38 Practice Questions for Exam II

1) A large massive rock is in contact with the ground surface that is a flat surface on the earth. Draw a force diagram for the rock and the earth. Which of the following statements is true?
a) The gravitational force on the rock due to the earth and the gravitational force on the earth due to the rock are action-reaction pairs.
b) The gravitational force on the rock due to the earth and the contact force on the earth due to the rock are action-reaction pairs.
c) The contact force on the earth due to the rock and the gravitational force on the earth due to the rock are action-reaction pairs.
d) The gravitational force on the earth due to the rock and the contact force on the earth due to the rock are action-reaction pairs.
e) None of the above

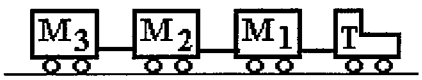
2) A certain spring has a length of 3.5 cm when no forces are applied. When 5.2 N is applied the spring has a length of 7.0 cm. If the force on the spring is increased to 7.8 N, then the length of the spring is, in cm
a) 4.49
b) 5.00
c) 5.25
d) 8.75
e) 9.25

$F = kx \qquad k = \frac{5.2\,N}{3.5\,cm} = 1.486\ N/cm$

$F = kx \Rightarrow x = \frac{F}{k} = \frac{7.8\,N}{1.486\,N/cm} = 5.25\ cm$

length $= 5.25\,cm + 3.5\,cm = \underline{8.75\,cm}$

3) An airplane is flying in horizontal flight at a constant velocity. The weight of the airplane is 40,000 N. The wings produce a lift force that is perpendicular to the wings and a drag force that is parallel to the wing. The engine produces a forward thrust force of 2,000 N. Which of the following statements is true?
a) The lift force on the airplane is zero.
b) The drag force on the airplane is zero.
c) The lift force on the airplane is 42,000 N upward.
d) The drag force on the airplane is 38,000 N backward.
e) The drag force on the airplane is 2,000 N backward.

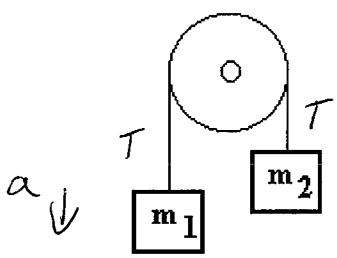


4) In the figure above, a airport luggage carrying train with a tractor T is pulling three luggage carts, M_1, M_2, and M_3.with an acceleration of 1.2 m/s^2. If T = 300 kg, M_1 = 200 kg, M_2 =100 kg, and M_3 =100 kg, then the force in the connection between cart M_2 and cart M_1 is,

a) 2350 N
b) 480 N
c) 240 N
d) 120 N
e) 0 N

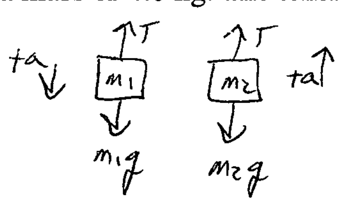
$F = ma$

$F = (m_3 + m_2)a = (200\,kg)(1.2\,m/s^2) = \underline{240\,N}$



5) Two masses are suspended by cord that passes over a pulley with negligible mass. The cord also has negligible mass. One of the masses, m_1, has a mass of 6.0 kg and the other mass, m_2, has a mass of 4.0 kg. The tension of the cord attached to m_1 is,

a) 47 N
b) 59 N
c) 39 N
d) 24 N
e) 15 N



$m_1 g - T = m_1 a \Rightarrow T = m_1 g - m_1 a$ (1)

$T - m_2 g = m_2 a \Rightarrow T = m_2 a + m_2 g$ (2)

so $m_1 g - m_1 a = m_2 a + m_2 g$

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

$a = g\dfrac{(m_1 - m_2)}{m_1 + m_2} = \dfrac{9.8\,m/s^2\,(6\,kg - 4\,kg)}{6\,kg + 4\,kg}$

$\underline{a = 1.96\,m/s^2}$

from (1) $T = m_1(g - a) \Rightarrow 6\,kg(9.8\,m/s^2 - 1.96\,m/s^2)$

$= \boxed{47\,N}$

To move m_1 need $F > \mu_s F_N = 0.7 \cdot 10kg \cdot 9.8 m/s^2$

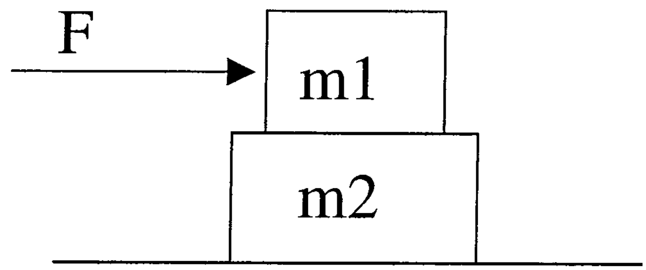
if $F > 68.6 N$, block m_1 will move

to move m_2, need $F > (0.4)(10kg + 20kg) \cdot 9.8 m/s^2$

if $F > 117.6 N$, block 2 will move

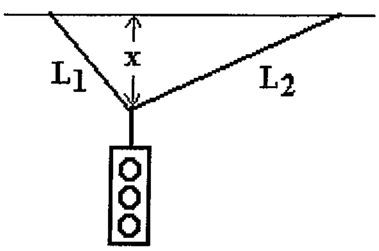
Not enough Force to move m_2

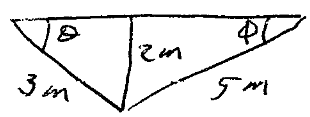
net Force ~~of~~ block m_1 -



6) Two blocks M1 and M2 are initially at rest. M1 sits on top of M2. M1=10 Kg and M2=20 Kg. The coefficient of static friction between the floor and M2=0.4 and the coefficient of kinetic friction between the floor and M2=0.2. The coefficient of static friction between M2 and M1 is 0.7 and the coefficient of kinetic friction between M1 and M2=0.6. A force of 70 Newtons is applied horizontally on block M1. What happens?

a) Block M1 moves at a constant velocity, Block M2 stationary
b) Block M1 stationary, Block M2 moves at a constant velocity
c) Block M1 accelerates, Block M2 accelerates
d) Block M1 accelerates, Block M2 stationary
e) Block M1 stationary, Block M2 stationary



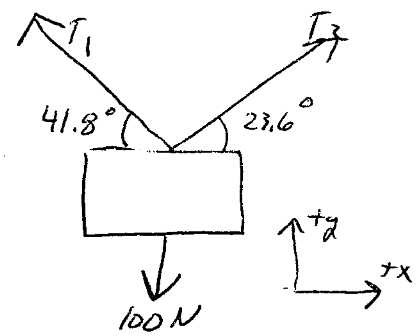


$\sin\theta = 2/3$

$\theta = 41.8°$

$\sin\phi = 2/5$

$\phi = 23.6°$



7) A 100 N traffic light is suspended by two wires of length L1 and L2 as shown in the figure. If L1 = 3.0 m and L2 = 5.0 m and the distance x = 2.0 m, then the tension in the wire of length L1 is,

a) 125 N
b) 101 N
c) 90 N
d) 82 N
e) 75 N

x: $-T_1 \cos 41.8° + T_2 \cos 23.6° = 0$

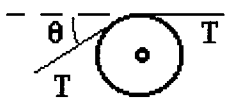
y: $T_1 \sin 41.8° + T_2 \sin 23.6° - 100 N = 0$

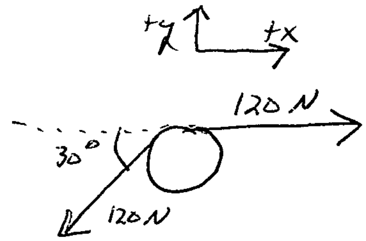
from x: $T_1 \cos 41.8° = T_2 \cos 23.6° \Rightarrow T_2 = .81 T_1$

into y: $T_1 \sin 41.8° + .81 T_1 \sin 23.6° = 100 N$

$$T_1 = \frac{100 N}{\sin 41.8° + .81 \cdot \sin 23.6°}$$

$$T_1 = \frac{100 N}{.99} = \boxed{101 N}$$





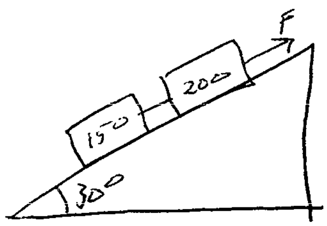
$$X: 120N - 120N\cos 30^\circ - F_x = 0$$
$$y: 0 - 120\sin 30^\circ - F_y = 0$$
$$\boxed{F_x = 16.1N \quad F_y = 60N}$$

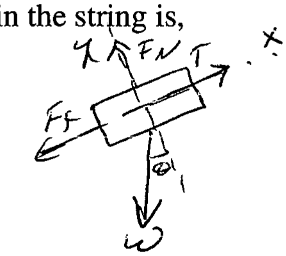
8) A cord with a tension T is passes over a pulley as shown in the figure. The angle θ is 30 degrees and the tension T is 120 N. The magnitude of the force on the pulley by the shaft that supports the pulley is,

a) Fx = 60.0 N, Fy = 16.1 N
b) Fx = 16.1 N, Fy = 60.0 N
c) Fx = 60.0 N, Fy = 60.0 N
d) Fx = 30.0 N, Fy = 90.0 N
e) Fx = 90.0 N, Fy = 30.0 N

9) Two masses are being pulled up a 30 degrees incline by a force F parallel to the incline. The acceleration up the incline is 1.0 m/s^2 and the velocity is up the incline. The force is applied to a 200 kg mass and a string connects the 200 kg mass to a 150 kg mass. The coefficient of kinetic friction is 0.2. The tension in the string is,

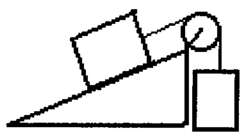
a) 2,660 N
b) 1,140 N
c) 990 N
d) 875 N
e) 633 N





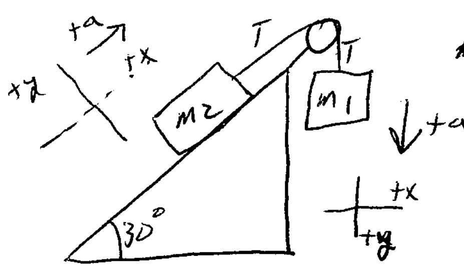
$$X: T - mg\sin 30^\circ - \mu_k F_N = ma$$
$$y: F_N - mg\cos 30^\circ = 0$$

$$X: T = ma + \mu_k mg\cos 30^\circ + mg\sin 30^\circ$$
$$T = (150kg)(1m/s^2) + (0.2)(150kg)(9.8m/s^2)(\cos 30^\circ) + (150kg)(9.8m/s^2)(\sin 30^\circ)$$
$$\boxed{T = 1140\,N}$$

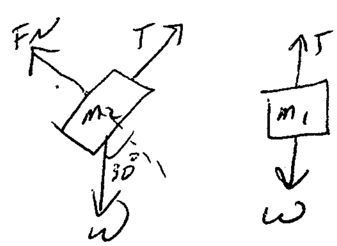


10) Two masses are connected by a string which passes over a frictionless, mass less pulley. One mass hangs vertically and one mass slides on a 30 degrees incline. The vertically hanging mass is 6.0 kg and the mass on the incline is 4.0 kg. The acceleration of the 4.0 kg mass is,

a) 0.98 m/s²
b) 3.92 m/s²
c) 5.75 m/s²
d) 6.86 m/s²
e) 7.84 m/s²



$$m_1: \; y: \; m_1 g - T = m_1 a \quad (1)$$
$$m_2: \; T - m_2 g\sin 30^\circ = m_2 a \quad (2)$$
$$F_N - m_2 g\cos 30^\circ = 0$$



$$(1) \quad T = m_1 g - m_1 a$$
$$(2) \quad T = m_2 a + m_2 g\sin 30^\circ$$

$$m_1 g - m_1 a = m_2 a + m_2 g\sin 30^\circ$$
$$a = \frac{g(m_1 - m_2\sin 30^\circ)}{m_1 + m_2} \qquad m_1 = 6kg, \; m_2 = 4kg$$
$$a = .4g = \underline{3.92\,m/s^2}$$

11) A 0.5 kg stone is moving in a circular path attached to a string that is 75 cm long. The stone is moving around the path at a constant frequency of 1.5 rev/sec. At the moment the stone is overhead, the stone is released. The velocity of the stone when it leaves the circular path is,

a) 5.55 m/s
b) 7.07 m/s
c) 7.75 m/s
d) 8.35 m/s
e) 9.00 m/s

$V = \frac{2\pi r}{T}$ $\quad f = 1.5$ rev/s $\quad T = \frac{1}{f} \quad T = .6\bar{6}$ s

$V = \frac{2\pi \cdot .75m}{.66s} = 7.075$

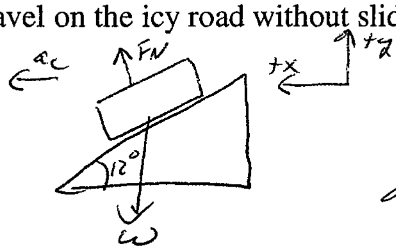
12) A conical pendulum is constructed with a string 2.0 m in length. The pendulum is set in horizontal circular path the vertical axis. If the angle the string makes with the vertical axis is 45 degrees, then the angular velocity of the conical pendulum is,

a) 4.00 rad/s
b) 3.55 rad/s
c) 3.04 rad/s
d) 2.63 rad/s
e) 2.01 rad/s

$\boxed{\text{ignore}}$

13) A 2000 kg car is traveling on a banked curved icy road. The road is banked at an angle of 12 degrees and has a radius of curvature of 500 m. The velocity of the car necessary to travel on the icy road without sliding is,

a) 32.3 m/s
b) 40.5 m/s
c) 42.8 m/s
d) 49.5 m/s
e) 50.2 m/s



y: $F_N \cos\theta - mg = 0$
x: $F_N \sin\theta = \frac{mv^2}{r}$

divide $\frac{x}{y} \Rightarrow \tan\theta = \frac{v^2}{gr}$

$V = \sqrt{\tan\theta \, g r} = \sqrt{\tan 12° \cdot 9.8 m/s^2 \cdot 500m}$

$v = 32.3 m/s$

14) A 5,000 kg satellite is orbiting the earth in a circular path. The height of the satellite above the surface of the earth is 800 km. The velocity of the satellite is, ($M_e = 5.98 \times 10^{24}$ kg, $R_e = 6.37 \times 10^6$ m, $G = 6.67 \times 10^{-11}$ Nm^2/kg^2)

a) 7,460 m/s
b) 6,830 m/s
c) 6,430 m/s
d) 5,950 m/s
e) 5,350 m/s

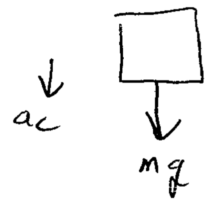
$F = \frac{G m_e \cancel{m_s}}{r^2} = \frac{\cancel{m_s} v^2}{r}$ $\quad r = 6.37 \times 10^6 m + 800 \times 10^3 m$

$V_s = \sqrt{\frac{G m_e}{r}}$

$V_s = 7460 m/s$

15) A 1.0 kg stone attached to a 1.0 m long string is traveling in a vertical circular orbit. What is the minimum tangential velocity at the top of the vertical circular orbit to keep the string from going slack?

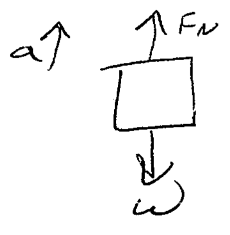
a) 5.63 m/s
b) 5.31 m/s
c) 5.00 m/s
d) 4.50 m/s
e) 3.13 m/s



$$\cancel{m}g = \frac{\cancel{m}v^2}{r}$$
$$v^2 = gr \qquad v = \sqrt{gr}$$
$$= \sqrt{9.8\,m/s^2\,(1\,m)}$$
$$= 3.13\,m/s$$

16) A 95 kg person is standing on a scale to measure weight in an elevator near the surface of the earth. If the elevator is accelerated upward at 4.0 m/s ², then the reading on the scale is,

a) 1,310 N
b) 1,010 N
c) 932 N
d) 850 N
e) 750 N



$$F_N - w = ma$$
$$F_N = ma + mg$$
$$= (95\,kg)(9.8\,m/s^2 + 4.0\,m/s^2) = 1310\,N$$

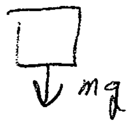
17) Which is an accurate statement regarding satellites in orbit?

A) The satellite has no forces acting on it, and so it is weightless.
B) The velocity required to keep a satellite in a given orbit depends on the mass of the satellite.
C) It is possible to have a satellite traveling at either a high or low speed in a given circular orbit.
D) The period of revolution of a satellite moving about the earth does not depend the size of the orbit it travels.
E) A satellite in a large diameter circular orbit will have a longer period of revolution about the earth than will a satellite in a smaller circular orbit.

18) A roller coaster car of mass M traveling with speed v is on a track that forms a circular loop in the vertical plane. If the car is to just maintain contact with the track at the top of the loop, what should be value of the radius of the loop be?

$F_N = 0$

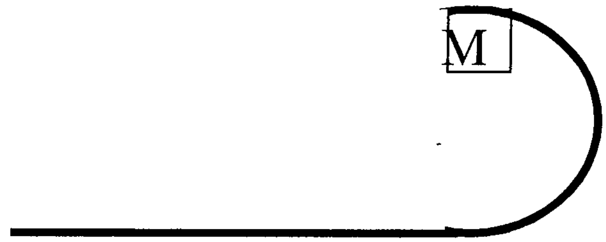
0. v^2/g
1. $2v^2/g$
2. $v/g^{1/2}$
3. $2v/g^{1/2}$
4. Mv^2/g



$\downarrow a_c$

$\cancel{m}g = \frac{\cancel{m}v^2}{r}$

$r = \frac{v^2}{g}$



19) Two identical coins are placed on a rotating platform. Coin A is closer to the center of rotation than Coin B. The coefficient of friction between the coins and platform is very, very small but nonzero. The platform undergoes angular acceleration, what happens to coins A and B?

f) Coin A flies off the platform first.
g) Coin B flies off the platform first.
h) Both coins fly off the platform at the same time.
i) Neither coin ever flies off the platform.
j) Not enough information to tell.

$F_c = \frac{mv^2}{r}$ $\quad V = \frac{2\pi r}{T}$

$F_c = \frac{m\left(\frac{2\pi r}{T}\right)^2}{r} = \frac{4\pi^2 r}{T^2} m$

coin with larger radius has greater centripetal force so flies off 1st

20) Two moons named Sooner and Boomer orbit a planet. Moon Sooner is nine times farther from the center of the planet than moon Boomer. If Boomer takes 20 days to orbit the planet, how long does Sooner take?

1. 20 days
2. 64 days
3. 160 days
4. 540 days
5. 729 days

$r_S^3 = T_S^2 \qquad r_B^3 = T_B^2 \qquad r_S = 9 r_B$

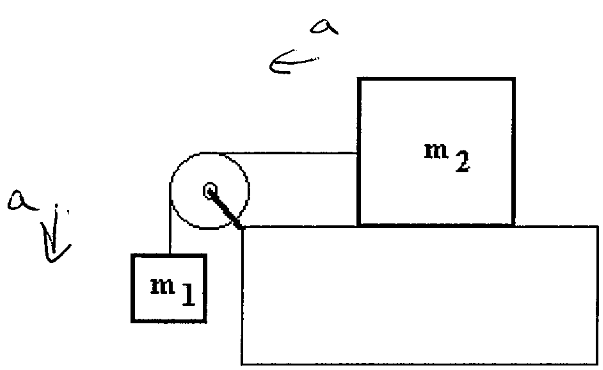
$T_B = 20$ days

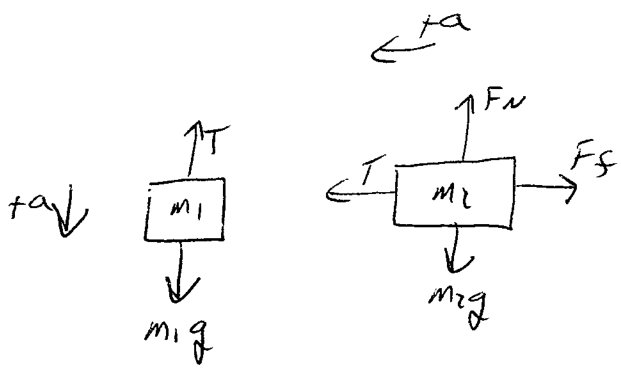
$\frac{r_S^3}{r_B^3} = \frac{T_S^2}{T_B^2}$

$\frac{(9 r_B)^3}{(r_B)^3} = \frac{T_S^2}{(20\,\text{days})^2} \qquad 9^3 = \frac{T_S^2}{(20\,\text{days})^2}$

$\frac{T_S}{20\,\text{days}} = \sqrt{9^3} = 27$

$T_S = 27 \cdot 20\,\text{days} = \underline{540\,\text{days}}$





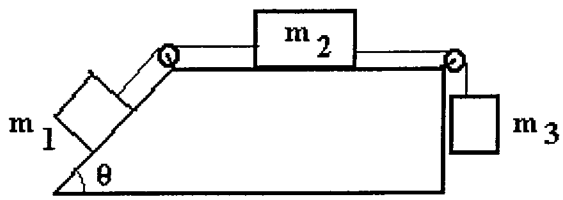
$m_1 g - T = m_1 a$

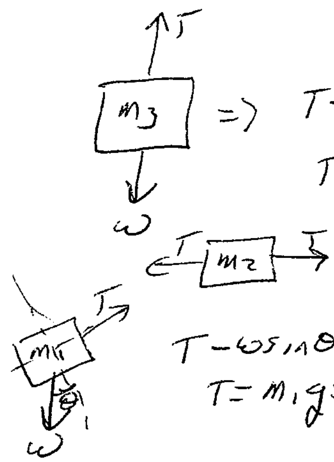
$F_N - m_2 g = 0$

$T - F_f = m_2 a$

21) Two masses are connected by a cord that passes over a pulley as shown in the figure above. The pulley has negligible mass. Mass 2 moves on a horizontal surface with friction and mass 1 is suspended vertically. The cord has negligible mass. What are the correct equations based on Newton's Second law assuming the masses are accelerating? T is the tension in the cord, N is the normal force and Ff is the force of friction.

a) T-M1g = M1a	N-M2g=0	T-Ff =M2a
b) M1g-T=M1a	N-M2g=M2a	T-Ff=M2a
c) T-M1g=M1a	N-M2g=0	T+Ff=M2a
d) T-M1g=0	N-M2g=0	T-Ff=M2a
e) M1g-T=M1a	N-M2g=0	T-Ff=M2a





$\Rightarrow \; T - w = 0$

$T = m_3 g$

$T - w\sin\theta = 0$

$T = m_1 g \sin\theta$

22) The masses are at rest and there is no friction. What is the relationship between the masses and the angles?

A. $m_1\tan\theta = m_2$
B. $m_1\tan\theta = m_3$
C. $m_1\cos\theta = m_3$
D. $m_1\sin\theta = m_3$
e) $m_1\cos\theta = m_2$

$m_3\cancel{g} = m_1\cancel{g}\sin\theta$

$m_3 = m_1\sin\theta$

23) Two coins are placed on a rotating platform at the same distance from the center. Coin A weighs more than Coin B. The coefficient of friction between the coins and platform is very, very small but nonzero. The platform undergoes angular acceleration, what happens to coins A and B?

A Coin A flies off the platform first.
B Coin B flies off the platform first.
C Both coins fly off the platform at the same time.
D Neither coin ever flies off the platform.
E Not enough information to tell.

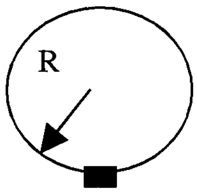
IGNORE

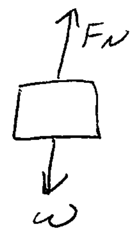
$F_f = \mu_s F_N = \mu_s \cancel{m} g = \dfrac{\cancel{m} v^2}{r}$

$\mu_s g = \dfrac{v^2}{r}$

independent of mass

24) What is the *normal force* exerted by a roller coaster track (with radius R)on a car (with mass M) moving with speed V at the bottom of a vertical loop?





$F_N - w = \frac{mv^2}{r}$

$F_N = \frac{mv^2}{r} + mg$

6. Mg
7. More than Mg
8. Less than Mg
9. Less than Mg and exactly zero.
10. Not enough information to tell.

25) Two satellites (satellite A with mass M and satellite B with mass 2M) orbit about the Earth with the same radius R. What is the ratio of the periods of the two satellites?

a) $\frac{T_A}{T_B}=2$

b) $\frac{T_A}{T_B}=1/2$

c) $\frac{T_A}{T_B}=1$

d) $\frac{T_A}{T_B}=2^{3/2}$

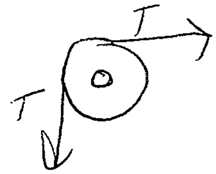
e) $\frac{T_A}{T_B}=2^{2/3}$

$T^2 = r^3$

independent of mass

since same radius

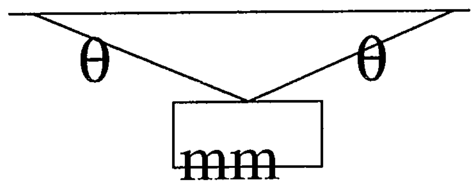
same period



Total $T = \sqrt{T^2+T^2} = \sqrt{2T^2}$
$= \sqrt{2}T = \sqrt{2}\cdot 120N = \underline{170N}$

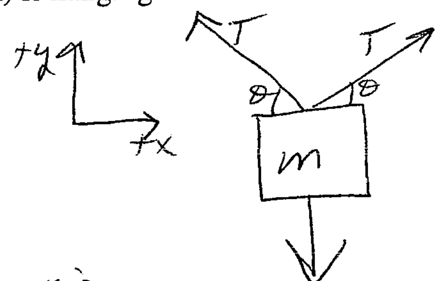
26) A cord passes over two pulleys as shown in the figure. The tension in the cord is 120 N. The magnitude of the force on one pulley by the shaft that supports the pulley is,

a) 60 N
b) 120 N
c) 170 N
d) 180 N
e) 240 N



27) An object of mass (m) is hanging as shown. What is the tension (T) in the ropes?

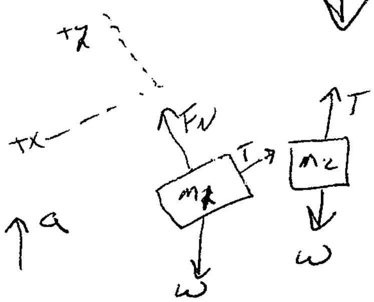
1. T= mg/(2 sin θ)
2. T= mg/sin θ
3. T=mg/cos θ
4. T=mg/(2 cos θ)
5. T=mg



$y: T\sin\theta + T\sin\theta - mg = 0$

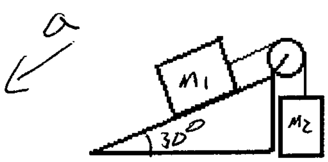
$2T\sin\theta = mg$

$T = \dfrac{mg}{2\sin\theta}$



$m_2: \quad T - m_2 g = m_2 a \quad (1)$
$m_1: \quad w_1 \sin\theta - T = m_1 a \quad (2)$
$w_1 \cos\theta - F_N = 0$

(1) $T = m_2 g + m_2 a$
(2) $T = m_1 g \sin\theta - m_1 a$



28) Two masses are connected by a string which passes over a frictionless, mass less pulley. One mass hangs vertically and one mass slides on a 30 degrees incline. The vertically hanging mass is 4.0 kg and the mass on the incline is 6.0 kg. The acceleration of the 4.0 kg mass is,

a) 0.98 m/s²
b) 3.92 m/s²
c) 5.75 m/s²
d) 6.86 m/s²
e) 7.84 m/s²

$m_2 g + m_2 a = m_1 g\sin\theta - m_1 a$

$a = \dfrac{g(m_1\sin\theta - m_2)}{(m_2 + m_1)}$

$= \dfrac{9.8\,m/s^2\,(3-4)}{6+4} = -.98$

Note I defined "a" in wrong direction so I get a negative answer

29) A car of mass m is traveling on a banked curved icy road without sliding. The velocity of the car is v and the road is banked at an angle of θ degrees. The radius of curvature of the road is r. The normal force is N. What 2 equations do we get using Newton's second law?

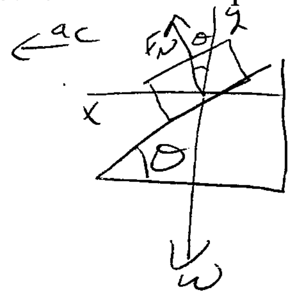
a) $N\sin\theta=0$; $N\cos\theta - mg = mv^2/r$

b) $N\sin\theta=mv^2/r$; $N\cos\theta-mg=0$

c) $N\cos\theta=0$; $N\sin\theta-mg=mv^2/r$

d) $N\cos\theta=mv^2/r$; $N\sin\theta-mg=0$

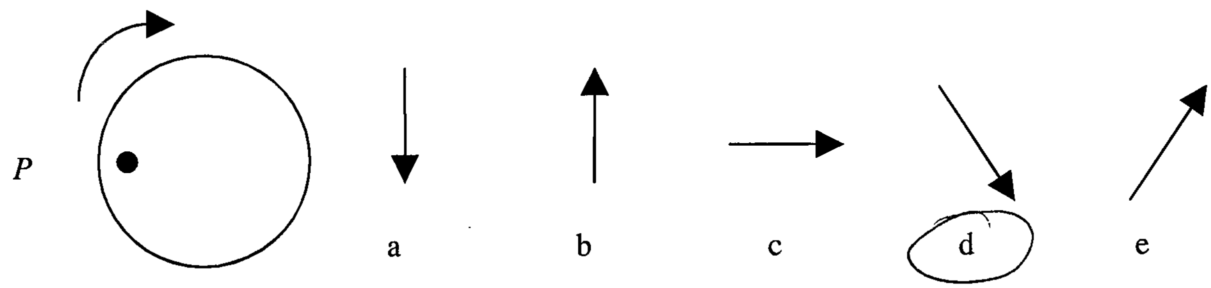
e) $N\cos\theta-mg=mv^2/r$; $N\sin\theta-mg=0$

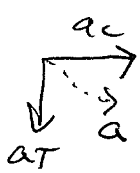


y: $F_N \cos\theta - mg = 0$

x: $F_N \sin\theta = \frac{mv^2}{r}$

30) Before CD's were invented, we used to listen to music on thin pieces of plastic with groves in them called records. Suppose you put a penny on a record and let it spin clockwise on the turntable. After turning the turntable off, it is still spinning, but is slowing down. Which arrow shows the direction of the acceleration of the penny at point *P* during this time when the turntable is spinning but slowing down.





31) A horizontal force of 12 Newtons is applied to a 4.0 kg box that slides on a horizontal surface. The box starts from rest moves a horizontal distance of 10 meters and obtains a velocity of 5.0 m/s. The surface has friction. The friction force is,

a) 7.0 N
b) 6.5 N
c) 6.0 N
d) 5.7 N
e) 4.9 N

$W = F_{net}\, d \cos\theta = \Delta K \qquad K_i = 0$

$F_{net}\, d = K_f \qquad F_{net} = \frac{\frac{1}{2} m v_f^2}{d} = 5N$

$F - F_f = F_{net} = 5N \qquad 12N - F_f = 5N \qquad \underline{F_f = 7N}$

32) A spring-powered dart gun is un-stretched and has a spring constant 12.0 N/m. The spring is compressed by 8.0 cm and a 5.0 gram projectile is placed in the gun. The velocity of the projectile when it is shot from the gun is,

a) 1.52 m/s
b) 2.54 m/s
c) 3.92 m/s
d) 4.24 m/s
e) 5.02 m/s

$\cancel{\frac{1}{2}} m v^2 = \cancel{\frac{1}{2}} k x^2 \qquad v^2 = \frac{kx^2}{m} = \frac{12\ N/m \cdot (.08m)^2}{.005kg}$

$\underline{v = 3.92 m/s}$

33) A 2000 kg car accelerates up to a velocity of 40 m/s in 5.0 seconds. The brakes are applied and the car is brought to a stop. The work done by the friction in the brakes is,

a) 1.0 x 10⁶ J
b) 1.2 x 10⁶ J
c) 1.6 x 10⁶ J
d) 2.1 x 10⁶ J
e) 2.5 x 10⁶ J

$W = \Delta K = \frac{1}{2} m v^2 = \frac{1}{2}(2000kg)(40m/s)^2 =$

$\underline{1.6 \times 10^6 J}$

34) A car traveling at 30 mph skids to a stop in 60 meters. If a car travels at 60 mph with the same skid conditions, then what is distance the car skids to come to a stop?

a) 340 m
b) 310 m
c) 260 m
d) 240 m
e) 190 m

$W = F_1 d_1 = \Delta K_1$

$F_2 d_2 = \Delta K_2$

take ratio $\frac{d_1}{d_2} = \frac{\frac{1}{2}\cancel{m} v_1^2}{\frac{1}{2}\cancel{m} v_2^2}$

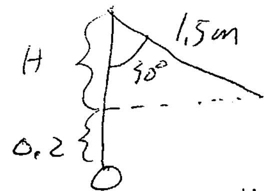
$F_1 = F_2 = F_f$

$\frac{d_1}{d_2} = \frac{v_1^2}{v_2^2} = \left(\frac{v_1}{2v_1}\right)^2 = \frac{1}{4} \qquad v_2 = 2v_1$

$d_2 = 4d_1 = 4 \cdot 60 = \underline{240m}$

35) A 2.0 kg pendulum bob on a string 1.5 m long is released with a velocity of 2.0 m/s when the support string makes an angle of 30 degrees with the vertical. What is the velocity of the bob at the bottom of the swing?

a) 4.32 m/s
b) 4.00 m/s
c) 3.75 m/s
d) 3.04 m/s
e) 2.81 m/s



$H = 1.5\cos 30° = 1.3\,m$

$E_i = \frac{1}{2}mv_i^2 + mgh = \frac{1}{2}mv_f^2$

$v_f^2 = v_i^2 + 2gh$

$v_f^2 = (2\,m/s)^2 + 2 \cdot 9.8\,m/s^2 \cdot 0.2\,m$

$v_f = 2.81$

36) An 1800 kg car moving at 20 m/s hits an initially uncompressed spring with a spring constant of 2.0 x 10^6 N/m. The maximum compression of the spring is,

a) 0.4 m
b) 0.6 m
c) 0.8 m
d) 1.0 m
e) 1.2 m

$\frac{1}{2}mv^2 = \frac{1}{2}kx^2 \qquad x^2 = \frac{mv^2}{k} = \frac{(1800\,kg)(20\,m/s)^2}{2\times10^6\,N/m} = .6\,m$

37) A 3.0 kg mass slides down a frictionless incline from a height of 4.0 m. A 6.0 kg mass also slides down the frictionless incline from the 8.0 m height. The ratio of the velocity of the 3.0 kg mass at the bottom of the incline to the velocity of the 6.0 kg mass at the bottom of the incline is,

a) 0.50
b) 0.71
c) 1.00
d) 1.41
e) 1.50

$\cancel{m_1}gh_1 = \frac{1}{2}\cancel{m_1}v_1^2 \qquad v_1 = \sqrt{2gh_1} \qquad \frac{v_1}{v_2} = \sqrt{\frac{h_1}{h_2}} = \sqrt{\frac{1}{2}}$

$\cancel{m_2}gh_2 = \frac{1}{2}\cancel{m_2}v_2^2 \qquad v_2 = \sqrt{2gh_2}$

$= .71$

38) A heavy and light marble leave a marble gun with the same initial velocity and are fired towards identical springs. Which marble compresses the spring more?

a) The heavy one
b) The light one.
c) They both compress the springs the same amount.
d) Not enough information to tell.

$\frac{1}{2}mv^2 = \frac{1}{2}kx^2$

heavier marble has more Kinetic Energy so will compress spring more