YAKEEN NEET 2.0

2026

Laws of Motion

PHYSICS | Lecture 08

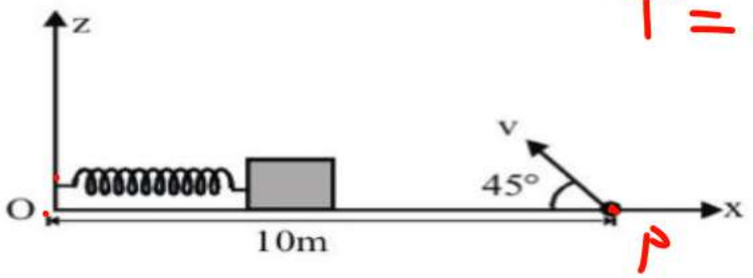
By - Saleem Ahmed Sir

Todays Goal

Questions practice on NLM & spring force

16. A small block is connected to one end of a massless spring of un-stretched length 4.9 m. The other end of the spring (see the figure) is fixed. They system lies on a horizontal frictionless surface. The block is stretched by 0.2 m and released from rest at $t = 0$. It then executes simple harmonic motion with angular frequency $\omega = \frac{\pi}{3}$ rad/s. Simultaneously at $t = 0$, a small pebble is projected with speed v from point P at an angle of 45° as shown in the figure. Point P is at a horizontal distance of 10m from O. If the pebble hits the block at $t = 1s$, the value of v is:- (take $g = 10\ m/s^2$) **[IIT-JEE 2012]**

एक द्रव्यमान-रहित स्प्रिंग की तनाव-रहित लम्बाई 4.9 m है। उसका एक सिरा बंधित है और दूसरे पर एक छोटा गुटका लगा है (चित्र देखिये)। यह निकाय एक घर्षण-रहित क्षैतिज (horizontal) सतह पर रखा है। समय $t = 0$ पर गुटके को 0.2 m खींच कर स्थिर अवस्था से छोड़ा जाता है। तब वह गुटका $\omega = \frac{\pi}{3}$ rad/s आवृत्ति का सरल-आवर्त-दोलन करता है। ठीक उसी समय ($t = 0$) पर एक छोटा कंकड़ा v चाल से क्षैतिज से 45° कोण पर बिंदु P से प्रक्षेपित किया जाता है। बिंदु P की बिंदु O से दूरी (क्षैतिज) 10 m है। यदि $t = 1$ s पर कंकड़ गुटके पर गिरता है, तब v का मान है ($g = 10\ m/s^2$ लें)



$T = 1 = \frac{2u\sin 45°}{10}$

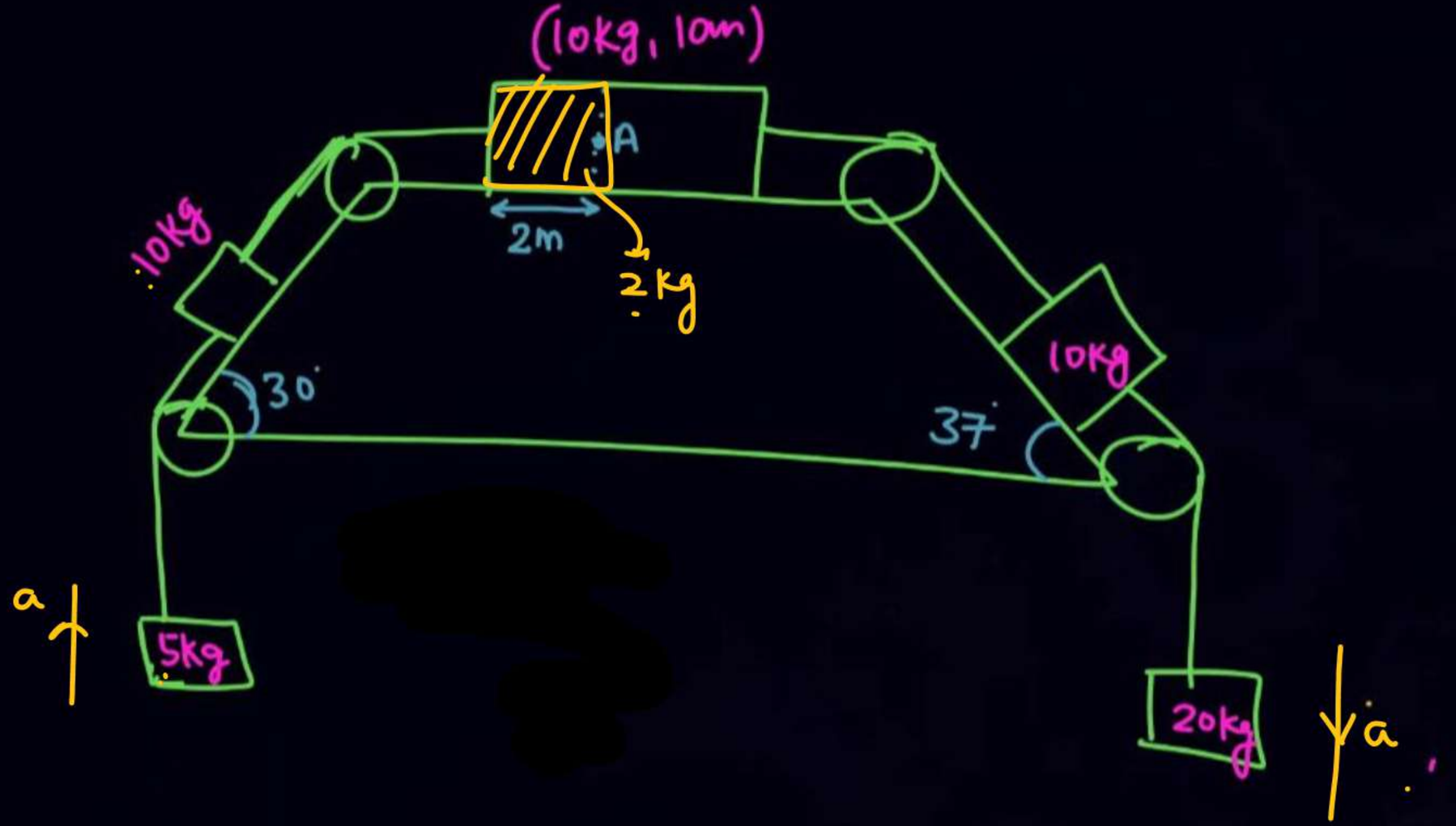
$u = 5\sqrt{2} = \sqrt{50}$

(A) $\sqrt{50}$ m/s (B) $\sqrt{51}$ m/s (C) $\sqrt{52}$ m/s (D) $\sqrt{53}$ m/s

Ans. (A)

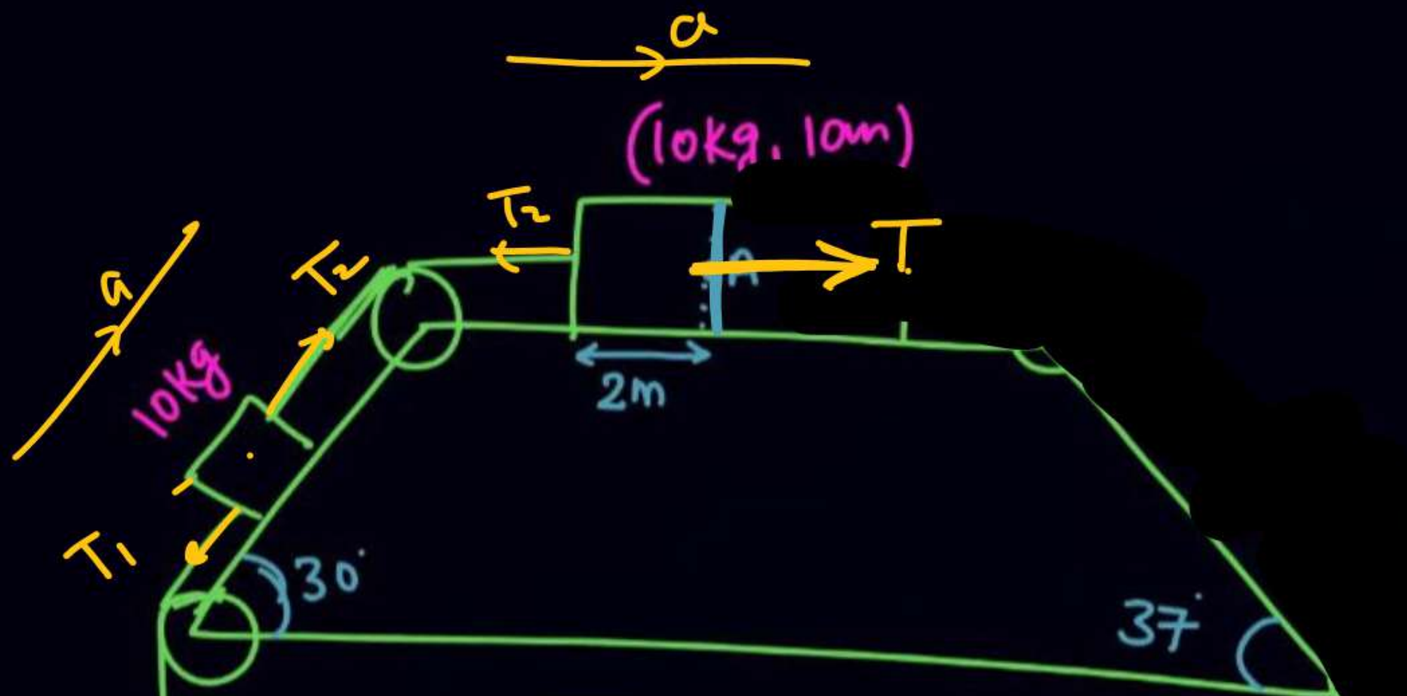
SSSQ

H/W



SSSQ

H/W



$$a = \frac{200+60-50-50}{55} = \frac{160}{55} = 2.9 = \frac{T_A-50-50}{17}$$

$$T_1 - 50 = 5a$$

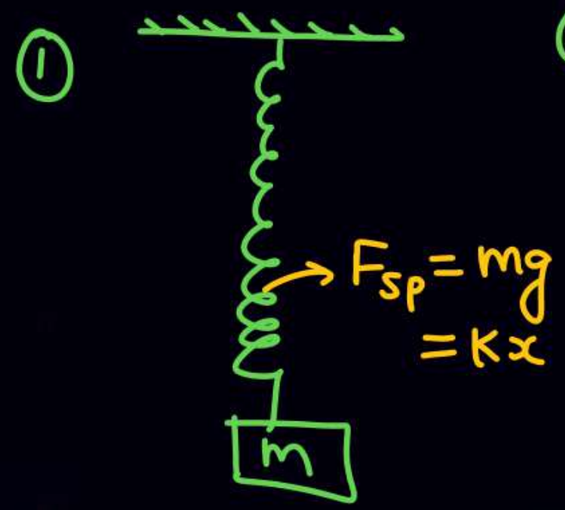
$$T_2 - T_1 - 50 = 10a$$

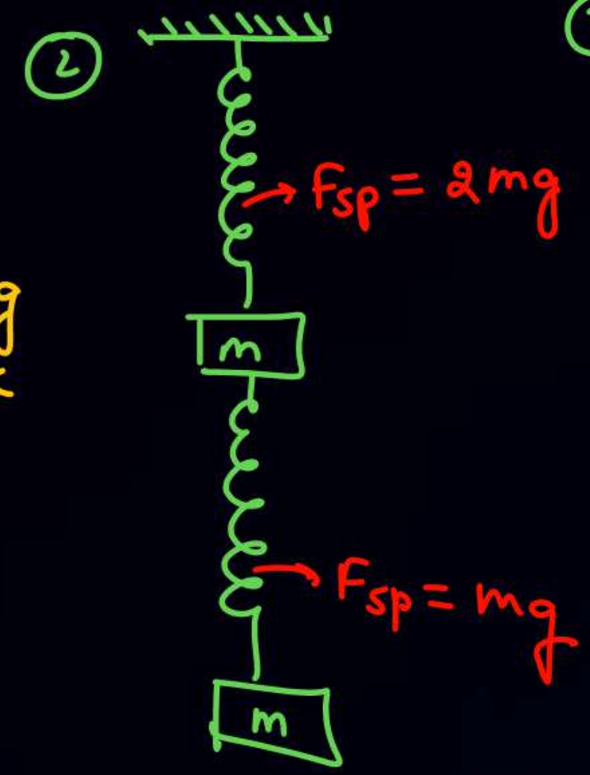
$$T - T_2 = 2a$$

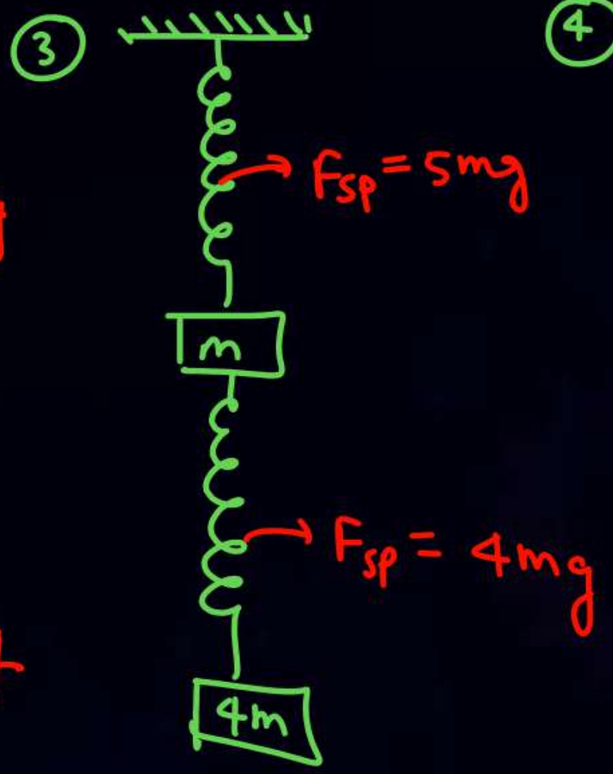
$$T - 100 = 17a$$

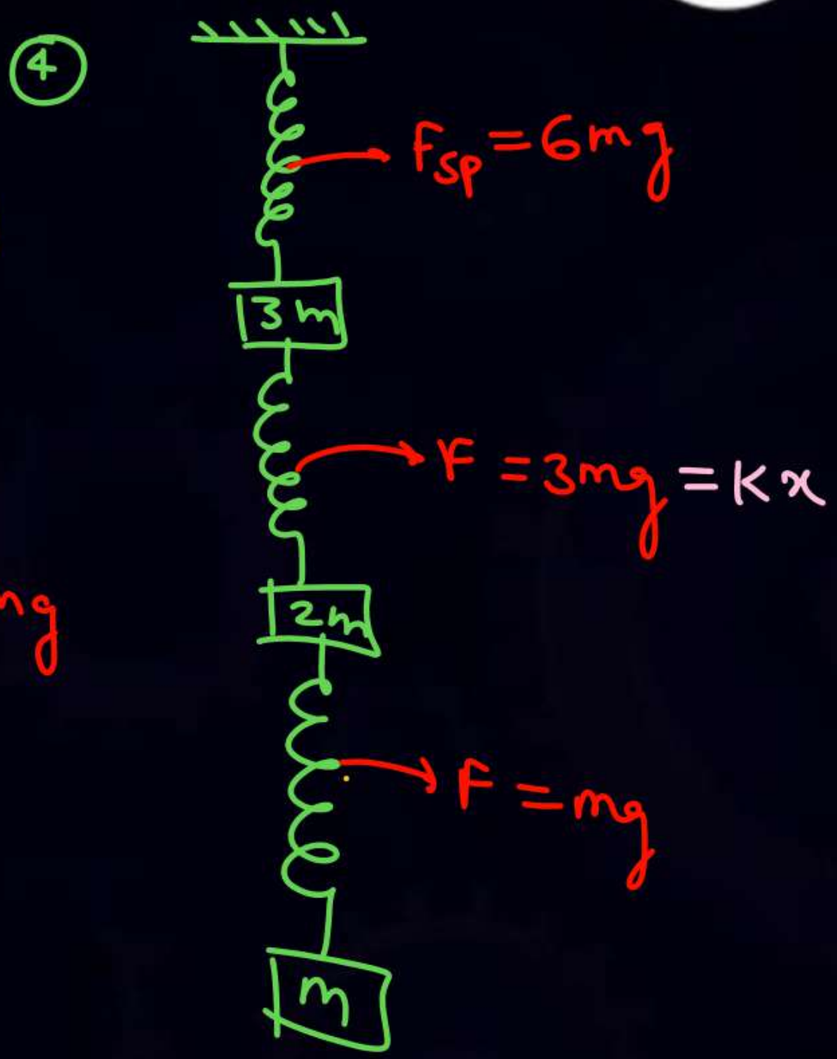
$$T_A = 149.3\,N$$

In following qus find the value of spring force if block is in equilibrium



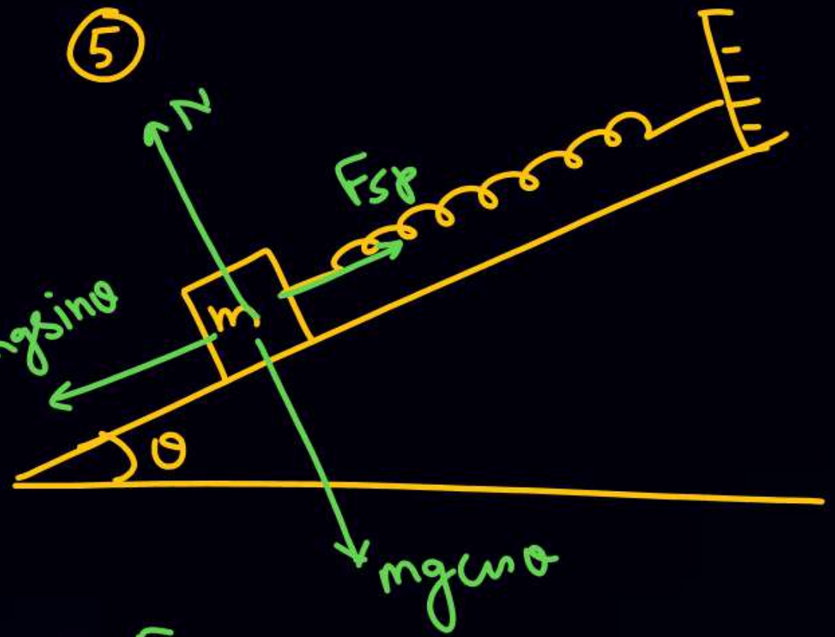






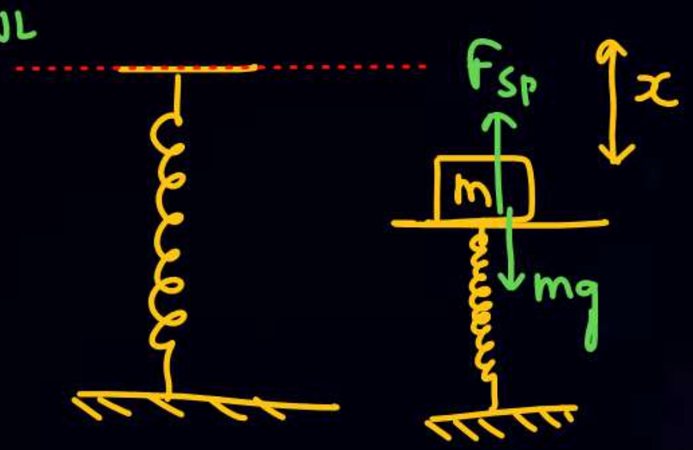
(Equilibrium)

⑤



$F_{sp} = mg\sin\theta$

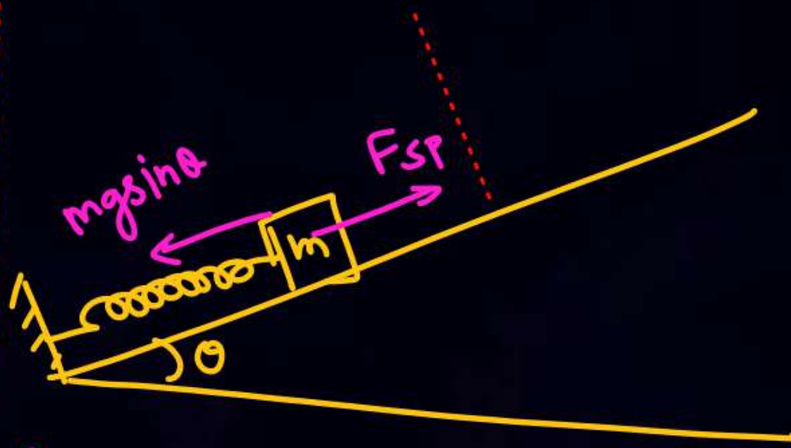
⑥



$F_{sp} = mg = kx$

(ऊपर)

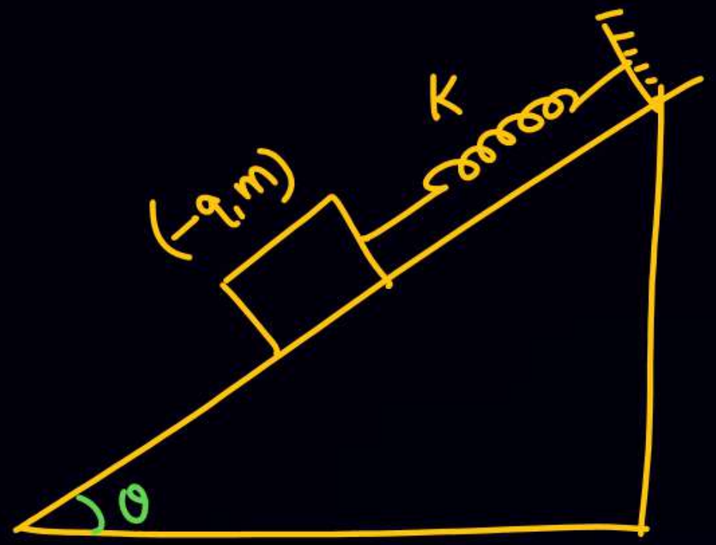
⑦



$F_{sp} = mg\sin\theta$.

SSSR

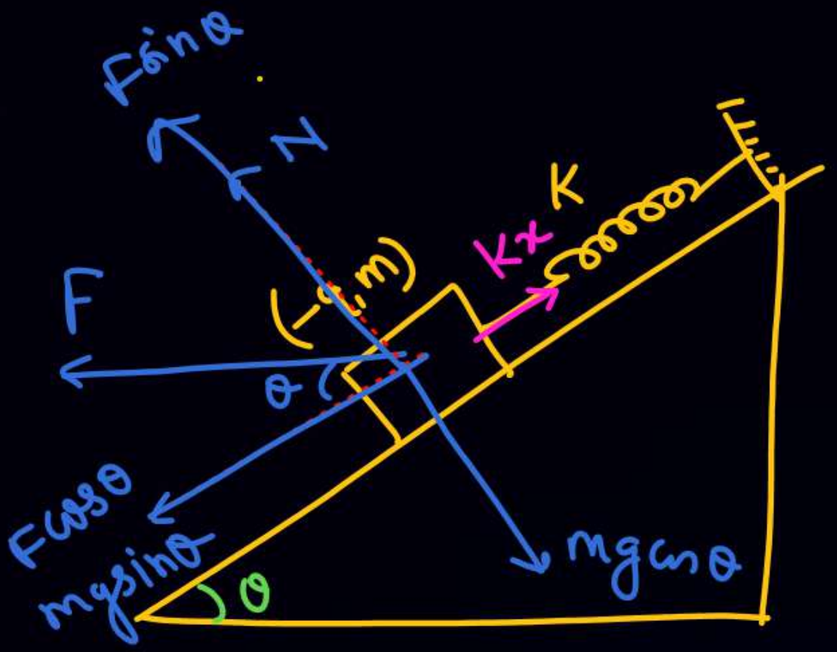
(8)



Block is in equil.
then find elongation in spring

SSSR

(8)



Block is in equil.
then find elongation in spring

$$F = qE = q\frac{\sigma}{2\epsilon_0}$$

$$Kx = mg\sin\theta + F\cos\theta$$

$$\boxed{Kx = mg\sin\theta + q\frac{\sigma}{2\epsilon_0}\cos\theta}$$

(9) initially. So! At A.

$AC = R = 5m$

3m के spring को खींचकर 5m बना दिया

elongation in spring = 2m

$F_{sp} = Kx = 100 \times 2 = 200\ N$

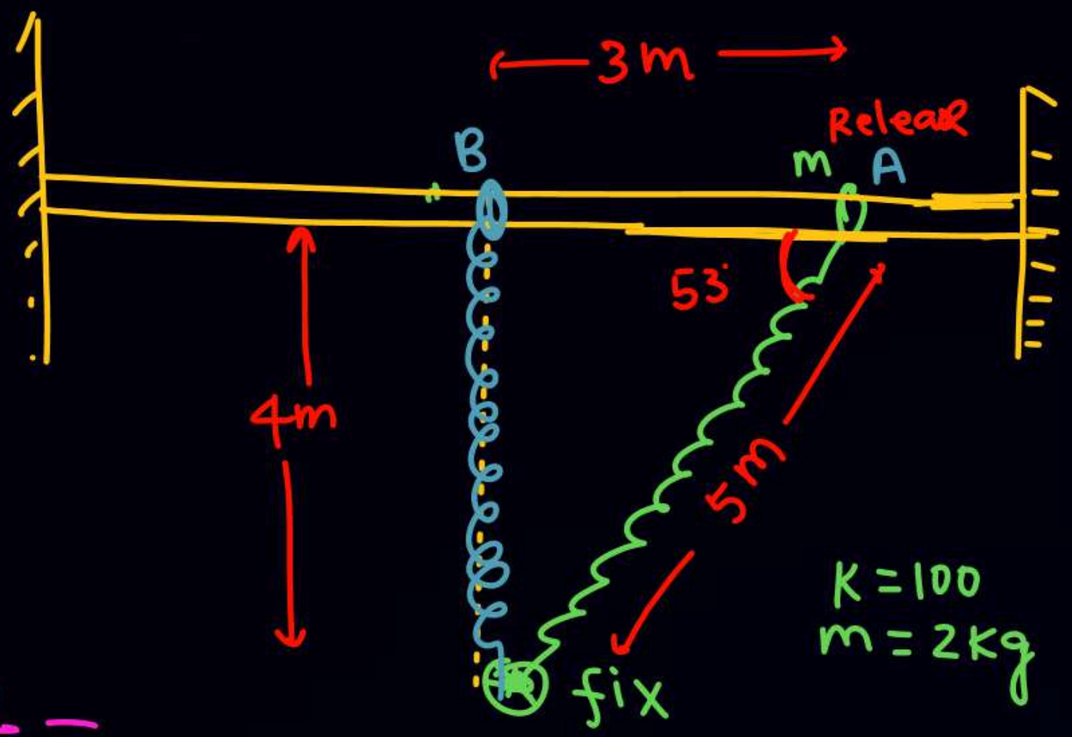
(B) 3m के spring को खींचकर 10m बना दिया

elongation in spring = 7m

$F_{sp} = Kx = 100 \times 7 = \underline{700\ N}$

Finally.

Q



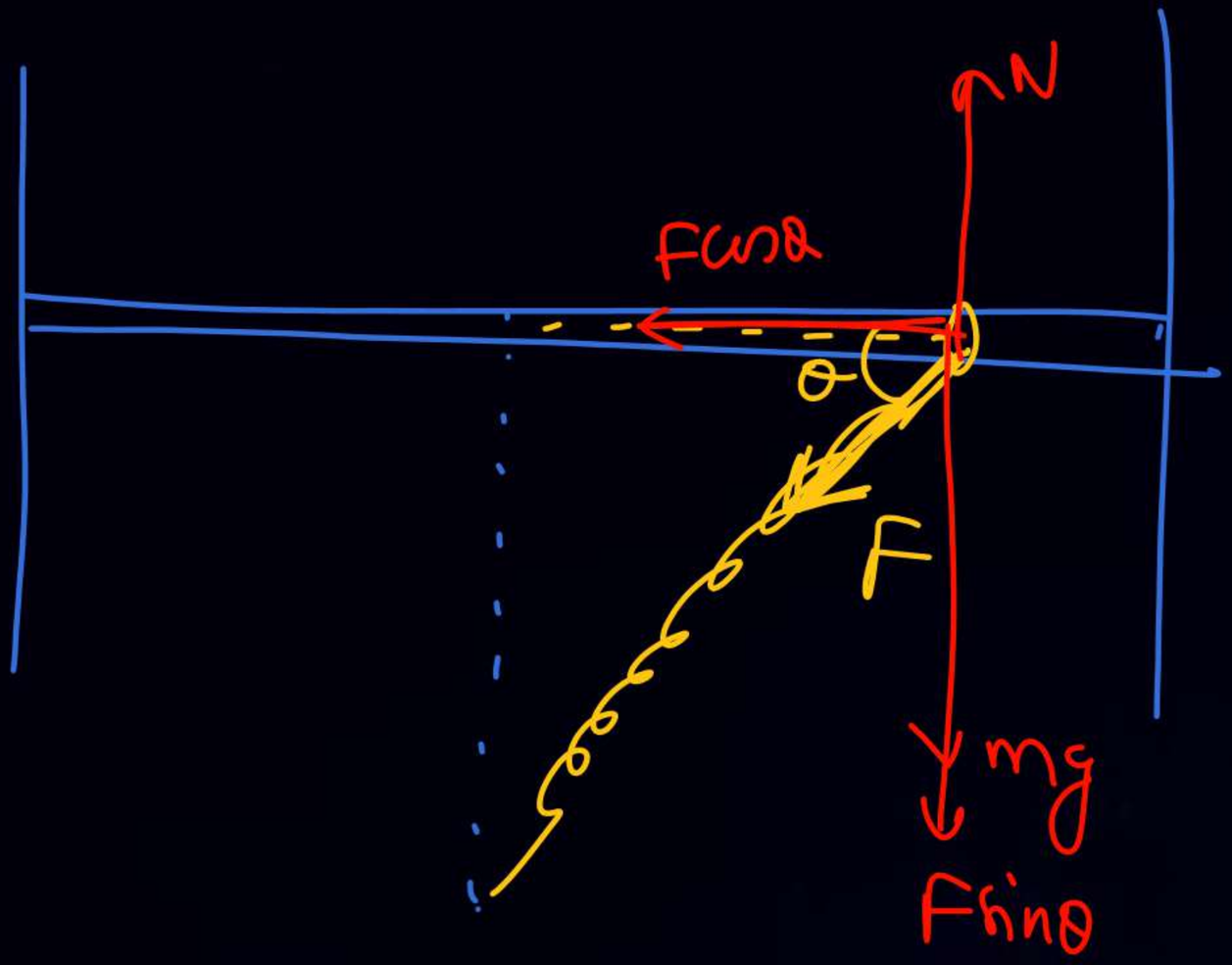
If natural length of spring is 2m.

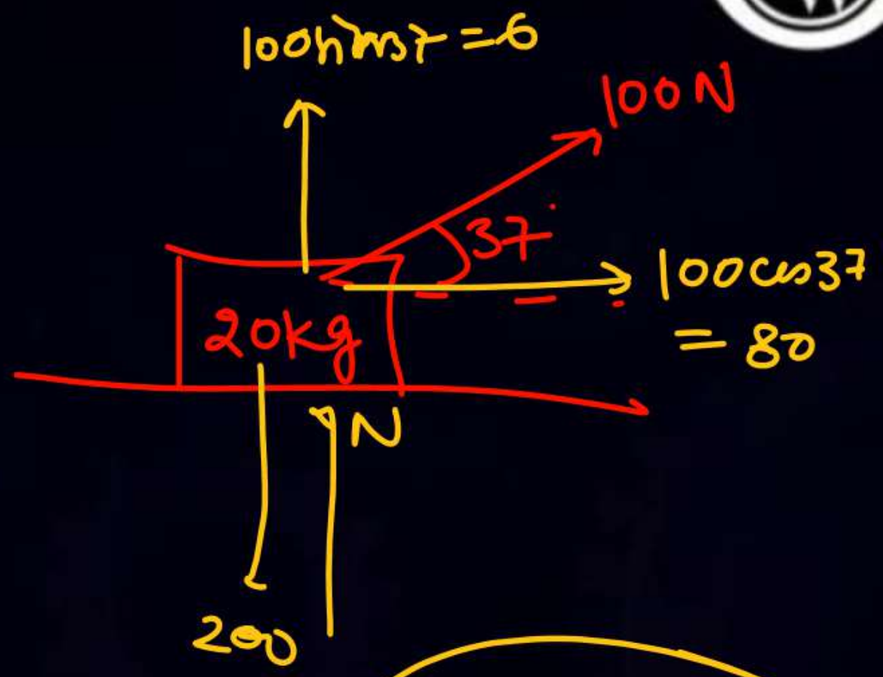
① $(F_{sp})_A = Kx = 100 \times 3 = 300$ ✓

② $(F_{sp})_B = Kx = 100 \times 2 = 200$ ✓

SSSQ

③ $\frac{N_A}{N_B} =$

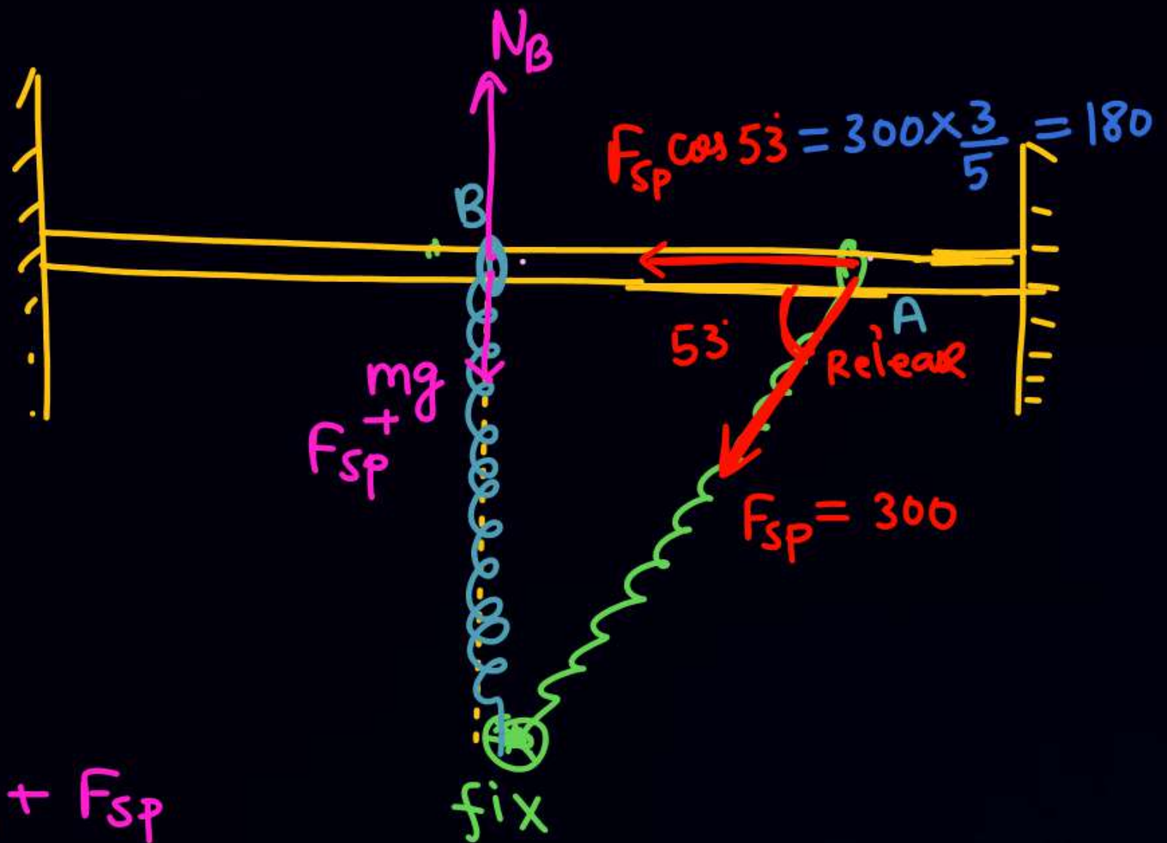




$80 = 20a$

Q

SSSQ



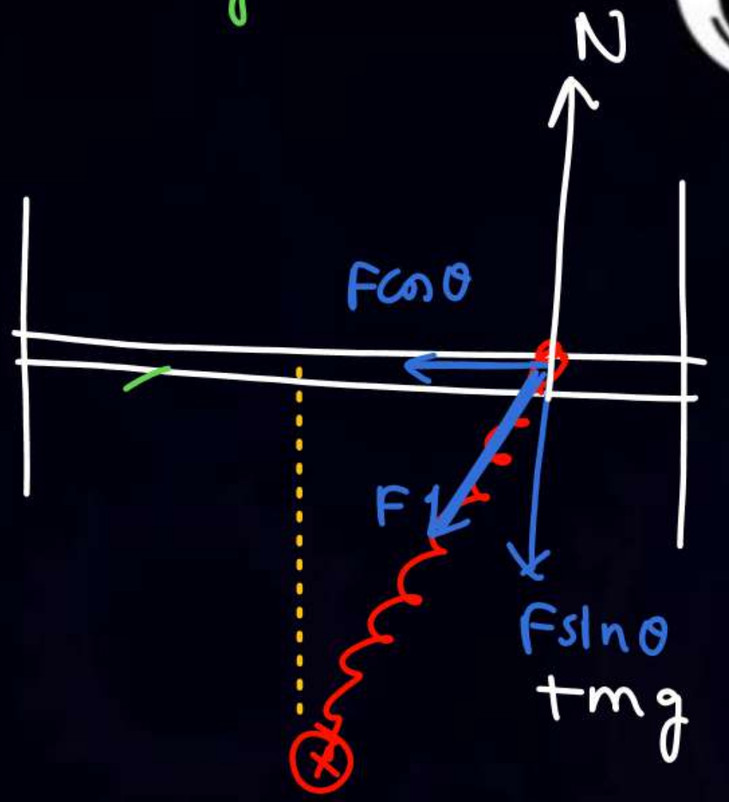
At B:

$N_B = mg + F_{sp}$

$= 20 + 200 = 220$

$K = 100$

$m = 2kg$



$N = F\sin\theta + mg$ = ✓

$a = \frac{F\cos\theta}{m} = \frac{180}{2} = 90$ ✓

purely NEET|JEEmain.

Agar material same hai ⇒ KL = Const

$$KL = K_1 l_1 = K_2 l_2$$

Q

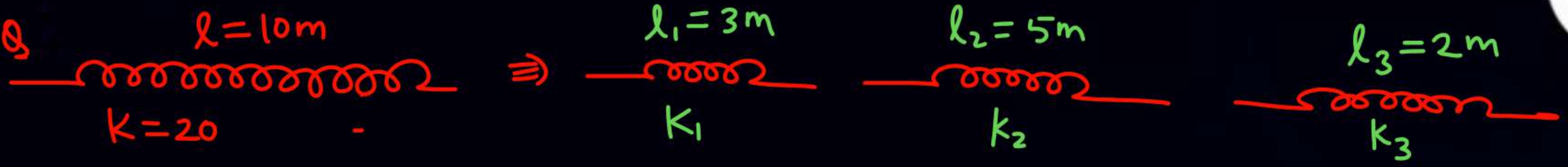
$100 \times 10 = K_1 \times 4$

$\boxed{K_1 = 250}$

$100 \times 10 = K_2 \times 6$

$\boxed{K_2 = \frac{1000}{6}}$

$\therefore$

Q 

$$kl = k_1 l_1 = k_2 l_2 = k_3 l_3$$

$$20 \times 10 = k_1 \times 3 = k_2 \times 5 = k_3 \times 2$$

$$k_1 = \frac{200}{3} \qquad k_2 = \frac{200}{5} \qquad k_3 = \frac{200}{2}$$

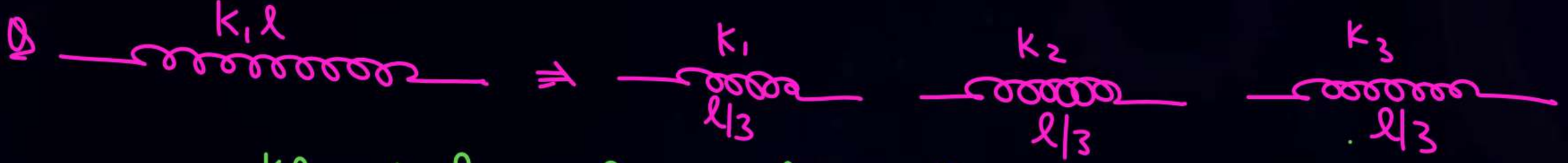
$$200 = 5k_2$$

Q 

$$Kl = K_1 \frac{l}{2} = K_2 \frac{l}{2}$$

$$\boxed{K_1 = 2K} \qquad Kl = K_2 \frac{l}{2}$$

$$\boxed{K_2 = 2K}$$

Q 

$$Kl = K_1 \frac{l}{3} = K_2 \frac{l}{3} = K_3 \frac{l}{3}$$

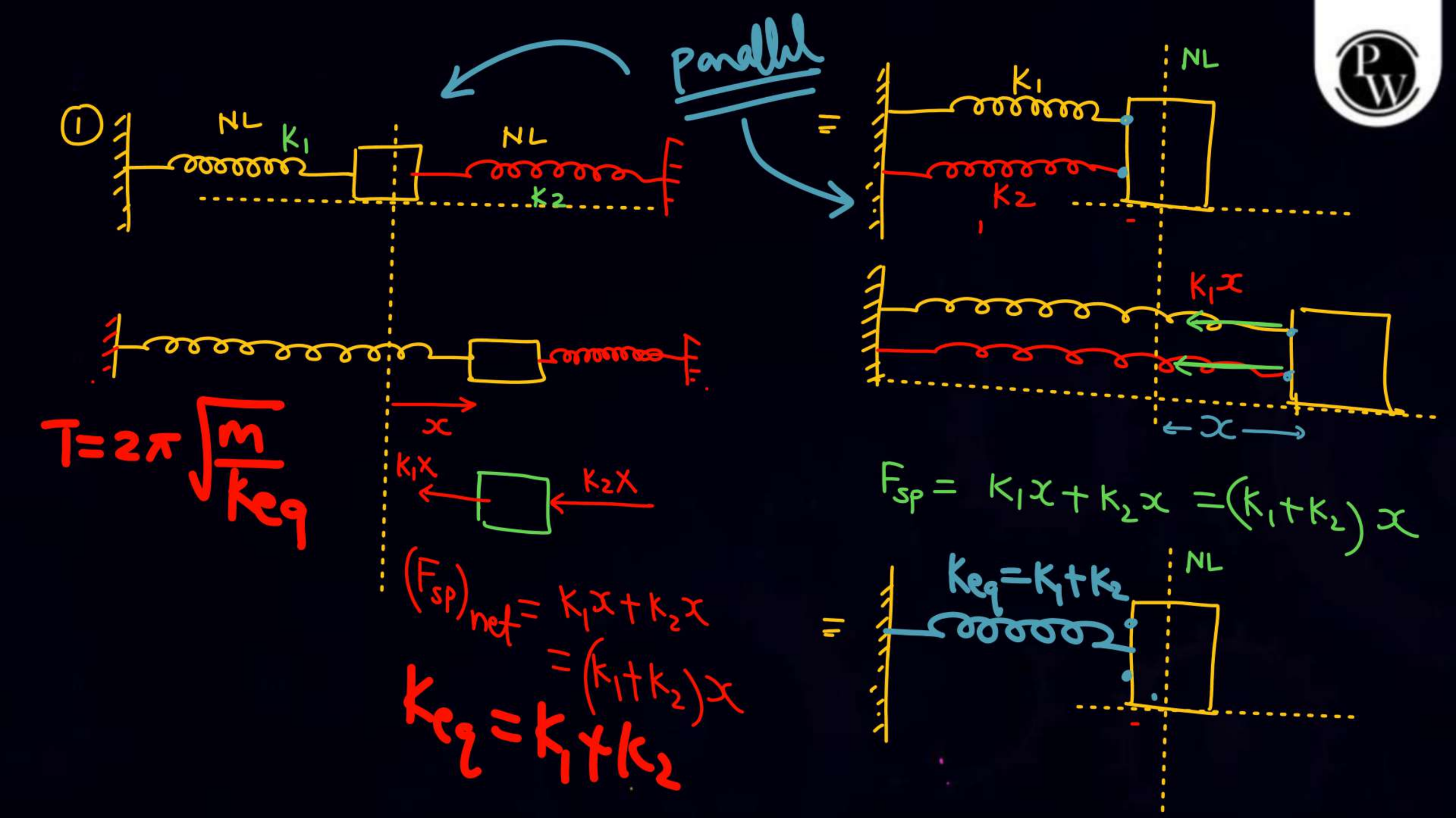
$$\boxed{K_1 = K_2 = K_3 = 3K}$$

Agar ek spring ko 2 equal parts me kata ⟶ har tukde ka $k' = 2k$
(k)

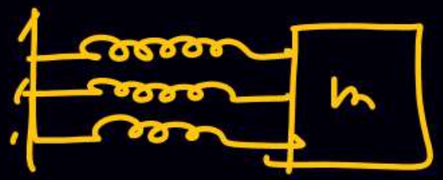
" " 3 " " ⟶ " " $k' = 3k$

" " 4 " " ⟶ " $k' = 4k$

" " n " " ⟶ " $k' = nk$


Parallel
NL
K1
K2
NL
K1
K2
NL
K1x
x
x
K1x
K2x
$T = 2\pi\sqrt{\frac{m}{k_{eq}}}$
$F_{sp} = k_1x + k_2x = (k_1 + k_2)x$
$(F_{sp})_{net} = k_1x + k_2x$
$= (k_1 + k_2)x$
$k_{eq} = k_1 + k_2$
$k_{eq} = k_1 + k_2$
NL

If spring are in parallel



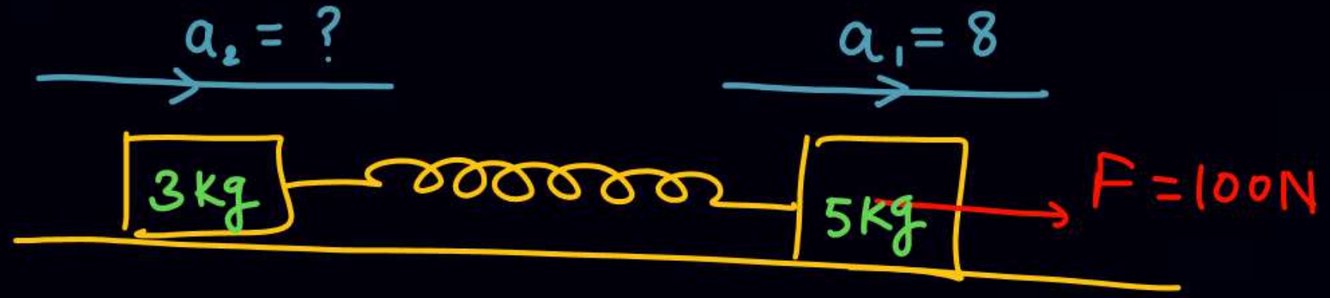
$K_{eq} = K_1 + K_2 + K_3 + - -$

If spring are in series.

$$\frac{1}{K_{eq}} = \frac{1}{K_1} + \frac{1}{K_2} + \frac{1}{K_3}$$

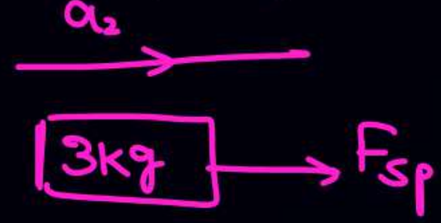
Resistance ke Result ka Ulta ⇒ Capacitor Spring

Q

Q 

find acc. of 3kg & spring force.

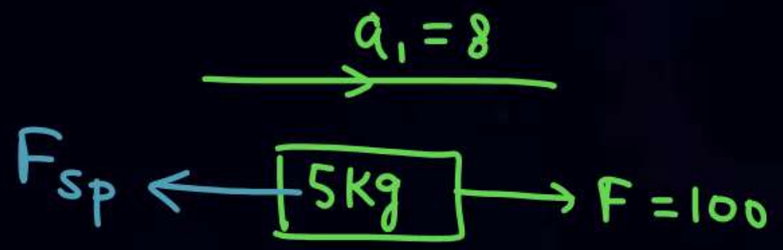
Sol^n



$F_{sp} = 3 \times a_2$

$60 = 3 \times a_2$

$\boxed{a_2 = 20}$



$100 - F_{sp} = 5 \times 8$

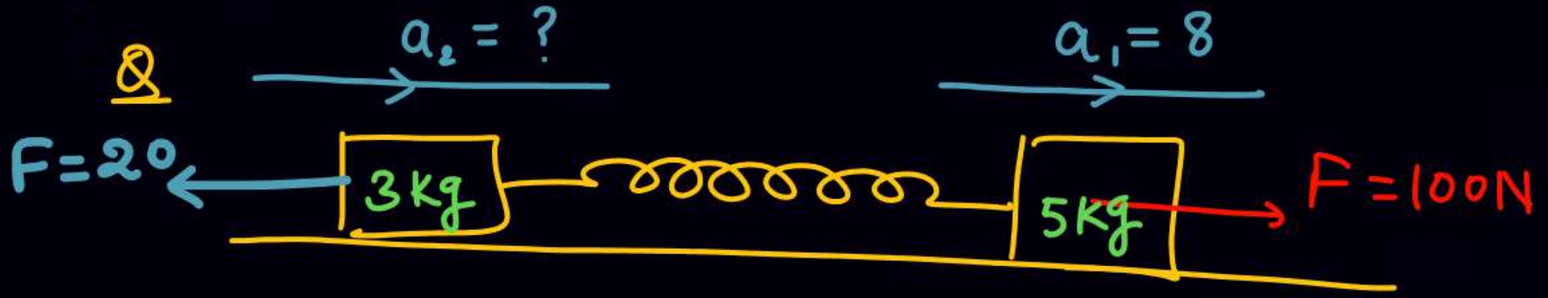
$\boxed{F_{sp} = 60}$

$(\vec{F}_{net})_{ext} = m_1\vec{a}_1 + m_2\vec{a}_2 + \dots$

$100 = 5 \times 8 + 3a_2$

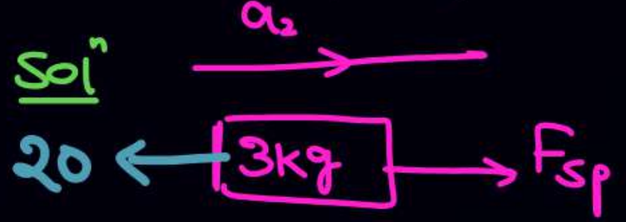
$\boxed{a_2 = 20}$

Q



find acc. of 3kg & spring force.

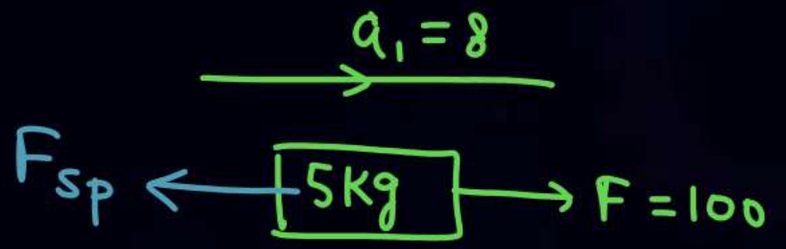
Soln



$F_{sp} - 20 = 3 \times a_2$

$60 - 20 = 3a_2$

$\boxed{a_2 = 40/3}$



$100 - F_{sp} = 5 \times 8$

$\boxed{F_{sp} = 60}$

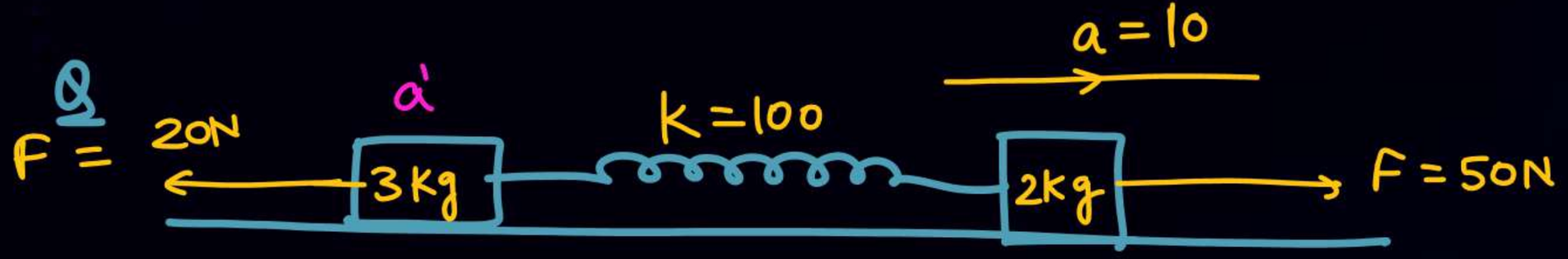
***

$\left(\vec{F}_{net}\right)_{ext} = m_1\vec{a}_1 + m_2\vec{a}_2 + \ldots$

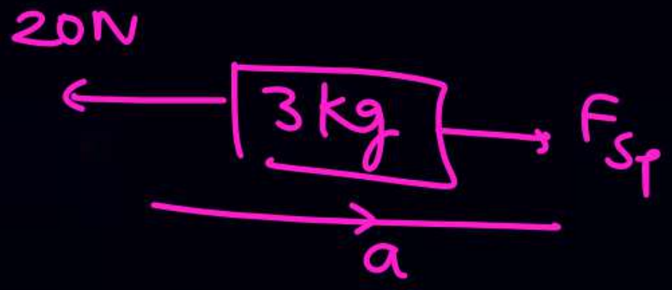
$100 - 20 = 5 \times 8 + 3a_2$

$a_2 = 40/3$

Q



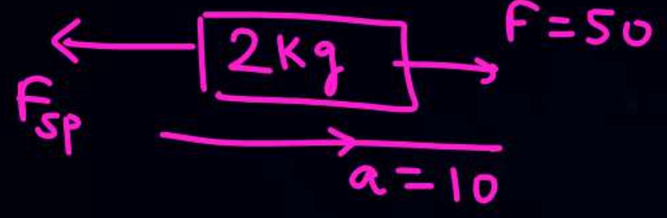
① a_{cc} of 3kg and spring force.



$F_{sp} - 20 = 3 \times a$

$30 - 20 = 3a$

$a = 10/3$ ✓



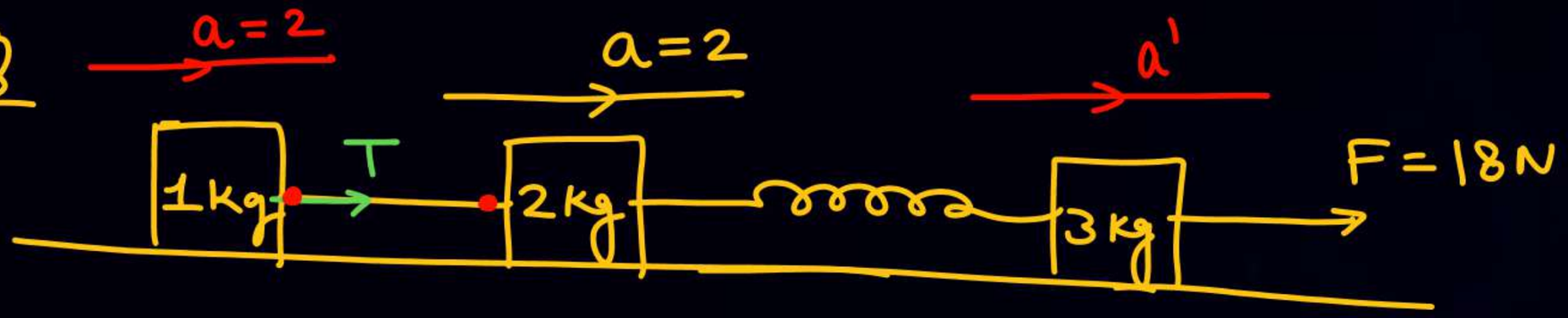
$50 - F_{sp} = 2 \times 10$

$F_{sp} = 30$

$30 = 20 + 3a'$

$a' = 10/3$

Q



① find acc. of each block spring force & tension

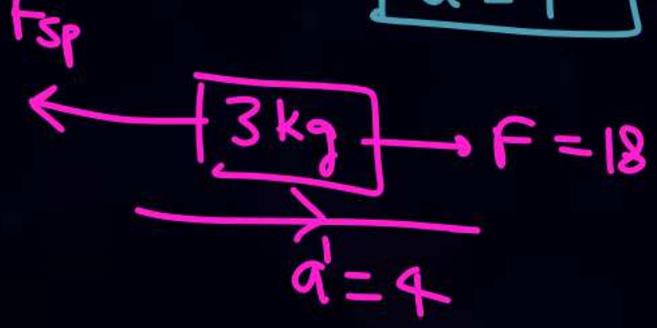
Sol^{n}

$18 = 1 \times 2 + 2 \times 2 + 3a'$

$18 = 6 + 3a'$

$\boxed{a' = 4}$

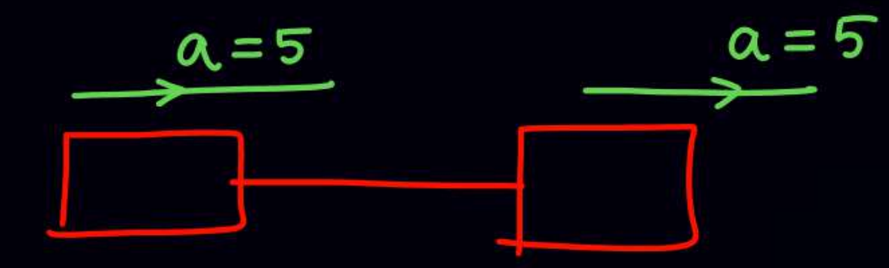
$T = 1 \times 2$

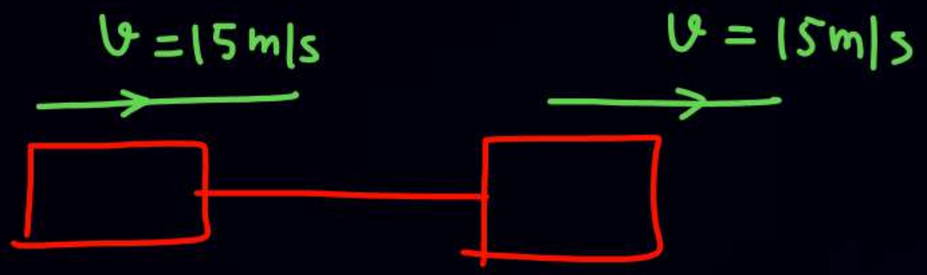


$18 - F_{sp} = 3 \times 4$

$\boxed{F_{sp} = 6}$

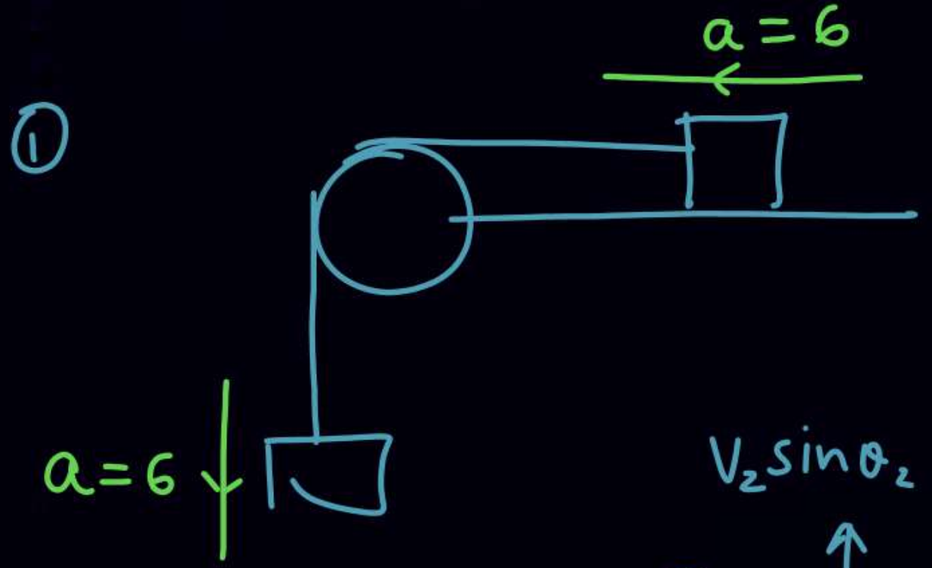
Constraint motion





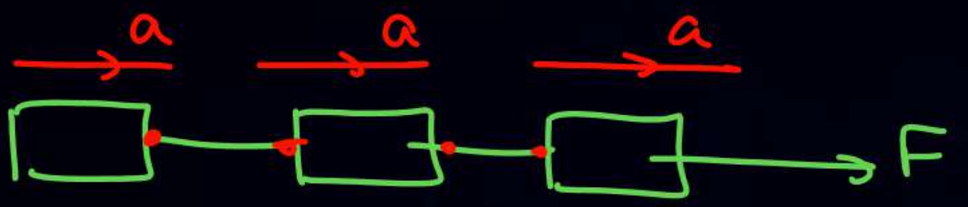
* For a taut string.
magnitude of component of acc or velocity along the String remains Same.

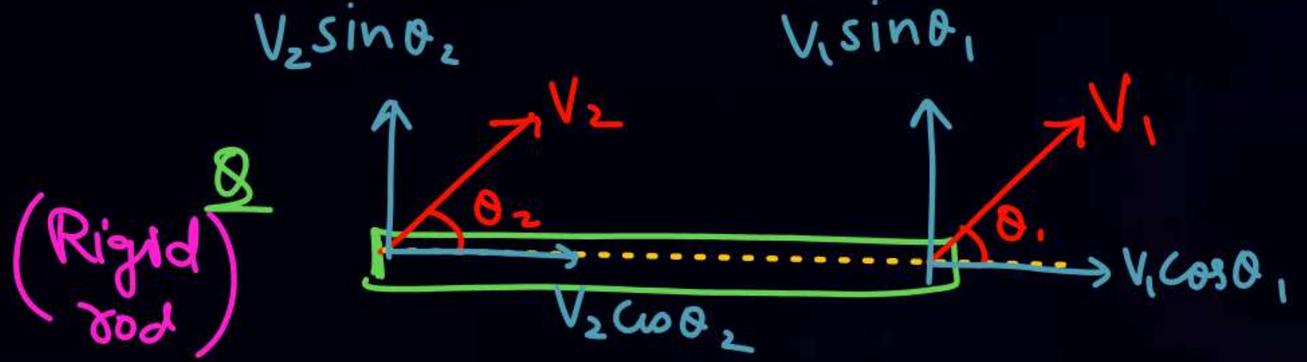
* Same ≡ rod, rigid



(1)

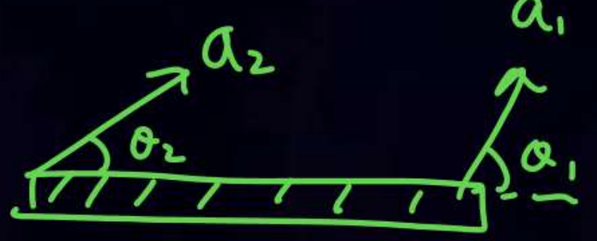
(2)





(Rigid rod)

$V_2 \cos\theta_2 = V_1 \cos\theta_1$



$a_1 \cos\theta_1 = a_2 \cos\theta_2$

Homework

- yesterday KPP

join it

THANK YOU