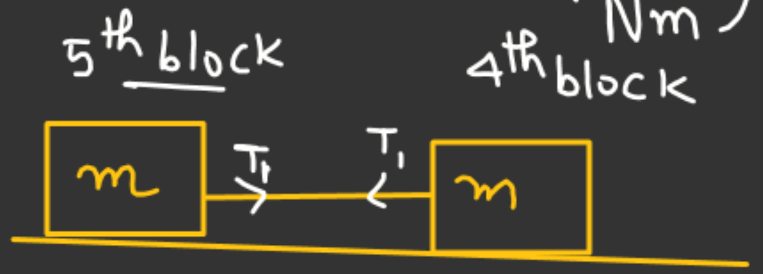
Sol^n :→

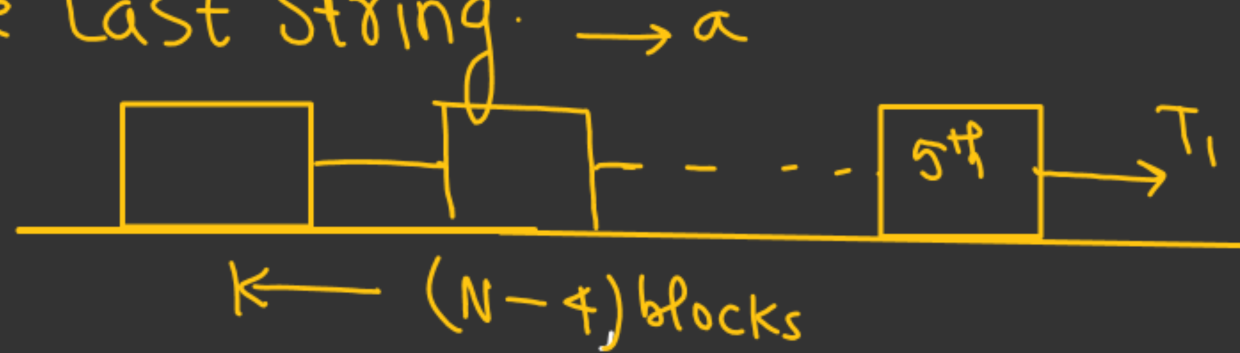
\# Tension in the String connecting 4th & 5th (from Left) block is twice the tension in the String connecting 8th & 9th block. then find No of blocks (N=??). also find tension in the Last String.

Common accleration

$$a = \left(\frac{F}{Nm}\right)$$

Nm = Total mass of the System.





$$\Rightarrow T_1 = (N-4)ma$$

$$T_1 = (N-4)m\left(\frac{F}{Nm}\right)$$

$$T_1 = \frac{F(N-4)}{N}$$

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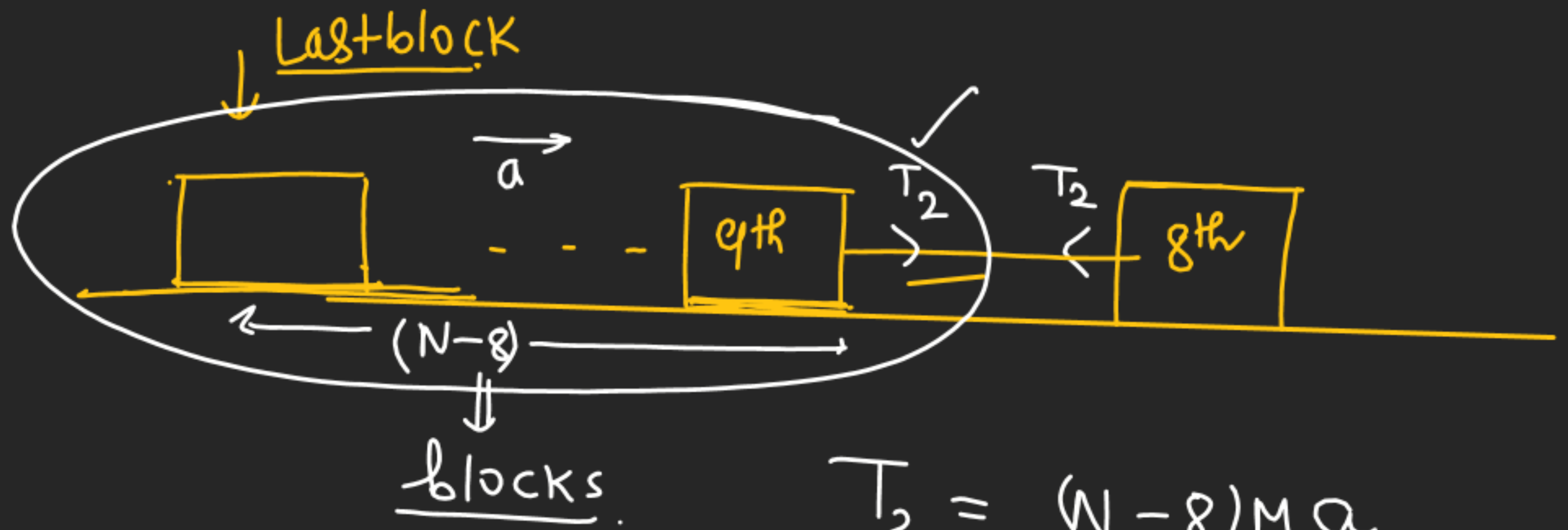
Law of Motion

let, tension in the string connecting 8^{th} and 9^{th} block be T_2

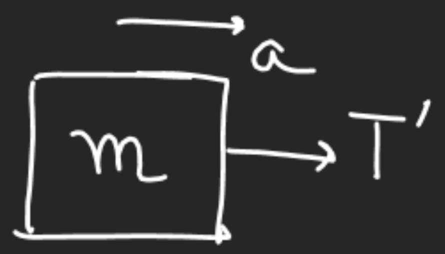


$T_2 = (N-8)Ma$

$T_2 = (N-8)m\left(\frac{F}{Nm}\right)$

$T_2 = \frac{(N-8)}{N} \times F$

For last block



$T' = ma = m\left(\frac{F}{Nm}\right) = \frac{F}{N} = \frac{F}{12}$ (Newton)

According to question

$T_1 = 2T_2$

$\cancel{\frac{F}{N}}(N-4) = 2\left(\frac{N-8}{\cancel{N}}\right) \times \cancel{F}$

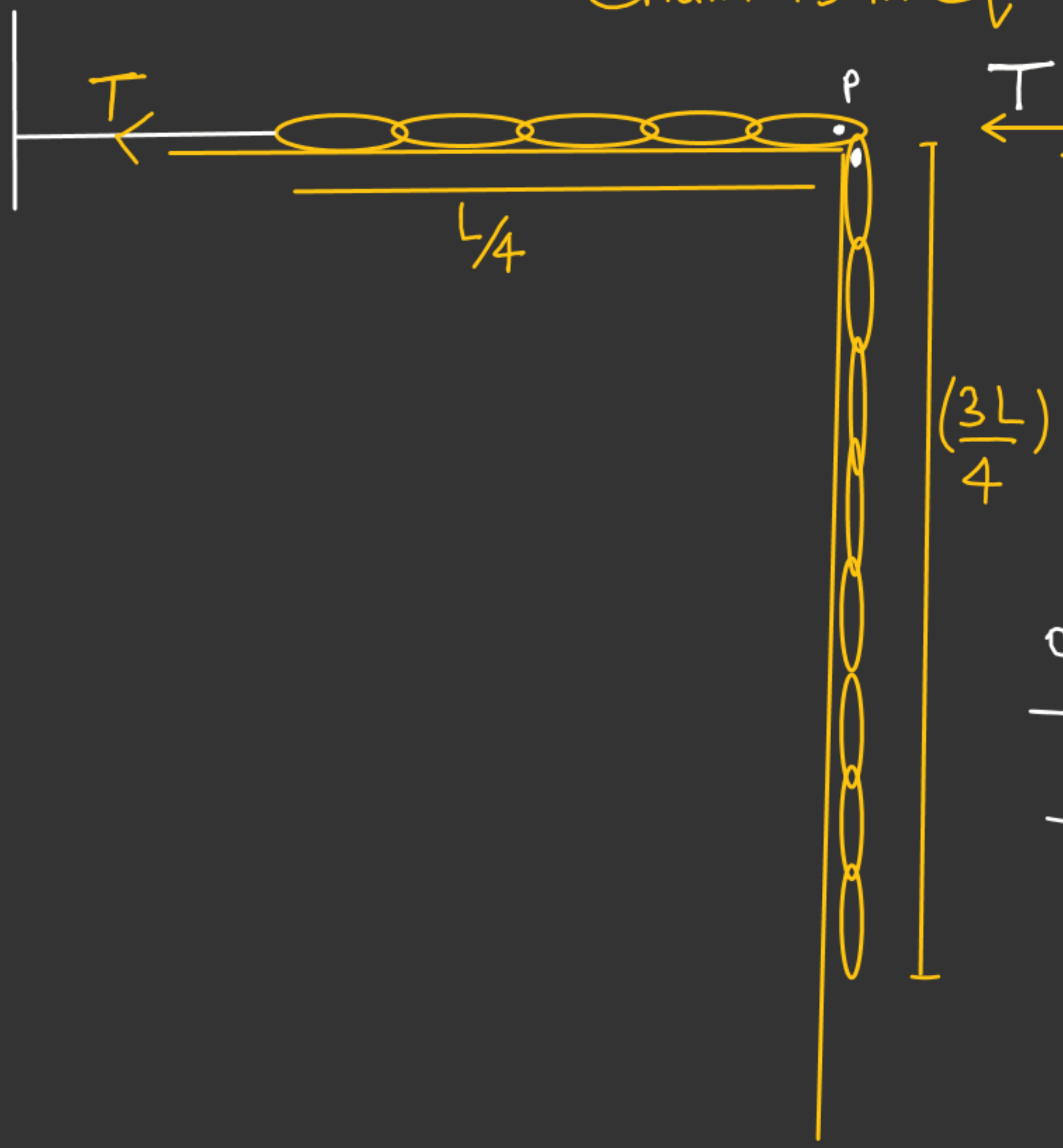
$(N-4) = 2N-16$

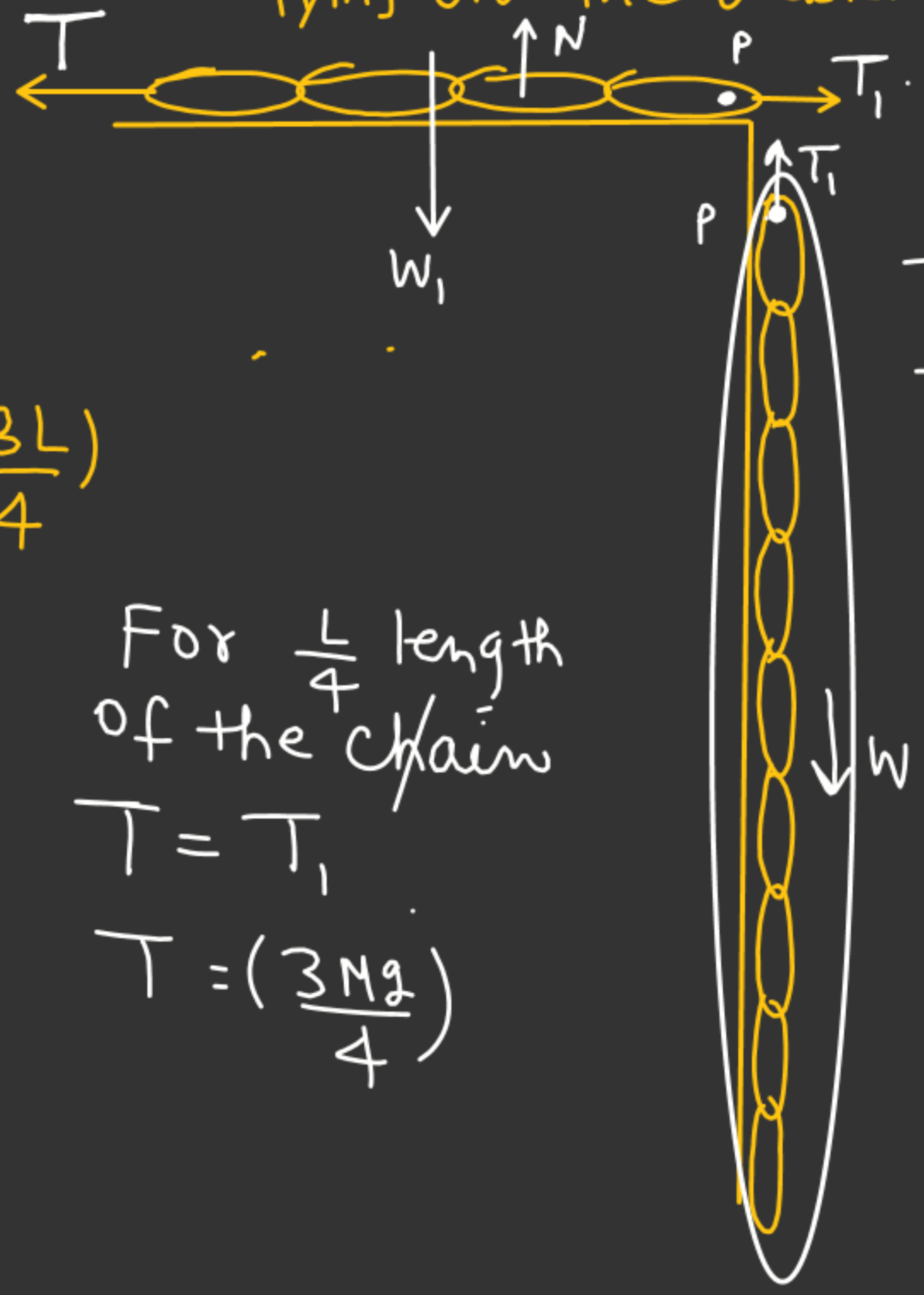
$16-4 = 2N-N$

$\boxed{N = 12}$ ✓

Uniform. Chain of mass M and length L.

Chain is in equlibrium. and one fourth length of the chain lying on the table. Find tension in the string.





For $\frac{L}{4}$ length of the chain

$T = T_1$

$T = \left(\frac{3Mg}{4}\right)$

$T_1 = W$

$T_1 = \left(\underset{\sim\sim\sim}{\frac{M}{L} \times \frac{3L}{4}}\right) g = \left(\frac{3Mg}{4}\right)$ ✓

W = Weight of hanging part. ie $\frac{3L}{4}$ part of Chain

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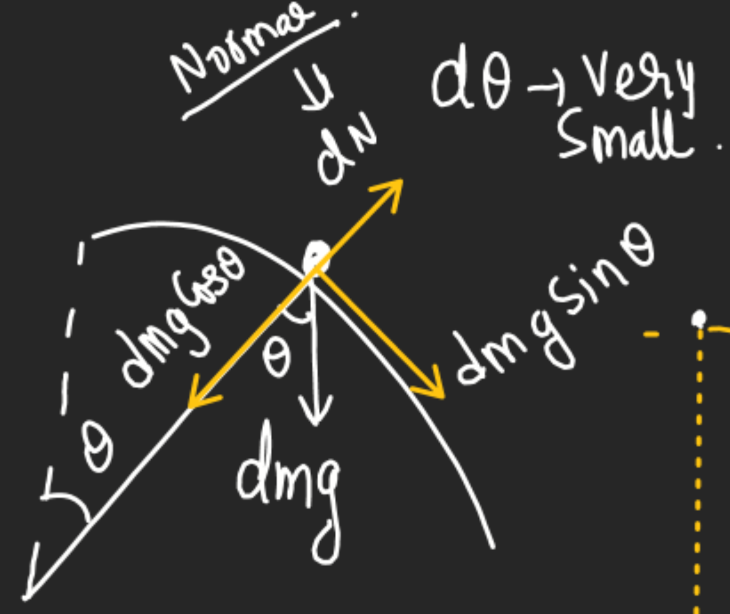
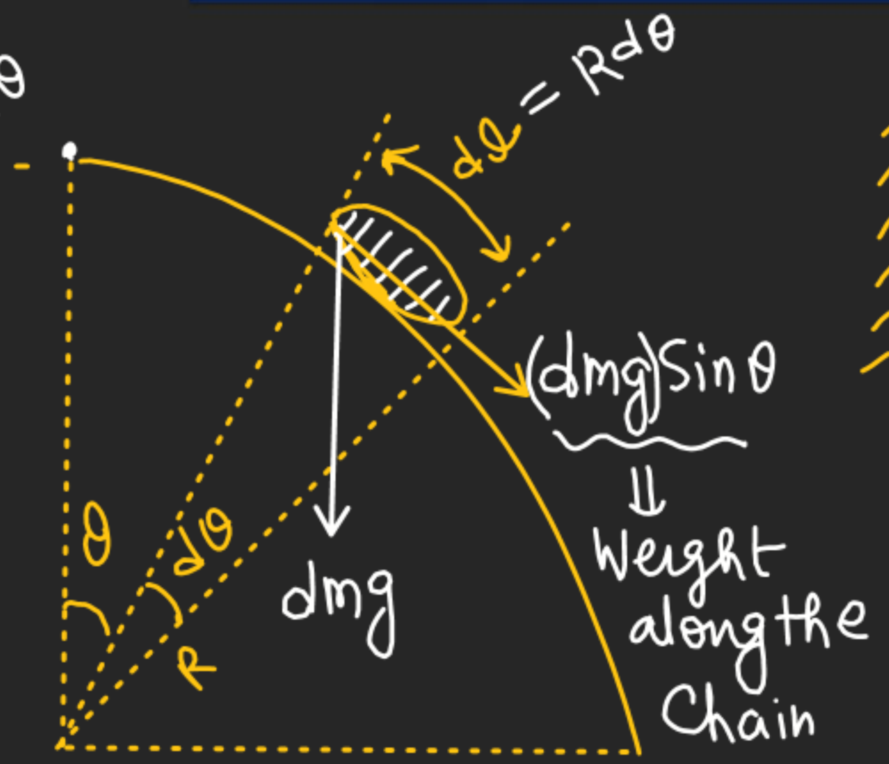
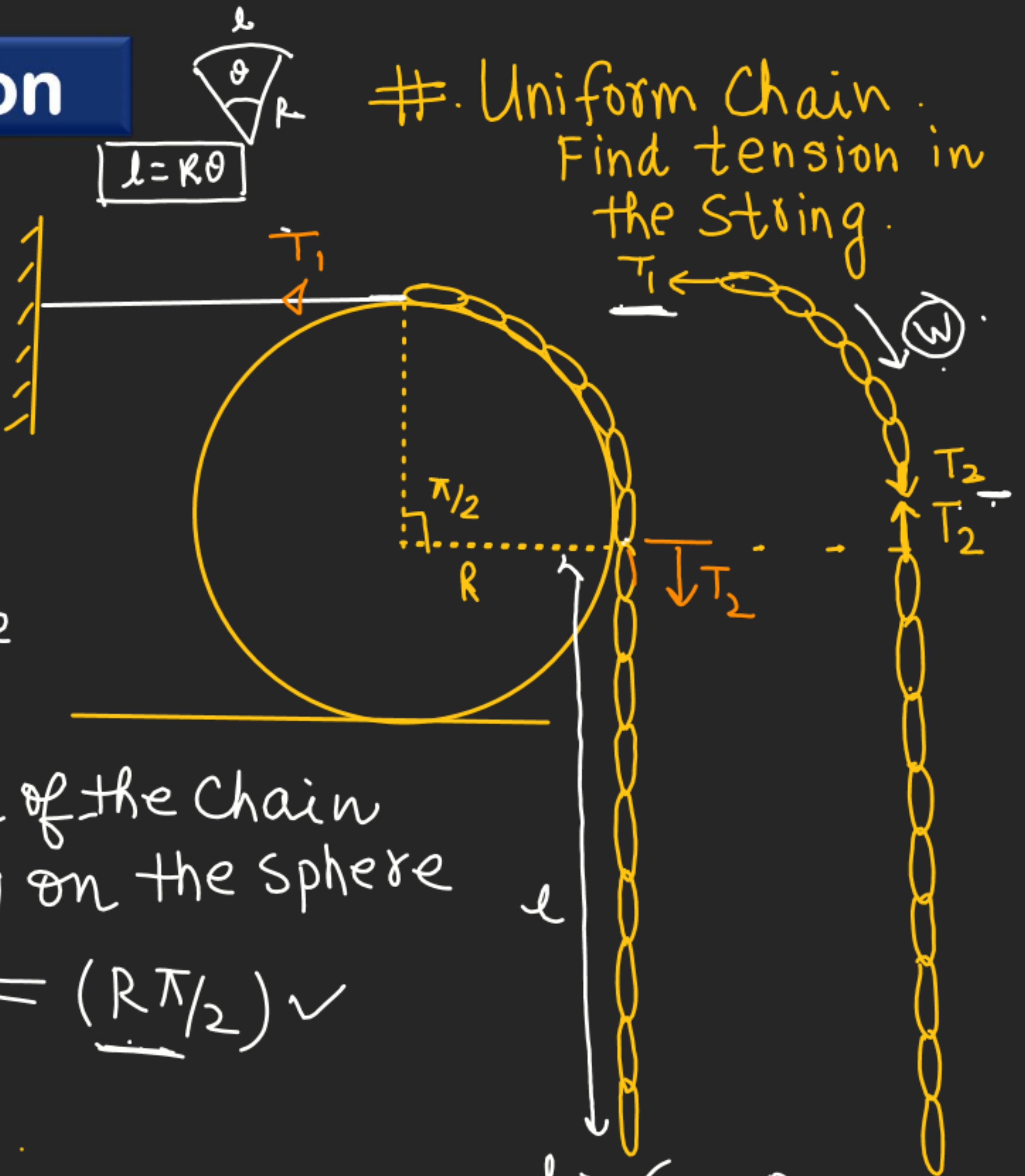
Law of Motion





$\boxed{l = R\theta}$

#. Uniform Chain. Find tension in the String.



$$dM = \frac{M}{L}(dl)$$

$$dM = \left(\frac{M}{L} R\,d\theta\right)$$

Along the Chain.

$\Downarrow$

$$dW = dmg\sin\theta$$

$$\int_0^W dW = \frac{MRg}{L}\int_0^{\pi/2} \sin\theta \cdot d\theta.$$

$$W = \frac{MRg}{L}\left[-\cos\theta\right]_0^{\pi/2} = \frac{MgR}{L}\left[-\cos\frac{\pi}{2} - (-\cos 0)\right]$$

$$W = \left(\frac{MgR}{L}\right)$$

Length of the Chain lying on the sphere

$$= \left(R\pi/2\right)$$

$$l = \left(L - R\pi/2\right)$$

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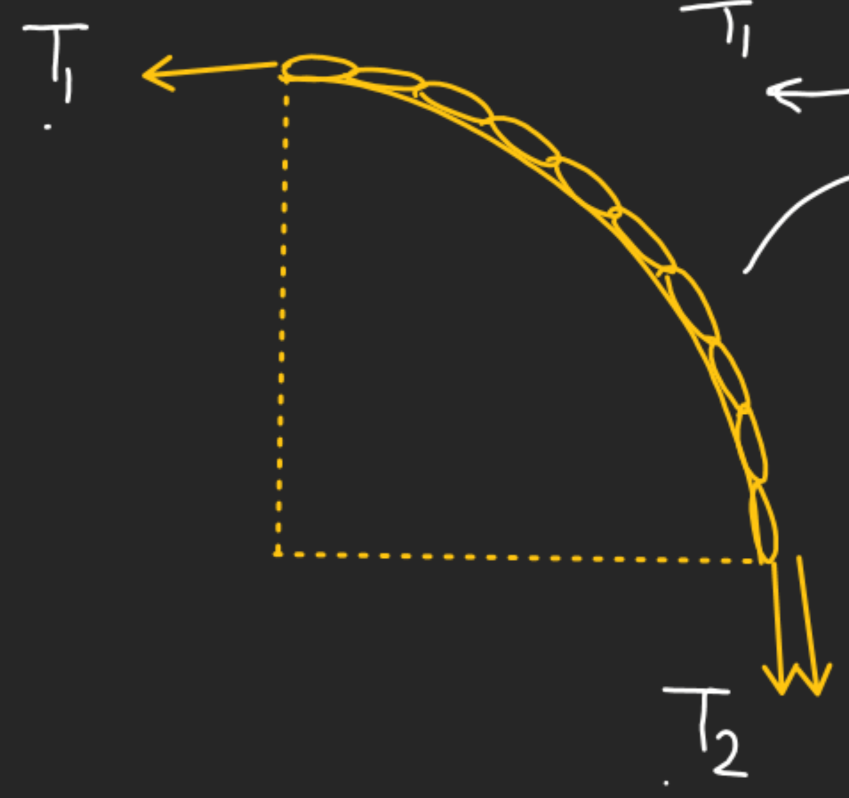
Law of Motion



$$T_1 = T_2 + W.$$

$$T_1 = T_2 + \frac{MgR}{L}$$

W = Component of gravity along the chain

$W = \frac{MgR}{L}$

$$l = \left(L - \frac{R\pi}{2}\right)$$

W_1 = Weight of l length of the chain

$$T_2 = W_1 = \frac{M}{L} \times \left(L - \frac{R\pi}{2}\right) g.$$

$$T_1 = T_2 + \frac{MgR}{L} = \left[\frac{Mg}{L}\left(L - \frac{\pi R}{2}\right) + \frac{MgR}{L}\right] \checkmark$$