YAKEEN NEET 2.0

2026

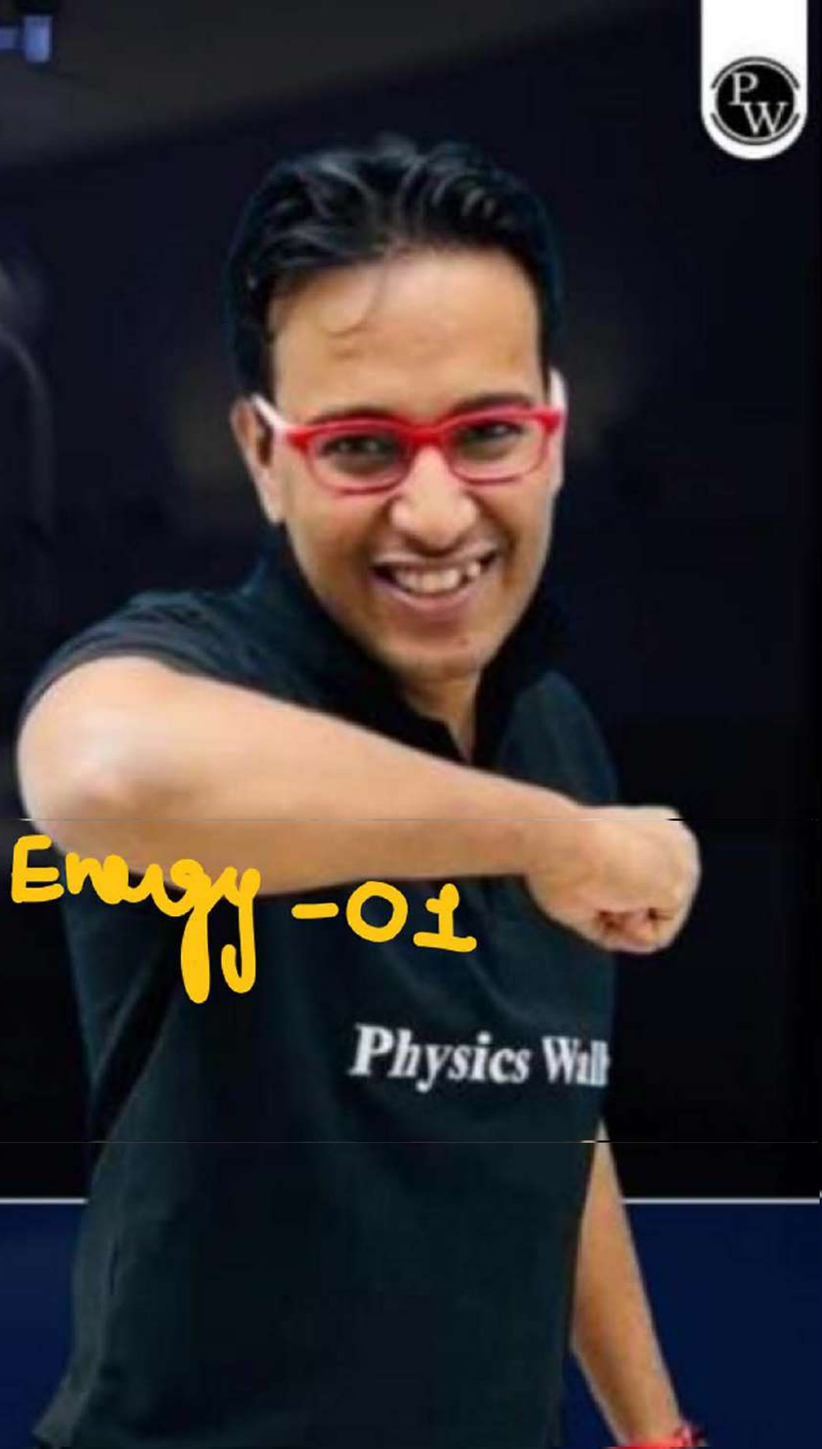
Work Power Energy -01

Work, Energy and Power

PHYSICS

Lecture -01

By - Saleem Ahmed Sir



Todays Goal

- Circular motion & banking of road.
- work power energy.

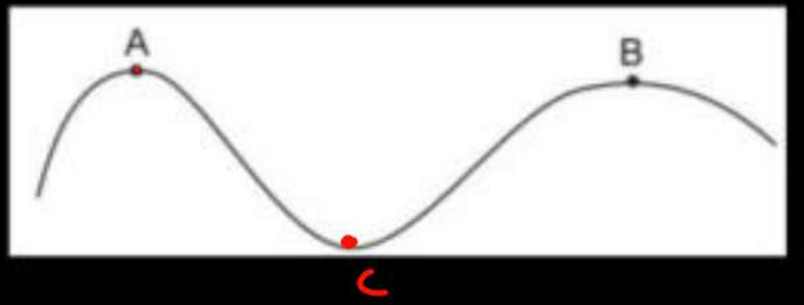
Next class

H/W

H/W

3. A car moves at a constant speed on a road as shown in figure (7-Q2). The normal force by the road on the car is N_A and N_B when it is at the points A and B respectively.

(a) $N_A = N_B$ (b) $N_A > N_B$ (c) $N_A < N_B$ (d) insufficient information to decide the relation of N_A and N_B.



Next class ⇒ will Discuss sum.

Ans : (c)

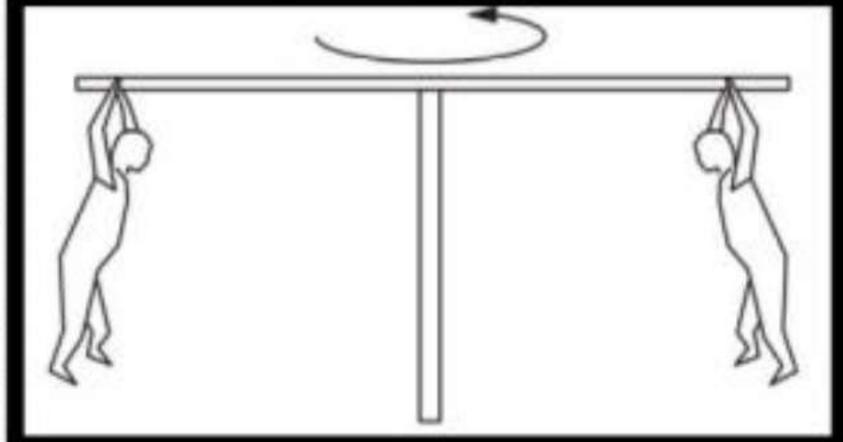
OBJECTIVE I

1. When a particle moves in a circle with a uniform speed
(a) its velocity and acceleration are both constant
(b) its velocity is constant but the acceleration changes
(c) its acceleration is constant but the velocity changes
(d) its velocity and acceleration both change.

Ans : (d)

HCV Hlw

23. In a children's park a heavy rod is pivoted at the centre and is made to rotate about the pivot so that the rod always remains horizontal. Two kids hold the rod near the ends and thus rotate with the rod (figure 7-E2). Let the mass of each kid be 15 kg, the distance between the points of the rod where the two kids hold it be 3·0 m and suppose that the rod rotates at the rate of 20 revolutions per minute. Find the force of friction exerted by the rod on one of the kids.



Ans : $(10\ \pi^2\ N)$

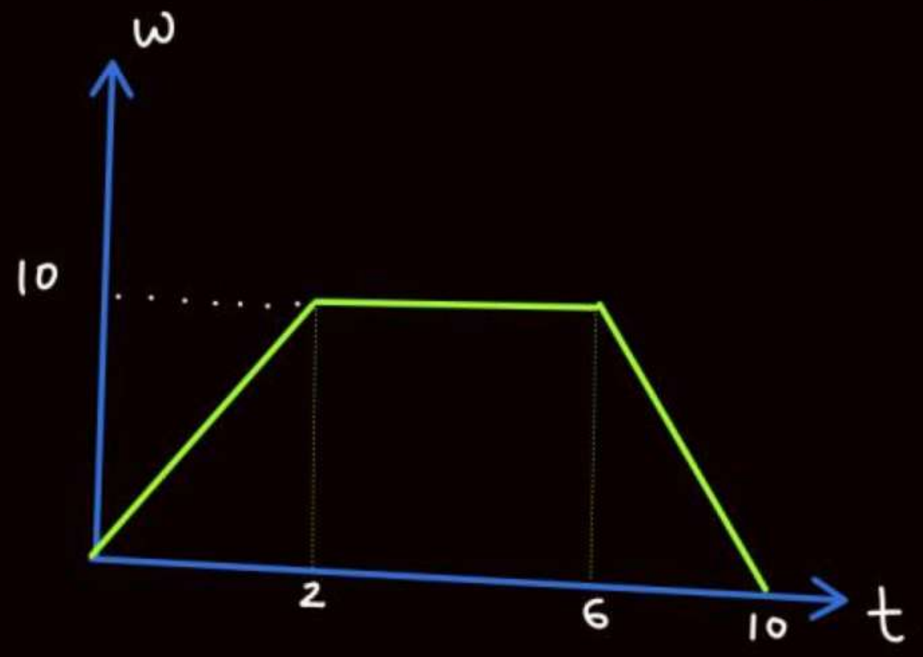
18. A turn of radius 20 m is banked for the vehicles going at a speed of 36 km/h. If the coefficient of static friction between the road and the tyre is 0·4, what are the possible speeds of a vehicle so that it neither slips down nor skids up ?

Ans : Between 14.7 km/h and 54 km/hr

Revision

H/W

particle start moving in a circular path such that its ω vs relation is given as



find

① α at $t = 1$, $t = 4$, $t = 9$

② Total angle rotated by particle.

6. A particle is kept fixed on a turntable rotating uniformly. As seen from the ground the particle goes in a circle, its speed is 20 cm/s and acceleration is 20 cm/s^2. The particle is now shifted to a new position to make the radius half of the original value. The new values of the speed and acceleration will be

(a) 10 cm/s, 10 cm/s^2 (b) 10 cm/s, 80 cm/s^2

(c) 40 cm/s, 10 cm/s^2 (d) 40 cm/s, 40 cm/s^2.

Ans : (a)

8. A stone of mass m tied to a string of length l is rotated in a circle with the other end of the string as the centre. The speed of the stone is v. If the string breaks, the stone will move

(a) towards the centre
(b) away from the centre
(c) along a tangent
(d) will stop.

Ans : (c)

9. A coin placed on a rotating turntable just slips if it is placed at a distance of 4 cm from the centre. If the angular velocity of the turntable is doubled, it will just slip at a distance of

(a) 1 cm (b) 2 cm (c) 4 cm (d) 8 cm.

Ans : (a)

3. A particle moves in a circle of radius 1·0 cm at a speed given by $v = 2{\cdot}0\ t$ where v is in cm/s and t in seconds. (a) Find the radial acceleration of the particle at $t = 1$ s. (b) Find the tangential acceleration at $t = 1$ s. (c) Find the magnitude of the acceleration at $t = 1$ s.

Ans : (a) 4.0 cm/s^2; (b) 2.0 cm/s^2; (c) $\sqrt{20}$ cm/s^2

2. Two cars having masses m_1 and m_2 move in circles of radii r_1 and r_2 respectively. If they complete the circle in equal time, the ratio of their angular speeds ω_1 / ω_2 is

(a) m_1 / m_2 (b) r_1 / r_2 (c) $m_1 r_1 / m_2 r_2$ (d) 1.

Ans : (d)

OBJECTIVE I

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(a) its velocity and acceleration are both constant
(b) its velocity is constant but the acceleration changes
(c) its acceleration is constant but the velocity changes
(d) its velocity and acceleration both change.

Ans : (d)

8. A circular road of radius 50 m has the angle of banking equal to 30°. At what speed should a vehicle go on this road so that the friction is not used ?

Ans : (17 m/s)

6. A park has a radius of 10 m. If a vehicle goes round it at an average speed of 18 km/hr, what should be the proper angle of banking ?

Ans : $\tan^{-1}(1/4)$

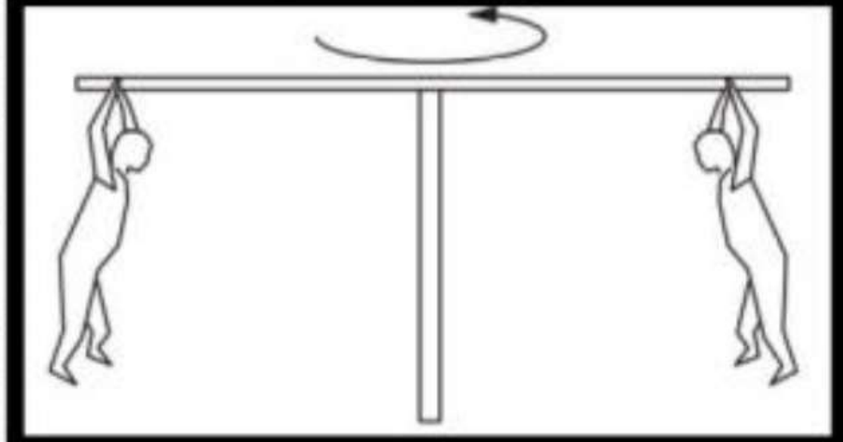
4. A scooter weighing 150 kg together with its rider moving at 36 km/hr is to take a turn of radius 30 m. What horizontal force on the scooter is needed to make the turn possible ?

Ans : 500 N

14. The bob of a simple pendulum of length 1 m has mass 100 g and a speed of 1·4 m/s at the lowest point in its path. Find the tension in the string at this instant.

Ans : 1.2 N

23. In a children's park a heavy rod is pivoted at the centre and is made to rotate about the pivot so that the rod always remains horizontal. Two kids hold the rod near the ends and thus rotate with the rod (figure 7-E2). Let the mass of each kid be 15 kg, the distance between the points of the rod where the two kids hold it be 3·0 m and suppose that the rod rotates at the rate of 20 revolutions per minute. Find the force of friction exerted by the rod on one of the kids.



Ans : $(10\ \pi^2\ N)$

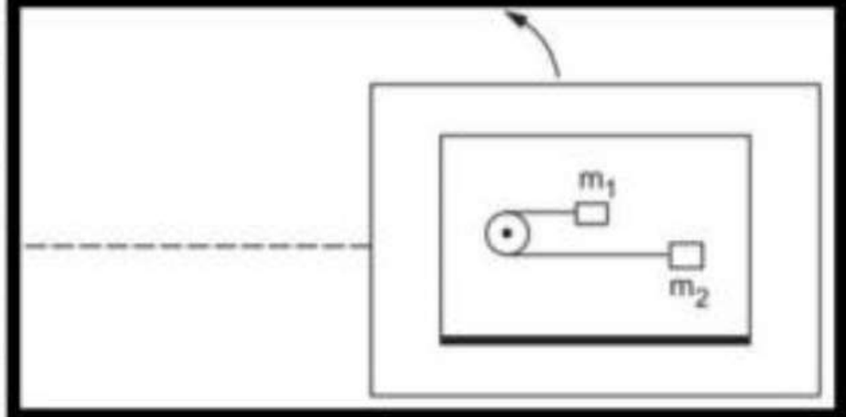
21. A block of mass m is kept on a horizontal ruler. The friction coefficient between the ruler and the block is μ. The ruler is fixed at one end and the block is at a distance L from the fixed end. The ruler is rotated about the fixed end in the horizontal plane through the fixed end. (a) What can the maximum angular speed be for which the block does not slip ? (b) If the angular speed of the ruler is uniformly increased from zero at an angular acceleration α, at what angular speed will the block slip ?

Ans : (a) $\sqrt{\mu g / L}$ (b) $\left[\left(\frac{\mu g}{L}\right)^2 - \alpha^2\right]^{1/4}$

18. A turn of radius 20 m is banked for the vehicles going at a speed of 36 km/h. If the coefficient of static friction between the road and the tyre is 0·4, what are the possible speeds of a vehicle so that it neither slips down nor skids up ?

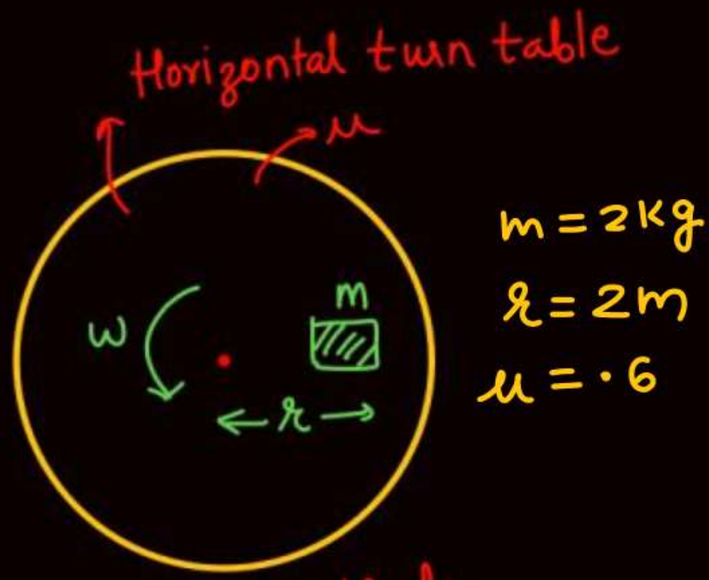
Ans : Between 14.7 km/h and 54 km/hr

30. A table with smooth horizontal surface is placed in a cabin which moves in a circle of a large radius R (figure 7-E5). A smooth pulley of small radius is fastened to the table. Two masses m and $2m$ placed on the table are connected through a string going over the pulley. Initially the masses are held by a person with the strings along the outward radius and then the system is released from rest (with respect to the cabin). Find the magnitude of the initial acceleration of the masses as seen from the cabin and the tension in the string.



Ans : $\frac{\omega^2 R}{3}, \frac{4}{3} m\omega^2 R$

Q



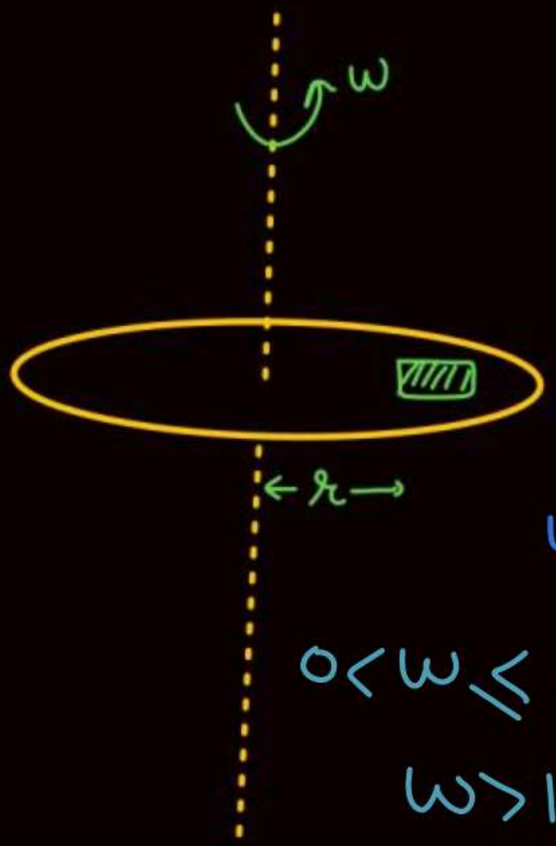
$m = 2kg$

$r = 2m$

$u = 0.6$

① Find w_{max} so that mass remains at rest wrt turn table.

② w_{min} so that block slip. $= 1.73$



$f = m r w^2$

$0.6 \times 20 = 2 \times 2 \times w^2$

$w = \sqrt{3} = 1.73$

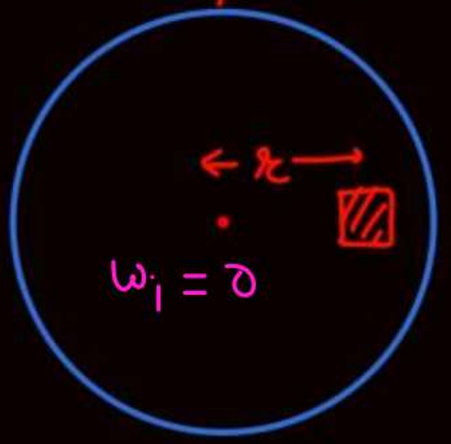
$0 < w \leq 1.73 \Rightarrow$ Nahi fisklga

$w > 1.73 \Rightarrow$ Fislega

(**)

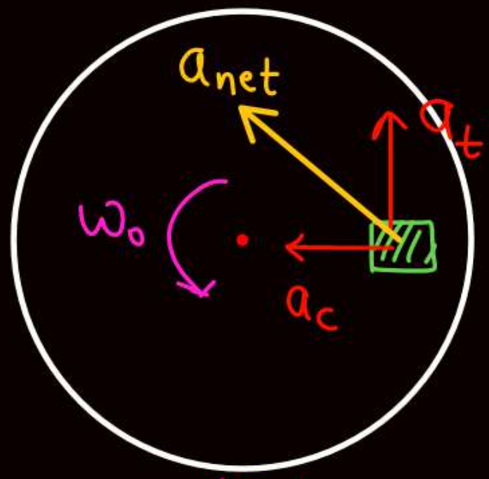
Q A turn table start rotating from rest with const angular acc α at $t=0$
At what 'ω' coin will slip & at what time.

Top view



Sol^n

when coin is just abt to slip.



$a_t = R\alpha$

$a_{net} = \sqrt{a_t^2 + a_c^2}$

$(f_s)_{max} = \mu mg = ma_{net} = m\sqrt{(R\alpha)^2 + (R\omega^2)^2}$

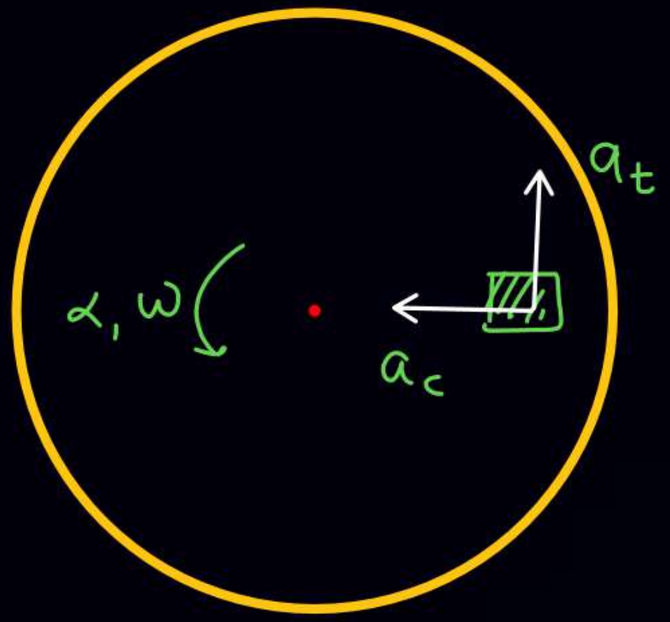
$\omega_f = \checkmark$

$\omega_f = \omega_i + \alpha t$

$\omega_f = 0 + \alpha t$

$t = \checkmark$

✓



$$f\sin\theta = ma_t$$
$$f\cos\theta = ma_c$$

Sqr & add, $f^2\sin^2\theta + f^2\cos^2\theta = (ma_t)^2 + (ma_c)^2$

$$\Rightarrow \quad f = \sqrt{(mR\alpha)^2 + m(R\omega^2)^2}$$

18. A block of mass m = 20 kg is kept at a distance R = 1m from central axis of rotation of a round turn table (A table whose surface can rotate about central axis). Table starts from rest and rotates with constant angular acceleration, $\alpha = 3$ rad/sec^2. The friction coefficient between block and table is $\mu = 0.5$. At time $t = \frac{x}{3}$ sec from starting of motion (i.e. t = 0 sec) the block is just about to slip. Find the value of x.

एक m = 20 kg द्रव्यमान का ब्लॉक घूर्णी टेबल (ऐसी टेबल जिसकी सतह केन्द्रीय अक्ष के सापेक्ष घूर्णन कर सकती है) की केन्द्रीय घूर्णन अक्ष से R = 1m की दूरी पर रखा है। टेबल विरामावस्था से प्रारम्भ होती है तथा नियत कोणीय त्वरण $\alpha = 3$ rad/sec^2 से घूर्णन करती है। ब्लॉक तथा टेबल के मध्य घर्षण गुणांक $\mu = 0.5$ है। गति के प्रारम्भ से (अर्थात् t =0 sec से) $t = \frac{x}{3}$ sec समय पर ब्लॉक बस फिसलने ही वाला है। x का मान ज्ञात कीजिये।

Ans. 2

18. A block of mass m = 20 kg is kept at a distance R = 1m from central axis of rotation of a round turn table (A table whose surface can rotate about central axis). Table starts from rest and rotates with constant angular acceleration, $\alpha = 3$ rad/sec^2. The friction coefficient between block and table is $\mu = 0.5$. At time $t = \frac{x}{3}$ sec from starting of motion (i.e. t = 0 sec) the block is just about to slip. Find the value of x.

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$\omega = \omega_i + \alpha t$

$2 = 0 + 3t$

$t = 2/3$

$f = \mu mg = m\sqrt{(R\alpha)^2 + (R\omega^2)^2}$

$25 = 9 + 1 \times \omega^4$

$\omega = 2$

Ans. 2

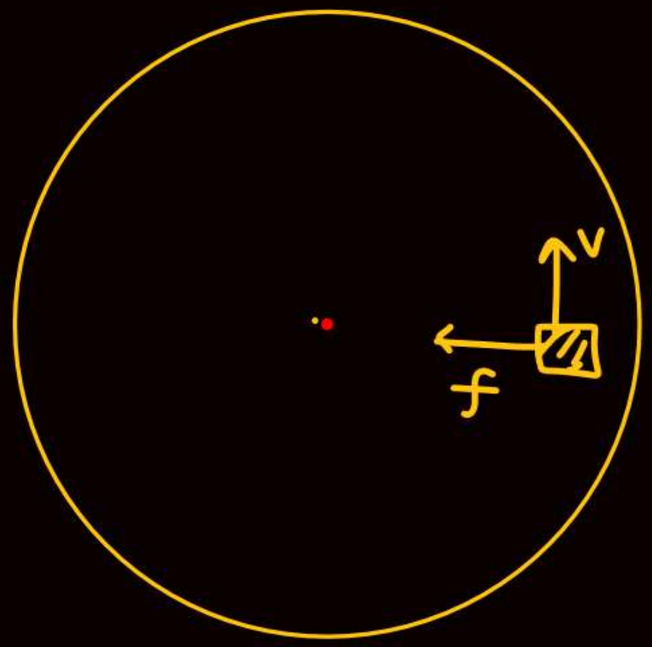
Q Find the max speed that a vehical can have moving in a circle of radius R with const speed v. (surface is horizontal, cof of friction μ)

Soln $f = \frac{mv^2}{R}$

$(f_s)_{max} = \mu_s mg = \frac{mv^2}{R}$

$\boxed{V = \sqrt{\mu g R}}$

$\mu = \mu_s$



$v = \sqrt{Rg \tan(\theta + \phi)}$

$\theta = 0$

$v = \sqrt{Rg \tan\phi}$

$= \sqrt{Rg\mu}$

A particle is revolving in a circle of radius 1m with an angular speed of 12 rad/s. At $t = 0$, it was subjected to a constant angular acceleration α and its angular speed increased to $(480/\pi)$ rotation per minute (rpm) in 2 sec. Particle then continues to move with attained speed. Calculate

(i) angular acceleration of the particle,

(ii) tangential velocity of the particle as a function of time.

(iii) acceleration of the particle at $t = 0.5$ second and at $t = 3$ second

(iv) angular displacement at $t = 3$ second.

एक कण 1 m त्रिज्या वाले वृत्ताकार पथ में 12 rad/s की कोणीय चाल से चक्कर लगा रहा है। $t = 0$ पर इसे नियत कोणीय त्वरण α दिया जाता है तथा इसकी कोणीय चाल 2 सेकण्ड में $(480/\pi)$ rpm तक बढ़ जाती है। अब कण इसी चाल से चक्कर लगाता रहता है। ज्ञात कीजिए

(i) कण का कोणीय त्वरण।

(ii) समय के फलन के रूप में कण का स्पशरिखीय वेग।

(iii) $t = 0.5$ s तथा $t = 3$ s पर कण का त्वरण।

(iv) $t = 3$ s पर कोणीय विस्थापन।

Ans. (i) 2 rad/s^2

(ii) $12+2t$ for $t \leq 2s$, 16 for $t \geq 2s$

(iii) $a = 169.01$ m/s^2

(iv) 44 rad

A particle is travelling in a circular path of radius 4m. At a certain instant the particle is moving at 20m/s and its acceleration is at an angle of 37^o from the direction to the centre of the circle as seen from the particle

(i) At what rate is the speed of the particle increasing?

(ii) What is the magnitude of the acceleration?

एक कण 4 m त्रिज्या वाले वृत्ताकार पथ में गति कर रहा है। किसी क्षण पर कण 20 m/s से गतिशील है। कण से देखने पर इस क्षण इसका त्वरण वृत्त के केन्द्र से 37^o कोण पर है।

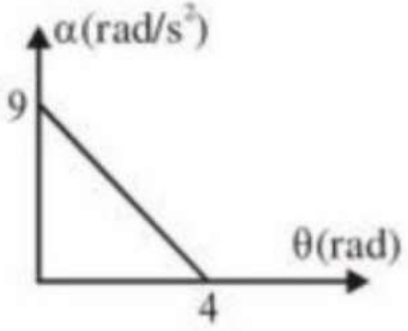
(i) कण की चाल किस दर से बढ़ रही है?

(ii) त्वरण का परिमाण ज्ञात कीजिए।

Ans. (i) $75 m/s^2$, (ii) $125 m/s^2$

A particle starts moving in a non-uniform circular motion, has angular acceleration as shown in figure. The angular velocity at the end of 4 radian is given by ω rad/s then find the value of ω.

एक कण असमरूप वृत्ताकार गति कर रहा है, जिसका कोणीय त्वरण चित्रानुसार परिवर्तित हो रहा है। 4 रेडियन के बाद कोणीय वेग ω रेडियन/सेकण्ड हो तो ω का मान ज्ञात कीजिए।



Ans. 6

A cyclist speeding at 18 km/h on a level road takes a sharp circular turn of radius 3 m without reducing the speed. The co~efficient of static- friction between the tyres and the road is 0.1. Will the cyclist slip while taking the turn?

एक सीधी सड़क पर 18 km/h की चाल से गतिशील एक साइकिल सवार अपनी चाल को कम किए बिना 3m त्रिज्या वाले एक तीक्ष्ण वृत्ताकार घुमाव पर मुड़ता है। टॉयरों तथा सड़क के मध्य स्थैतिक घर्षण गुणांक 0.1 है। क्या मुड़ने के दौरान साइकिल सवार फिसल जाएगा ?

$18 \times \frac{5}{18} = 5 \text{ m/s}$

Ans. Yes, $a_c = 8$, $\mu g = 1$

$$V_{max} = \sqrt{\mu g R} = \sqrt{\frac{1}{10} \times 10 \times 3} = \sqrt{3} = 1.73$$

$a = 2g$

A particle is moving along a circular path of radius R in such a way that at any instant magnitude of radial acceleration & tangential acceleration are equal. If at $t = 0$ velocity of particle is V_0. Find the speed of the particle after time $t = \frac{R}{2V_0}$

→ Normal acc, (centripetal ace)

$= t_0$

एक कण R त्रिज्या के वृत्ताकार पथ में इस प्रकार गति करता है कि प्रत्येक क्षण इसके त्रिज्यीय त्वरण तथा स्पशरिखीय त्वरण का परिमाण बराबर है। यदि $t = 0$ पर कण का वेग V_0 है तो समय $t = \frac{R}{2V_0}$ के पश्चात् कण की चाल ज्ञात कीजिए।

H/W

Ans. $2V_0$

$a_c = a_t$

$\frac{v^2}{R} = \frac{dv}{dt}$

$a_t = \frac{d(\text{speed})}{dt} = \frac{dv}{dt}$

$\int_0^{t_0} \frac{dt}{R} = \int_{v_0}^{v_f} \frac{dv}{v^2} = \frac{t_0}{R}$

Two blocks of mass m_1=10kg and m_2=5kg connected to each other by a massless inextensible string of length 0.3m are placed along a diameter of a turn table. The coefficient of friction between the table and m_1 is 0.5 while there is no friction between m_2 and the table. The table is rotating with an angular velocity of 10rad/sec about a vertical axis passing through its centre. The masses are placed along the diameter of the table on either side of the centre O such that m_1 is at a distance of 0.124 m from O. The masses are observed to be at rest with respect to an observer on the turn table.

(i) Calculate the frictional force on m_1

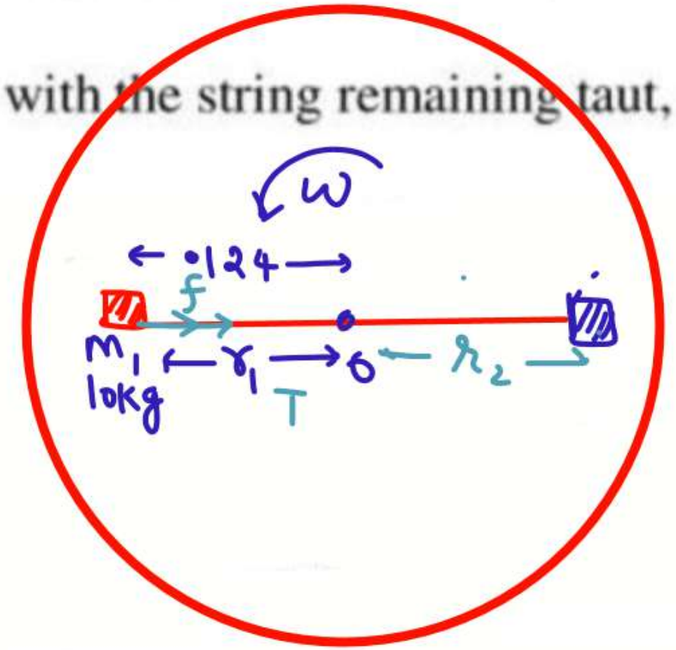
(ii) What should be the minimum angular speed of the turn table so that the masses will slip from this position.

(iii) How should the masses be placed with the string remaining taut, so that there is no frictional force acting on the mass m_1.

(i) $T + f = m_1 r_1 \omega^2$

$T = m_2 r_2 \omega^2$

$f = (m_1 r_1 - m_2 r_2)\omega^2$



$r_2 = .3 - .124$

$= .176$

(b) (ii)

$f = (m_1 r_1 - m_2 r_2)\omega^2 \leq \mu_s m_1 g$

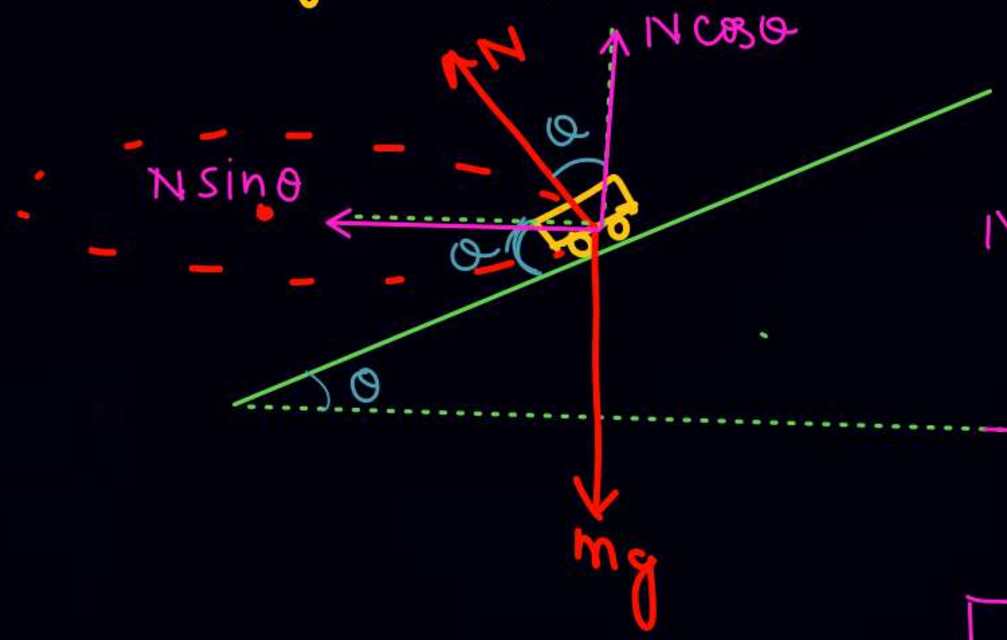
Ans. (i) 36N, (ii) 11.66rad/sec, (iii) 0.1m, 0.2m


θ

Banking of Road

Banking of road

① surface is frictionless ($\mu = 0$)



$$N\sin\theta = \frac{mv^2}{R}$$

$$N\cos\theta = mg$$

$$\tan\theta = \frac{v^2}{Rg}$$

$$\boxed{v = \sqrt{Rg\tan\theta}}$$

② when friction is present

$$v_{max} = \sqrt{Rg\tan(\theta+\phi)}$$

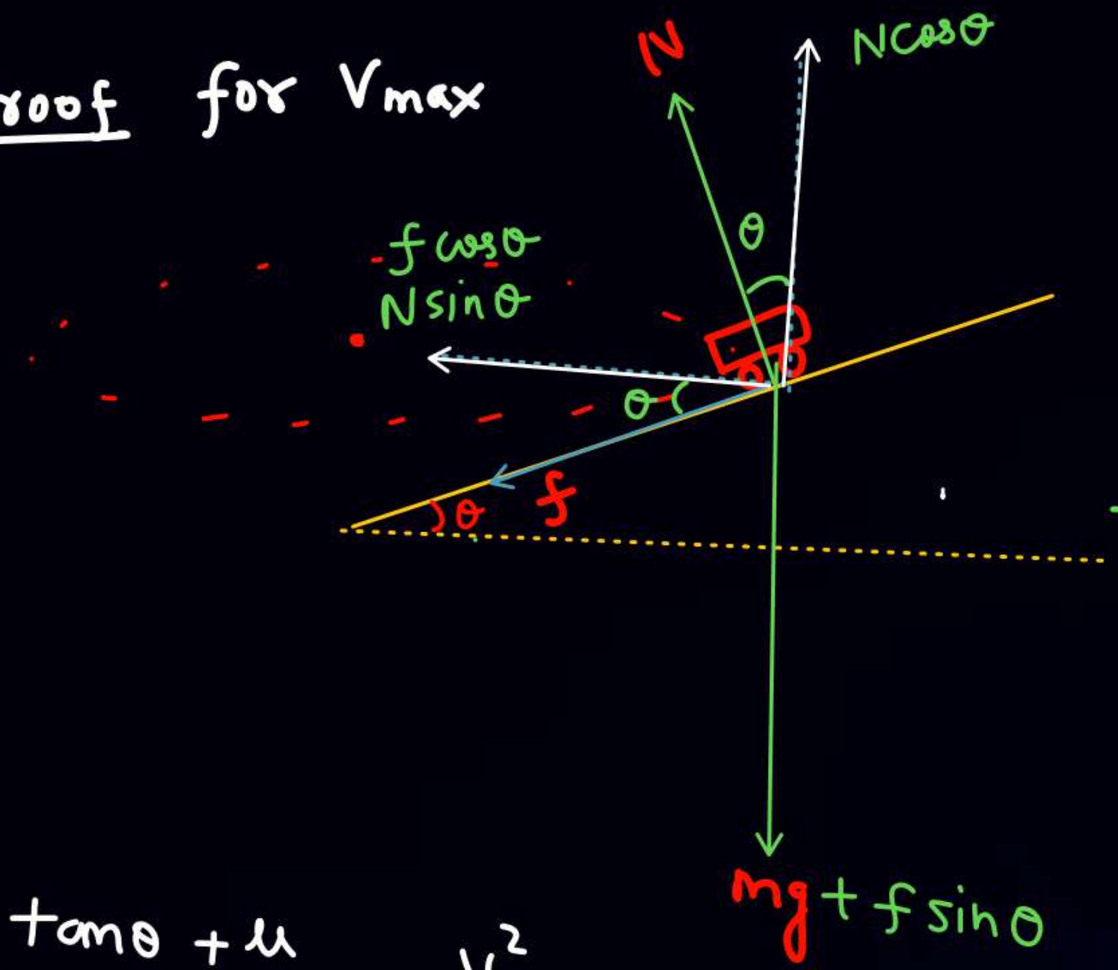
$$v_{min} = \sqrt{Rg\tan(\theta-\phi)}$$

$$\boxed{\mu_s = \tan\phi}$$

Let $\mu_s = \frac{1}{\sqrt{3}} \Rightarrow \boxed{\phi = 30^\circ}$

$$v_{min} \leq v \leq v_{max}$$

Proof for Vmax



$$N\sin\theta + f\cos\theta = \frac{mV^2}{R} \quad \text{— (1)}$$

$$N\cos\theta = f\sin\theta + mg$$

$$N\cos\theta - f\sin\theta = mg \quad \text{— (2)}$$

$$\frac{N\sin\theta + f\cos\theta}{N\cos\theta - f\sin\theta} = \frac{V^2}{Rg}$$

$f = \mu N$ (max)

$$\frac{N\sin\theta + \mu N\cos\theta}{N\cos\theta - \mu N\sin\theta} = \frac{V^2}{Rg}$$

$$\frac{\sin\theta + \mu\cos\theta}{\cos\theta - \mu\sin\theta} = \frac{V^2}{Rg}$$

$$\frac{\tan\theta + \mu}{1 - \mu\tan\theta} = \frac{V^2}{Rg}$$

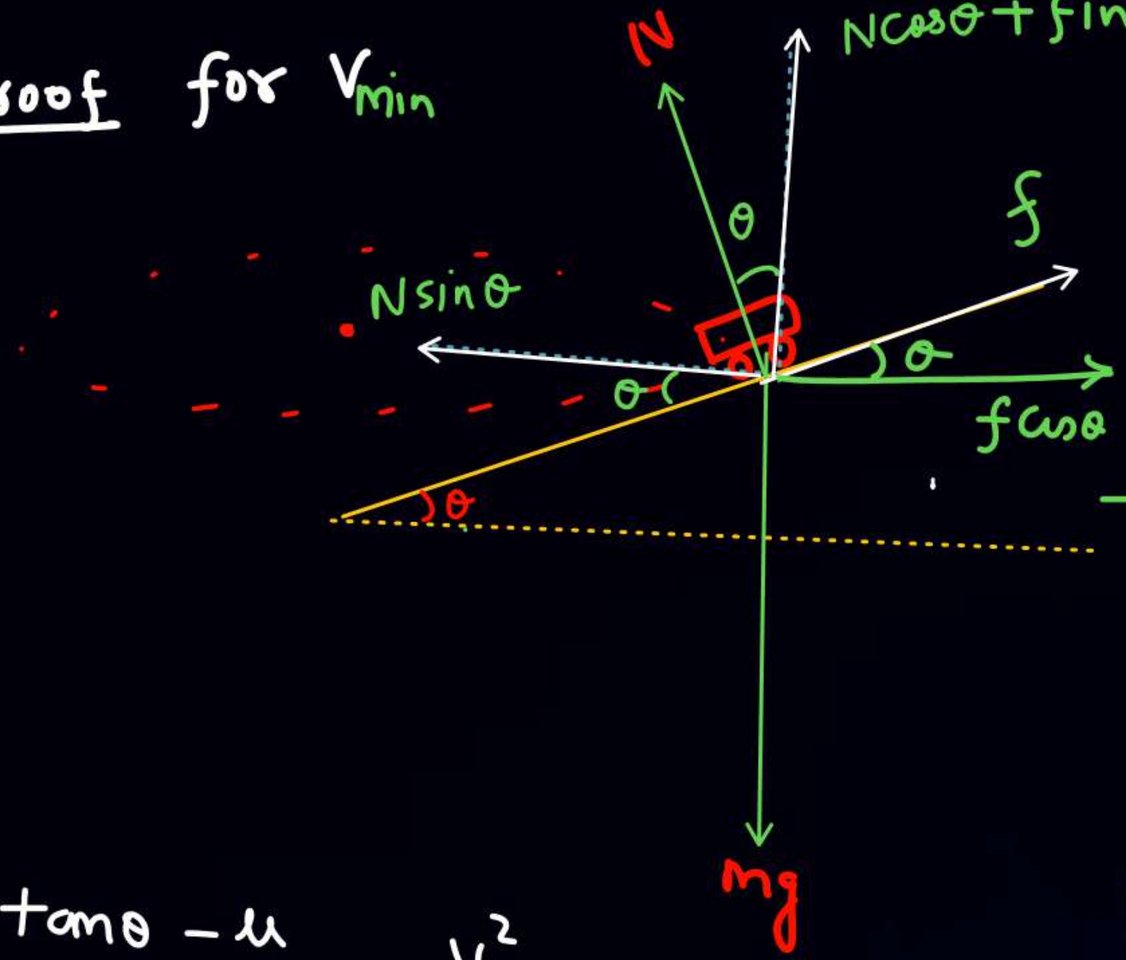
$$\frac{\tan\theta + \mu}{1 - \mu\tan\theta} = \frac{v^2}{Rg}$$

$$\boxed{v_{max} = \sqrt{Rg\tan(\theta + \phi)}}$$

$$\mu = \mu_s = \tan\phi$$

$$\frac{\tan\theta + \tan\phi}{1 - \tan\phi\tan\theta} = \tan(\theta + \phi) = \frac{v^2}{Rg}$$

Proof for V_{min}



$$N\sin\theta - f\cos\theta = \frac{mV^2}{R} \quad \text{— (1)}$$

$$N\cos\theta = f\sin\theta + mg$$

$$N\cos\theta + f\sin\theta = mg \quad \text{— (2)}$$

$$\frac{N\sin\theta - f\cos\theta}{N\cos\theta + f\sin\theta} = \frac{V^2}{Rg}$$

$f = \mu N$

f_{max}

$$\frac{N\sin\theta - \mu N\cos\theta}{N\cos\theta + \mu N\sin\theta} = \frac{V^2}{Rg}$$

$$\frac{\sin\theta - \mu\cos\theta}{\cos\theta + \mu\sin\theta} = \frac{V^2}{Rg}$$

$$\frac{\tan\theta - \mu}{1 + \mu\tan\theta} = \frac{V^2}{Rg}$$

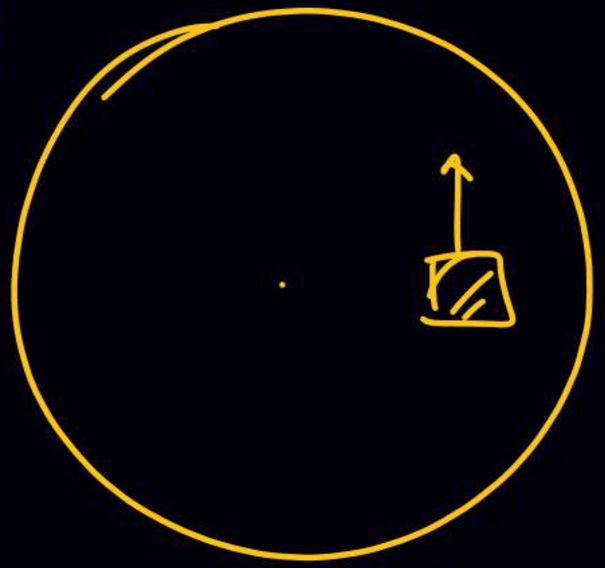
$$\frac{\tan\theta - \mu}{1 + \mu\tan\theta} = \frac{v^2}{Rg}$$

$$\boxed{v_{min} = \sqrt{Rg\tan(\theta - \phi)}}$$

$$\mu = \mu_s = \tan\phi$$

$$\frac{\tan\theta - \tan\phi}{1 + \tan\phi\tan\theta} = \tan(\theta - \phi) = \frac{v^2}{Rg}$$

(1)



$\mu mg = \frac{mv^2}{R}$

(2)

$\mu = \tan\phi$

$v = \sqrt{Rg\tan(\theta \pm \phi)}$

① If $\mu = 0$, $v = \sqrt{Rg\tan\theta}$

Banking of Road

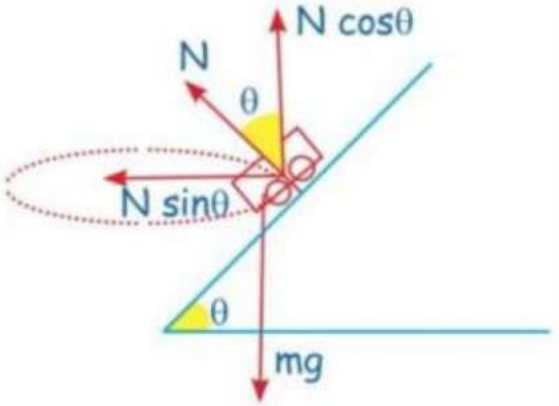
(i) Frictionless

$N\cos\theta = mg$

$N\sin\theta = \frac{mv^2}{R}$

$\tan\theta = \frac{V^2}{Rg}$

$V = \sqrt{Rg\tan\theta}$



Short note

box

SKC

काम का डब्बा

देख भाई JEE MAINS के लिए ये 4 formula बहुत काम के है exam से पहले इन्हे जरूर पढ़के जाना।

★ $V_{max} = \sqrt{\mu g R}$ (Max speed on horizontal plane for safely turn of a bicycle)

★ $V = \sqrt{Rg\tan\theta}$ (banking of road when $\mu = 0$)

★ Banking of road when friction is present

$$V_{max} = \sqrt{Rg\tan(\theta + \phi)}$$

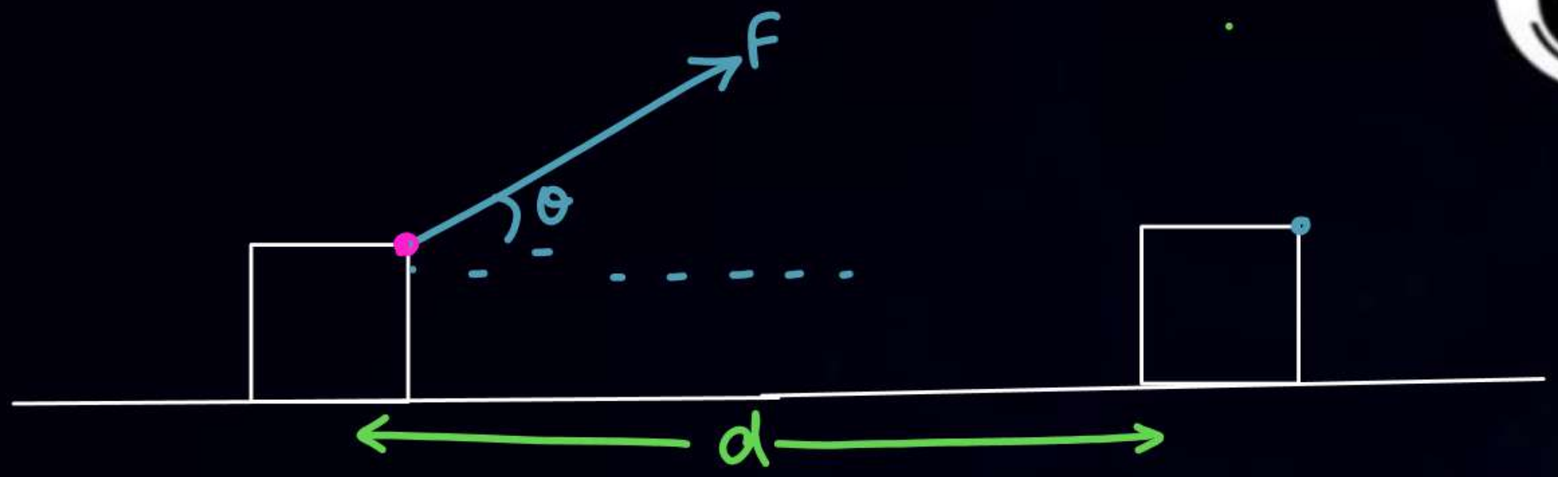
$$V_{min} = \sqrt{Rg\tan(\theta - \phi)} \qquad \tan\theta = \mu_s = \tan\phi$$

Radius of curvature ⟶ Kal

Work Power Energy

Work

WD by const. force



$$(WD)_F = \vec{F} \cdot \vec{d} = F d \cos\theta$$

(No tada-tadi)

SKC

Ye Vo force hai jiska WD hum nikal Rahe hai.

Displacement of point of Application of force.

Angle b/w $\vec{F}$ & $\vec{d}$

Q $\vec{F} = 3\hat{i} + 2\hat{j} + \hat{k}$

$\vec{d} = \hat{i} + t\hat{j} + 4\hat{k}$

Find the $(WD)_{by\ this\ force}$

$= WD = \vec{F} \cdot \vec{d} = 3 + 2 + 4$

$= 9$

Q $\vec{F} = x\hat{i} + 2\hat{j} + \hat{k}$

$\vec{d} = \hat{i} + t\hat{j} + 4\hat{k}$

---

find $x = ?$ so that $(WD)_F = 0$

$WD = F \cdot d$

$0 = x + 2 + 4$

$x = -6$

Q

A force $\vec{F} = 3\hat{i} + 4\hat{j} + 6\hat{k}$ is acting on a particle such that particle moves from A to B. Find WD by this force.

Sol^n

$$WD = \vec{F} \cdot \vec{d}$$

$$\vec{F} = 3\hat{i} + 4\hat{j} + 6\hat{k}$$

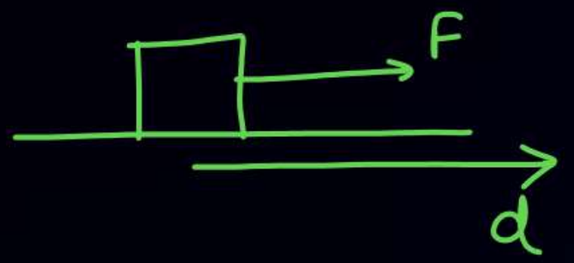
$$\vec{d} = 3\hat{i} + 5\hat{j} + 5\hat{k}$$

$$WD = 9 + 20 + 30 = 59 \text{ J}$$

$(WD)_{\text{by const force}} = \vec{F} \cdot \vec{d} = Fd\cos\theta$

① If $\theta = 0$,

$WD = F.d.$

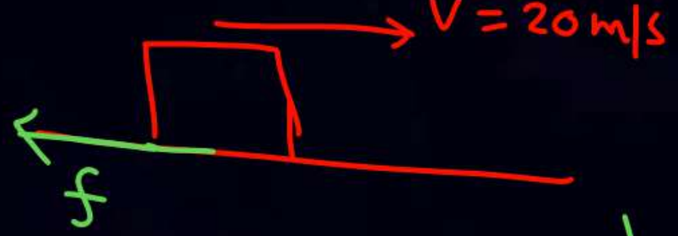


② If $\theta = 180$

$WD = Fd\cos 180 = -F.d$

③ $\theta = 90$ $\quad WD = Fd\cos 90$

$WD = 0$



Saleem bhaiya Style

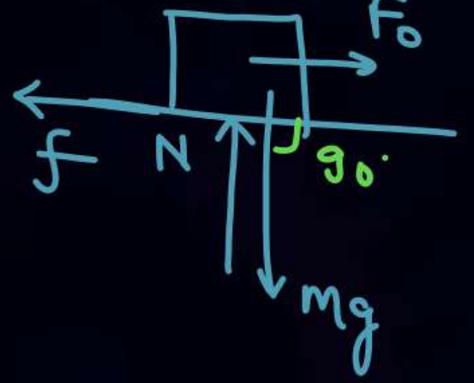
Q

① $(WD)_{\text{by force } F_0} = F_0 \cdot d = 100 \times 10 = 1000$

② $(WD)_{\text{by friction}} = f d \cos 180 = -60 \times 10 = -600$

③ $(WD)_{\text{by normal force}} = 0 \quad (\theta = 90^\circ)$

④ $(WD)_{\text{by gravity}} = 0$



⑤ $(WD)_{\text{by all the force}}$

$= W_{F_0} + W_f + W_g + W_N$

$= 1000 - 600 + 0 + 0$

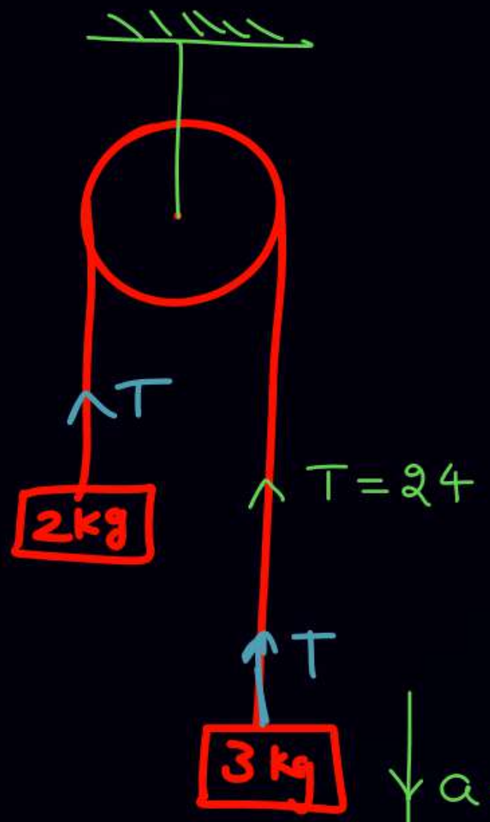
$= 400$ Joule.

⑥ $(WD)_{\text{by net force}} = ?$

$\vec{F}_{net} = 40\hat{i}$; $\vec{d} = 10\hat{i}$

$(WD)_{\text{by net force}} = 40 \times 10 = 400$

Q



t=0
Rest

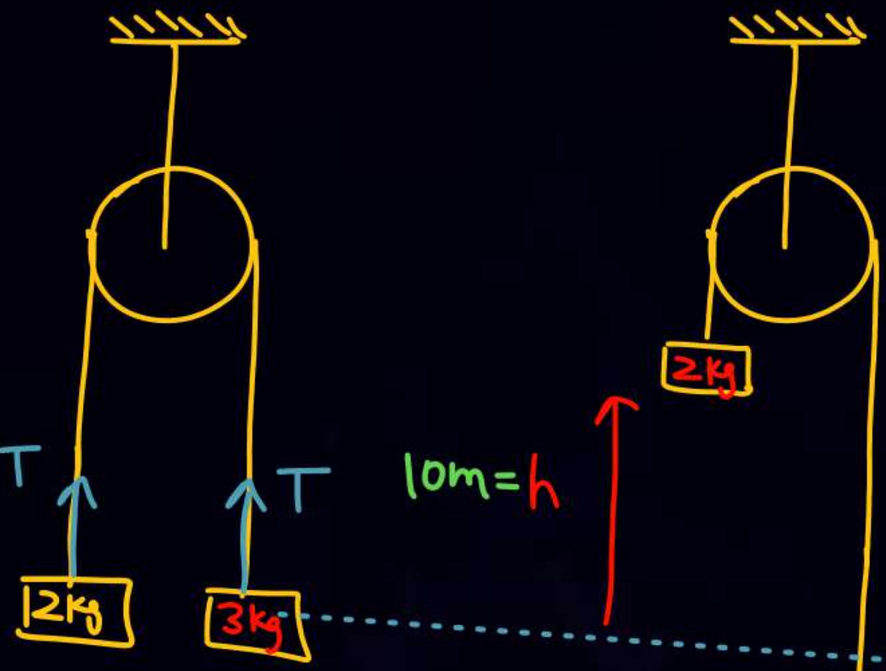
$a = \frac{30-20}{5} = 2$

$80 - T = 3 \times 2$

$T = 24$

Net (WD) by gravity
= 300 − 200
= 100 J

Q



(WD) by gravity on 3kg = +300

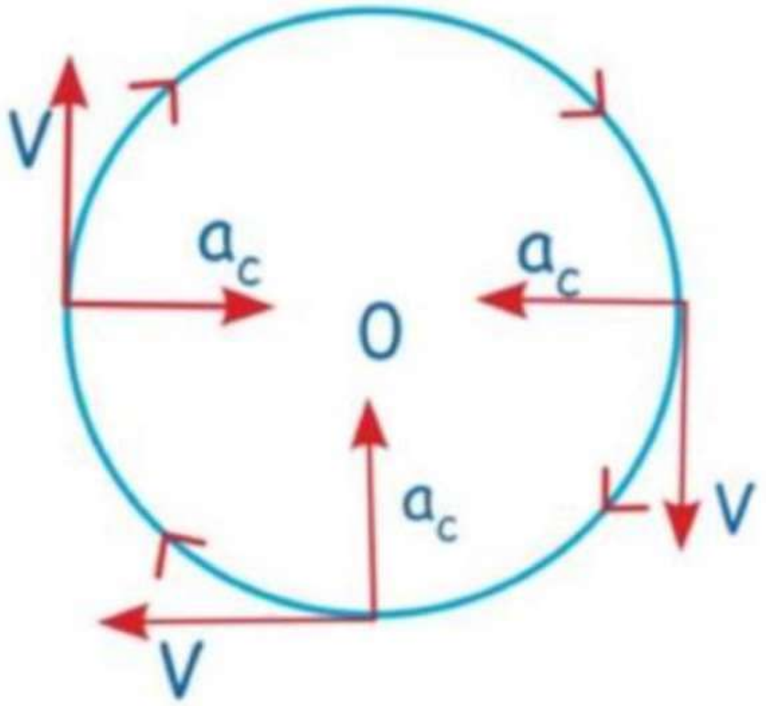
" " " 2kg = −200

(WD) by tension on 2kg = +T·h

(WD) by tension on 3kg = −Th

Net (WD) by tension = Th − Th = 0

Q. A particle is moving in a circular path of radius 4 m with speed 10 m/s in clockwise sense in x-y plane. Find ω, a_t, a_c



Sol. $\omega = \dfrac{V}{R}$

$\omega = 10/4$ or $\vec{\omega} = -2.5\,\hat{k}$,

$a_t = 0$

$a_t = R\alpha \Rightarrow \alpha = 0$

$$a_c = \frac{V^2}{R} = \frac{100}{4} = 25 \text{ (towards centre)}$$

★ $a_n = \frac{v^2}{R} \Rightarrow R = \frac{v^2}{a_n} = ROC$

★ $ROC = R = \frac{v^2}{a_\perp}$

भाई कुछ नही करना बस सबसे पहले normal acc निकाल लो और v^2/a_n करदो यही ROC है और अगर $y = f(x)$ given है means particle moves in a trajectory given by $y = f(x)$ then ROC at any point (x, y) of the trajectory is given by

$$R = \frac{\left[1+\left(\frac{dy}{dx}\right)^2\right]^{3/2}}{\frac{d^2y}{dx^2}}$$

Q. A stone is projected with speed u and angle of projection is θ.

(a) Find radius of curvature at $t = 0$.

(b) Find ROC at highest point.

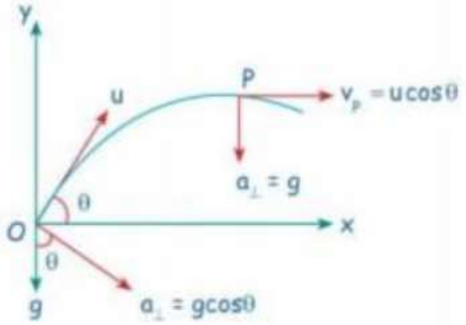
Sol. (a) At $t = 0$

$a_\perp = g\cos\theta$,

$$R = \frac{v^2}{a_\perp} = \frac{u^2}{g\cos\theta}$$

(b) At highest point $v_p = u\cos\theta$ and $a_\perp$ or $a_n = g$

Hence ROC at 'P' $= \frac{u^2\cos^2\theta}{g}$



Home work

- HCV ques one attach & KPP Ready till then Revise all notes (only)
- Next class will go for NEET/JM small-2 ques.

THANK YOU