PHYS 2414 HW # 4 SOLUTIONS

1. Giancoli6 4.P.003. [354131] **0/1 points** Show Details

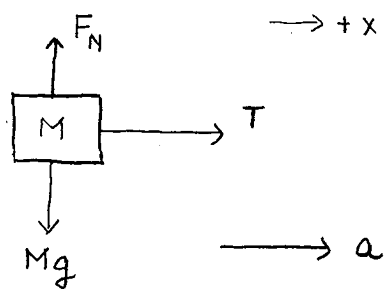
How much tension must a rope withstand if it is used to accelerate a $\boxed{1049}$ kg car horizontally along a frictionless surface at $\boxed{1.21}$ m/s^2?

[ ] ✗ ~~1270~~ N

Sol: Free body diagram for the car:

$M = \boxed{1049}$ kg

$a = \boxed{1.21}$ m/s^2



F_N = Normal force due to ground

T ⇒ Tension (force) due to rope

Mg = Weight of car due to gravity.

a = acceleration.

x dir:

$$\Sigma F_x = m a_x$$

$$T = ma = (\boxed{1049}\text{ kg})(\boxed{1.21}\text{ m/s}^2) = \boxed{1269.3}\text{ N} = \boxed{1270}\text{ N} \checkmark$$

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2. Giancoli6 4.P.011. [351604] **0/2 points** Show Details

A particular race car can cover a quarter mile track (402 m) in $\boxed{7.00}$ s starting from a standstill. Assuming the acceleration is constant, how many *g*'s, does the driver experience?

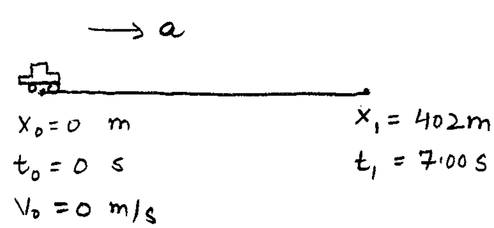
[ ] ✗ ~~1.67~~ *g*

If the combined mass of the driver and race car is $\boxed{445}$ kg, what horizontal force must the road exert on the tires?

[ ] ✗ ~~7300~~ N

Sol:

$$x_1 = \cancel{x_0}^{0} + \cancel{v_0}^{0}(t_1 - t_0) + \frac{1}{2}a(t_1 - \cancel{t_0}^{0})^2$$



$$(402\text{ m}) = \frac{1}{2}a(\boxed{7.00})^2$$

$$a = \boxed{16.41}\text{ m/s}^2$$

in terms of g's.

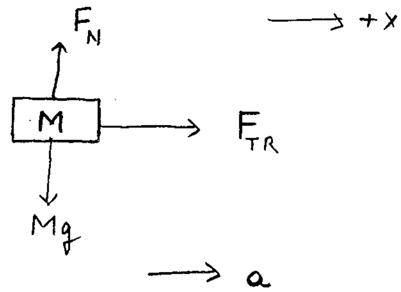
$$\frac{a}{\cancel{g}}\cancel{g} = \frac{\boxed{16.41}\text{ m/s}^2}{g} \cdot g$$

$$a = \frac{\boxed{16.41}\cancel{\text{m/s}^2}}{9.8\cancel{\text{m/s}^2}}g = \boxed{1.674}\,g = \boxed{1.67}\,g. \checkmark$$

Cont....

(2) Contd.. (Second part of the problem)

Free body diagram for the car + driver



F_{TR} = Force on the tyres due to road.

F_N = Force on the car due to ground

Mg = Weight due to gravity

$M = \boxed{445}$ kg

$a = \boxed{1.674}\, g = 16.41\ m/s^2$

x dir:

$$\Sigma F_x = m a_x$$

$$F_{TR} = Ma = (\boxed{445}\,kg)(\boxed{16.41}\,m/s^2) = \boxed{7302.5}\ N$$

$$F_{TR} = \boxed{7300}\ N \quad ✓$$

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3. Giancoli6 4.P.018. [354115] **0/3 points** Show Details

A person jumps from the roof of a house 4.5 m high. When he strikes the ground below, he bends his knees so that his torso decelerates over an approximate distance of 0.70 m. The mass of his torso (excluding legs) is 43 kg.

(a) Find his velocity just before his feet strike the ground.

✗ ~~9.39~~ m/s (downward)

Sol (a)

$$V_y^2 = (\cancel{V_{oy}}^{\,0})^2 + 2g(Y - \cancel{Y_o}^{\,0})$$

$$V_y^2 = 2(9.8\ m/s^2)(\boxed{4.5}\ m)$$

$$V_y^2 = \boxed{88.2}\ m^2/s^2$$

$$V_y = \sqrt{\boxed{88.2}\ m^2/s^2} = \boxed{9.39}\ m/s \quad ✓$$

$Y_o = 0\ m$

$V_{oy} = 0\ m/s^2$

$\downarrow +Y$

$\downarrow g$

$Y = 4.5\ m$

$V_y = ?$

(3) Contd:

3(b) Contd...

3 (b) Find the average force exerted on his torso by his legs during deceleration.

Magnitude

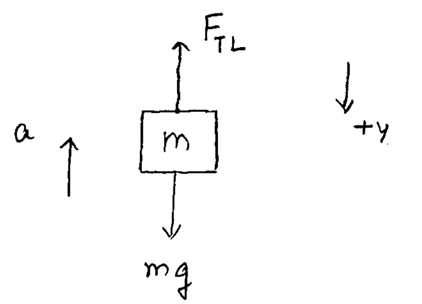
✗ ~~3130~~ N

Direction

- ( ) downward
- ( ) to the left
- (o) upward
- ( ) to the right

✗

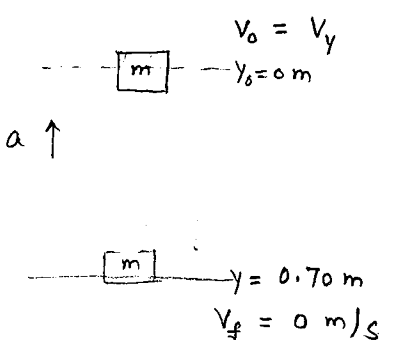
Sol 3(b): Free body diagram for the torso



F_{TL} = Force on the torso due to legs

mg = Weight due to gravity.

Since torso is stopping over a distance of 0.70 m it experiences a negative acceleration 'a' during that distance. Also we assume F_{TL} to be the average force during this stopping process (which may actually change at each instant in time). We need to determine 'a'.



$$\cancel{V_f^2}^{\,0} = V_0^2 + 2a(y - \cancel{y_0}^{\,0})$$

$$a = -\frac{V_0^2}{2y} = \frac{-(\boxed{9.39}\ m/s)^2}{2(0.70\,m)} = -\boxed{62.98}\ m/s^2$$

Now,

$$\Sigma F_y = m a_y$$

$$mg - F_{TL} = -ma$$

$$F_{TL} = mg + ma = \boxed{43\ kg}\left(9.8\ m/s^2 + \boxed{62.98}\ m/s^2\right)$$

$$F_{TL} = \boxed{3129.5}\ N = \boxed{3130}\ N$$

✓

Note: We are taking care of (sign) direction of acceleration so we use absolute value of 'a' when calculating force

4. Giancoli6 4.P.023. [351619] **0/1 points** Show Details

Arlene is to walk across a high wire strung horizontally between two buildings $\boxed{15.0}$ m apart. The sag in the rope when she is at the midpoint is 10.0°, as shown in Figure 4-42. If her mass is $\boxed{56.0}$ kg, what is the tension in the rope at this point?

[ ] ✗ ~~1580~~ N

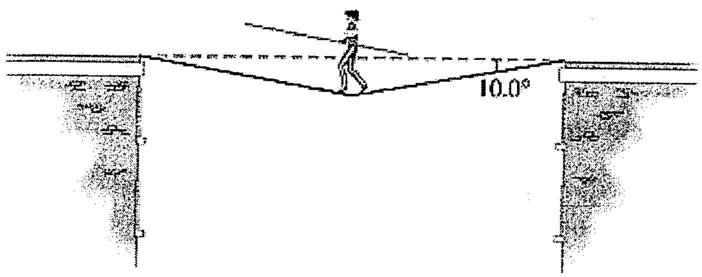
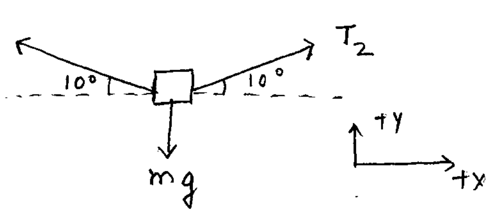


Figure 4-42

Sol:4: Free body diagram for Arlene



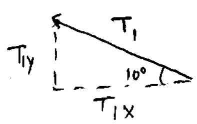
mg = Weight of Arlene due to gravity

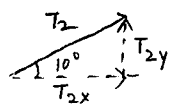
T_1 = Force due to (tension in) left side rope

T_2 = Force due to (tension in) right side rope

$T_{1x} = T_1 \cos(10°)$

$T_{1y} = T_1 \sin(10°)$





$T_{2x} = T_2 \cos(10°)$

$T_{2y} = T_2 \sin(10°)$

x: dir

$\Sigma F_x = m a_x$

$T_{2x} - T_{1x} = 0$ Since she is not moving in x-dir

$T_2 \cos(10°) - T_1 (\cos 10°) = 0$

$T_2 \cancel{\cos(10°)} = T_1 \cancel{\cos(10°)} \Rightarrow T_1 = T_2.$

y: dir

$\Sigma F_y = m a_y$. she is not moving in y-dir.

$T_{1y} + T_{2y} - mg = 0$

$T_1 \sin(10°) + T_2 \sin(10°) = mg \Rightarrow 2 T_1 \sin(10°) = mg$

$$T_1 = \frac{(\boxed{56.0}\ \text{kg})(9.8\ \text{m/s}^2)}{2 \sin 10°} = \boxed{1580}\ \text{N}$$

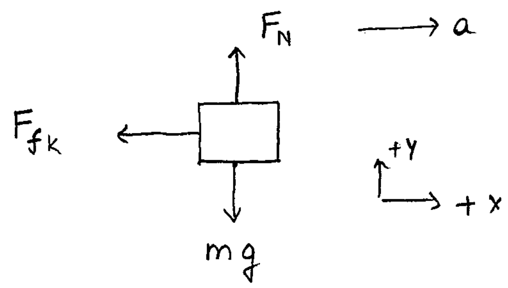
✓

5. Giancoli6 4.P.047. [352520] **0/1 points** Show Details

A box is given a push so that it slides across the floor. How far will it go, given that the coefficient of kinetic friction is $\boxed{0.21}$ and the push imparts an initial speed of $\boxed{4.0}$ m/s?

✗ ~~3.89~~ m

Sol 5 : Free body diagram of box (When it is moving)



mg = Weight due to gravity

F_N = Normal force due to ground

F_{fk} = Kinetic frictional force trying to oppose motion.

y-dir : $\Sigma F_y = m a_y$

$F_N - mg = 0$ No motion in y-direction.

$F_N = mg$

Kinechic friction force is given by

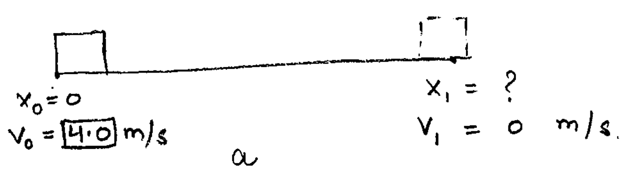
$F_{fk} = \mu_k F_N = \mu_k mg$.

x dir : $\Sigma F_x = m a_x$

$-F_{fk} = ma$

$-\mu_k \cancel{m} g = \cancel{m} a$

$a = -\mu_k g$



$\cancel{V_1}^{\,0\,2} = V_0^2 + 2a(x_1 - \cancel{x_0}^{\,0})$

$-V_0^2 = 2a\,x_1$

$\Rightarrow \quad x_1 = -\dfrac{V_0^2}{2a} = \dfrac{+V_0^2}{+2\mu_k g} = \dfrac{(\boxed{4.0}\ m/s)^2}{2(\boxed{0.21})(9.8\ m/s^2)} = \boxed{3.887}$ m

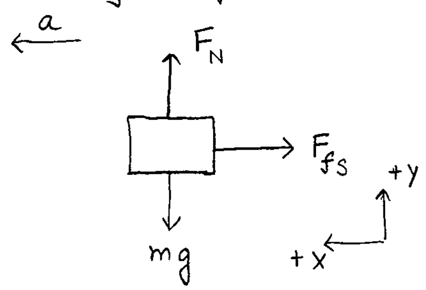
$x_1 = \boxed{3.89}$ m ✓

6. Giancoli6 4.P.049. [352518] **0/1 points** Show Details

A flatbed truck is carrying a heavy crate. The coefficient of static friction between the crate and the bed of the truck is $\boxed{0.80}$. What is the magnitude of the maximum rate at which the driver can decelerate and still avoid having the crate slide against the cab?

[ ] ✗ $\boxed{7.84}$ m/s^2

Sol 6: Free body diagram of the crate during deceleration.



mg = weight of crate due to gravity.

F_N = Normal force due to contact with bed of truck.

F_{fs} = Static frictional force trying to stop crate from sliding.

Y dir: $\Sigma F_y = ma_y$

$$F_N - mg = 0 \Rightarrow F_N = mg$$

$$F_{fs} \leq \mu_s F_N \leq \mu_s mg. \quad \Rightarrow (F_{fs})_{max} = \mu_s mg.$$

x dir: $\Sigma F_x = ma_x$

$$-(F_{fs})_{max} = m\, a_{max} \Rightarrow -\mu_s \cancel{m} g = \cancel{m} a_{max}$$

$$a_{max} = -(\boxed{0.80})(9.8\ m/s^2) = -\boxed{7.84}\ m/s^2$$

magnitude of maximum rate at which driver can decelerate -

$$a_{max} = \boxed{7.84}\ m/s^2$$

7. Giancoli6 4.P.052. [354118] **0/2 points** Show Details

The carton shown in Fig. 4-55 lies on a plane tilted at an angle $\theta = \boxed{21.0°}$ to the horizontal, with $\mu_k = 0.17$.

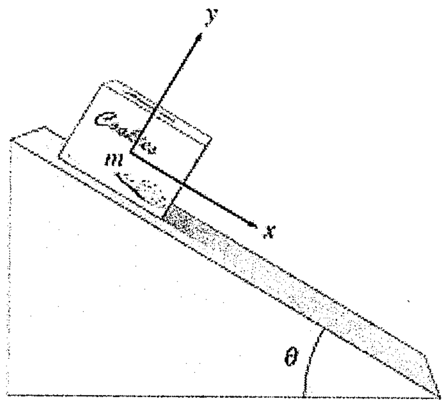


Figure 4-55

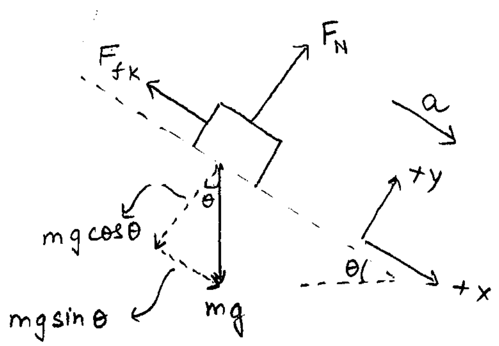
(a) Determine the acceleration of the carton as it slides down the plane. .

[ ] ✗ $\boxed{1.96}$ m/s^2 (down the plane)

(b) If the carton starts from rest $\boxed{8.70}$ m up the plane from its base, what will be the carton's speed when it reaches the bottom of the incline?

[ ] ✗ $\boxed{5.83}$ m/s

Sol 7 : (a) Free body diagram for the carton.



F_N = Normal force due to contact with surface

mg = Weight due to gravity.

F_{fk} = kinetic frictional force trying to oppose motion

Y dir: $\sum F_y = ma_y \Rightarrow F_N - mg\cos\theta = 0$ (No motion in Y-dir)

$\Rightarrow F_N = mg\cos\theta$

$F_{fk} = \mu_k F_N = \mu_k mg\cos\theta$

x dir: $\sum F_x = ma_x \Rightarrow mg\sin\theta - F_{fk} = ma.$

$\cancel{m}g\sin\theta - \mu_k \cancel{m}g\cos\theta = \cancel{m}a$

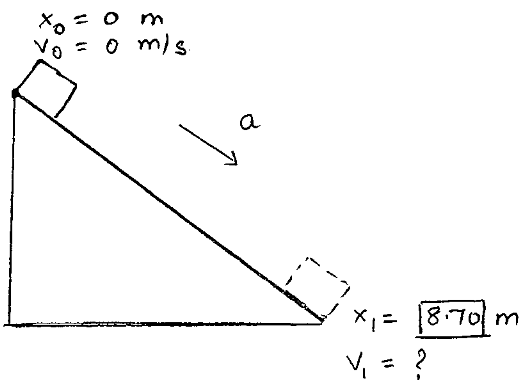
$a = g(\sin\theta - \mu_k\cos\theta) = (9.8\ m/s^2)(\sin(\boxed{21.0}°) - (\boxed{0.17})\cos(\boxed{21.0}°))$

$a = \boxed{1.957}\ m/s^2 \Rightarrow a = \boxed{1.96}\ m/s^2$ ✓

7 contd.

7 contd ...

(b)



We evaluated acceleration in part (a)

$$v_1^2 = \cancel{v_0^2}^{\,0} + 2a(x_1 - \cancel{x_0}^{\,0})$$

$$v_1^2 = 2 a x_1$$

$$v_1^2 = 2(\boxed{1.957}\ m/s^2)(\boxed{8.70}\ m)$$

$$v_1^2 = \boxed{34.0518}\ m^2/s^2$$

$$v_1 = \boxed{5.83}\ m/s$$

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8. Giancoli6 4.P.057. [351555] **0/3 points** Show Details

Piles of snow on slippery roofs can become dangerous projectiles as they melt. Consider a chunk of snow at the ridge of a roof with a pitch of 26°.

(a) What is the minimum value of the coefficient of static friction that will keep the snow from sliding down?

✗ ~~0.488~~

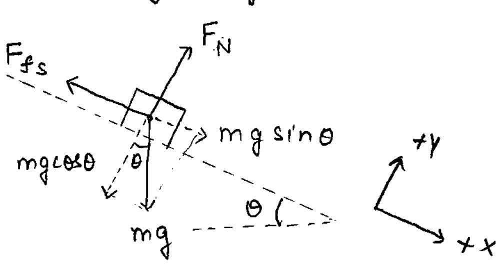
(b) As the snow begins to melt, the coefficient of static friction decreases and the snow eventually slips. Assuming that the distance from the chunk to the edge of the roof is 5.6 m and the coefficient of kinetic friction is 0.20, calculate the speed of the snow chunk when it slides off the roof.

✗ ~~5.33~~ m/s

(c) If the edge of the roof is 10.0 m above ground, what is the speed of the snow when it hits the ground?

✗ ~~15~~ m/s

Sol 8(a) Free body diagram for snow chunck



mg = weight due to gravity.

F_N = Normal force due to contact with roof

F_{fs} = static frictional force trying to stop snow from falling.

y-dir: $\sum F_y = ma_y \Rightarrow F_N - mg\cos\theta = 0$

$$F_N = mg\cos\theta.$$

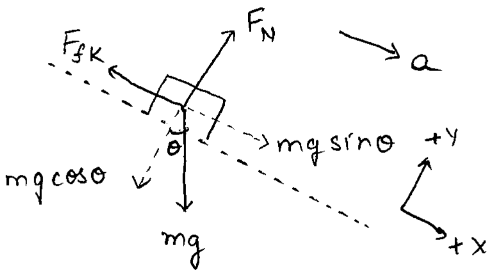
$$F_{fs} = \mu_s F_N = \mu_s mg\cos\theta$$

x dir: $\sum F_x = ma_x \Rightarrow mg\sin\theta - F_{fs} = 0$

$$\cancel{mg}\sin\theta = \mu_s \cancel{mg}\cos\theta \Rightarrow \mu_s = \frac{\sin\theta}{\cos\theta} = \tan\theta = \tan\boxed{26°} = \boxed{0.488}$$

8 Contd . . .

8(b) Free body diagram when snow is moving



mg cosθ and mg sinθ are y and x components of weight 'mg' respectively.

F_{fK} = kinetic frictional force trying to oppose motion

a = acceleration.

Y dir: $\sum F_y = ma_y$ (No motion in y-direction)

$F_N - mg\cos\theta = 0$

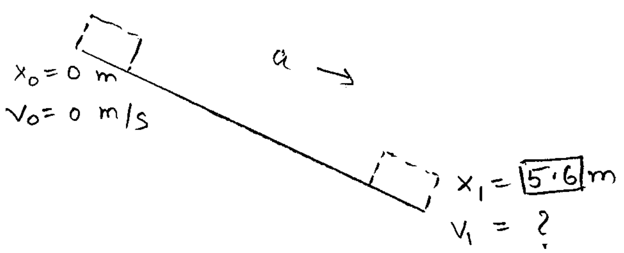
$F_N = mg\cos\theta$

Frictional force $F_{fK} = \mu_K F_N = \mu_K mg\cos\theta$.

x dir: $\sum F_x = ma_x$

$mg\sin\theta - F_{fK} = ma \Rightarrow \cancel{m}g\sin\theta - \mu_K \cancel{m}g\cos\theta = \cancel{m}a$

$a = g(\sin\theta - \mu_K\cos\theta) = (9.8\ m/s^2)(\sin(\boxed{26°}) - 0.20\cos(\boxed{26°})) = \boxed{2.5344}\ m/s^2$



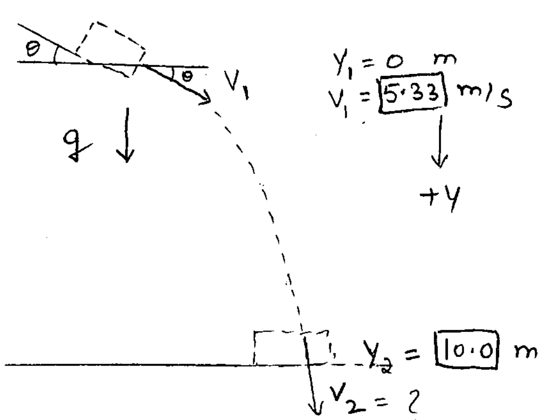
$V_1^2 = \cancel{V_0}^{2} + 2a(x_1 - \cancel{x_0})$

$V_1^2 = 2ax_1 = 2(\boxed{2.5344}\ m/s^2)(\boxed{5.6}\ m)$

$V_1^2 = \boxed{28.385}\ m^2/s^2$

$V_1 = \boxed{5.328}\ m/s = \boxed{5.33}\ m/s$

8(c)



$V_2^2 = V_1^2 + 2g(y_2 - \cancel{y_1})$

$V_2^2 = (\boxed{5.33}\ m/s)^2 + 2(9.8\ m/s^2)(\boxed{10.0}\ m)$

$V_2^2 = \boxed{224.387}\ m^2/s^2$

$V_2 = \sqrt{224.387}\ m/s = \boxed{14.98}\ m/s$

$V_2 = \boxed{15}\ m/s$

9. Giancoli6 4.P.075. [351620] **0/1 points** Show Details

Jean, who likes physics experiments, dangles her watch from a thin piece of string while the jetliner she is in takes off from Dulles Airport (Fig. 4-55). She notices that the string makes an angle of $\boxed{29°}$ with respect to the vertical while the aircraft accelerates for takeoff,

which takes about $\boxed{17}$ seconds. Estimate the takeoff speed of the aircraft.

✗ ~~92.3~~ m/s

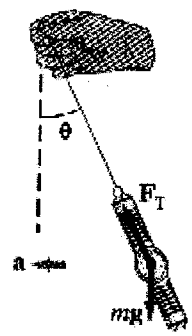
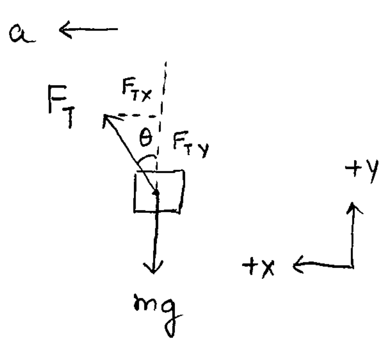


Figure 4-55

Sol 9 : Free body diagram for the clock



mg = weight due to gravity

F_T = Force exerted by tension in the string.

$$\left.\begin{aligned} F_{Tx} &= F_T \sin\theta \\ F_{Ty} &= F_T \cos\theta \end{aligned}\right\} \text{Resolving } F_T \text{ along x and y direction.}$$

$$\Sigma F_y = m a_y \Rightarrow F_{Ty} - mg = 0$$

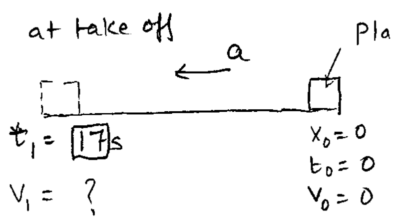
$$F_T \cos\theta = mg \Rightarrow F_T = \frac{mg}{\cos\theta}$$

$$\Sigma F_x = m a_x \Rightarrow F_{Tx} = m a$$

$$F_T \sin\theta = m a \Rightarrow \frac{\cancel{m} g \sin\theta}{\cos\theta} = \cancel{m} a \qquad \frac{\sin\theta}{\cos\theta} = \tan\theta$$

$$a = \boxed{9.8}\ m/s^2 \tan(\boxed{29°}) = \boxed{5.4322}\ m/s^2$$

Watch as well as plane is moving with this acceleration.



$$V_1 = \cancel{V_0}^{\,0} + a(t_1 - \cancel{t_0}^{\,0})$$

$$V_1 = \left(\boxed{5.4322}\ m/s^2\right)\left(\boxed{17}\ s\right) = \boxed{92.35}\ m/s$$

✓

10. Giancoli6 4.P.076. [351622] **0/2 points** Show Details

A $\boxed{28.5}$ kg block is connected to an empty 1.00 kg bucket by a cord running over a frictionless pulley (Fig. 4-57). The coefficient of static friction between the table and the block is $\boxed{0.475}$ and the coefficient of kinetic friction between the table and the block is 0.320. Sand is gradually added to the bucket until the system just begins to move.

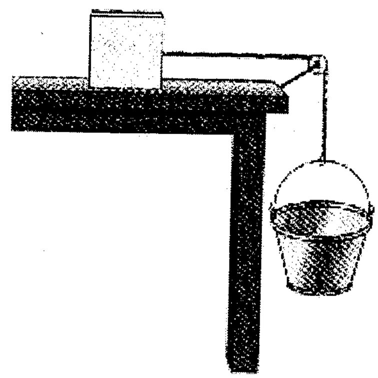


Figure 4-57

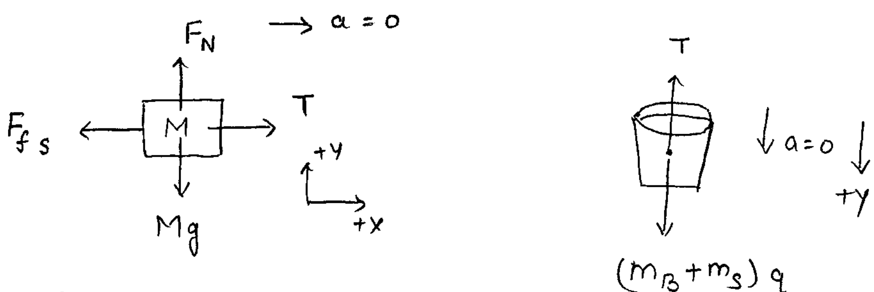
(a) Calculate the mass of sand added to the bucket.

✗ 12.5 kg

(b) Calculate the acceleration of the system.

✗ 1.03 m/s^2 (downward)

Sol 10(a) Free body diagram for block and bucket with sand when they are just about to move (Static situation)



F_N = Normal force on block due to contact with table.

F_{fs} = Force of static friction trying to stop block from moving.

Mg = weight of block due to gravity

T = Force due to tension in cord

m_B = mass of bucket

m_s = mass of sand.

Block

y dir: $F_N - Mg = 0$

$\Rightarrow F_N = Mg.$

$F_{fs} = \mu_s F_N = \mu_s Mg$

x dir: $T - F_{fs} = 0$

$T = \mu_s Mg$

Bucket + Sand

y dir: $(m_B+m_s)g - T = 0$

$\Rightarrow (m_B+m_s)g = T$

$(m_B+m_s)\cancel{g} = \mu_s M\cancel{g}$

$m_s = \mu_s M - m_B = (\boxed{0.475})(\boxed{28.5}\text{ kg}) - (\boxed{1.00}\text{ kg})$

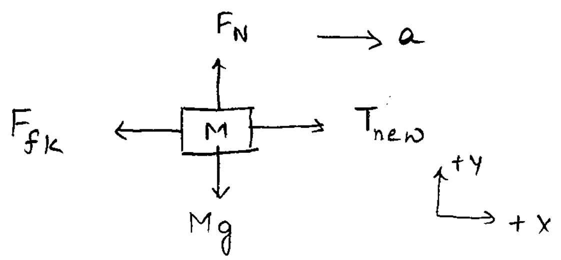
$m_s = \boxed{12.54}\text{ kg} = \boxed{12.5}\text{ kg}$ ✓

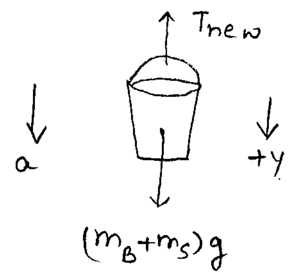
(10) contd:-

(10) Contd . . .

(b) Calculate the acceleration i.e. now the block and bucket+sand are moving. They are connect by cord therefore they will move with same acceleration.

Free body diagram for block and bucket + sand.





T_{new} = Force due to tension in cord.
[Note: It is different from T since system is moving now.]

Block

$\Sigma F_y = ma_y \Rightarrow F_N = Mg$

$\Sigma F_x = ma_x \Rightarrow T_{new} - F_{fk} = Ma$

$F_{fk} = \mu_k F_N = \mu_k Mg$

Bucket + Sand

$\Sigma F_y = ma_y$

$(m_B+m_s)g - T_{new} = (m_B+m_s)a \quad -(2)$

$\Rightarrow T_{new} - \mu_k Mg = Ma$

$T_{new} = Ma + \mu_k Mg \quad -(1)$

Substitute T_{new} from (1) in (2)

$(m_B+m_s)g - (Ma + \mu_k Mg) = (m_B+m_s)a.$

Solve for a.

$(m_B+m_s)g - \mu_k Mg = (m_B+m_s)a + Ma.$

$$\Rightarrow a = \frac{(m_B+m_s-\mu_k M)g}{(m_B+m_s+M)} = \frac{(1.00 + \boxed{12.54} - (0.320)(\boxed{28.5}))\cancel{kg}(9.8\,m/s^2)}{(1.00+\boxed{12.54}+\boxed{28.5})\cancel{kg}}$$

$$a = \boxed{1.0303}\ m/s^2 = \boxed{1.03}\ m/s^2$$

11.

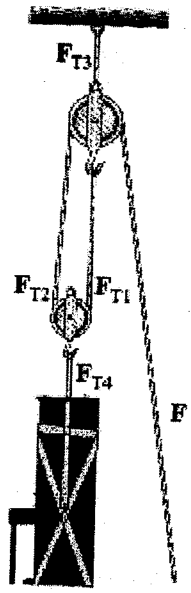


Figure 4-56

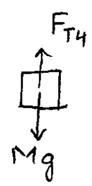
(a) What minimum force F is needed to lift the piano (mass M) using the pulley apparatus shown in Fig. 4-56? (Enter your answers in terms of Mg.)

~~0.5~~ Mg

(b) Determine the tension in each section of rope.

Sol 11: Minimum force refer to the amount of force required to keep Piano static. That is applying just a little force above this with start lifting Piano.

Free body diagram for Piano

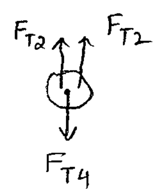


$\Sigma F_y = 0$

$F_{T4} - Mg = 0$

$\Rightarrow \boxed{F_{T4} = 1\ Mg}$ —(1)

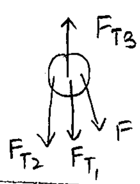
Free body diagram for lower Pulley



$\Sigma F_y = 0$

$\boxed{F_{T1} + F_{T2} = F_{T4}}$ —(2)

Free body diagram for upper Pulley



$\Sigma F_y = 0$

$\boxed{F_{T3} = F_{T1} + F_{T2} + F}$ —(3)

Since same rope is going over both pulleys. This implies

$$\boxed{\begin{aligned} F_{T1} &= F_{T2} \\ F_{T2} &= F \end{aligned}}$$ —(4)

From (2), (4) and (1)

$2F_{T1} = F_{T4} = Mg$.

$\Rightarrow F_{T1} = \frac{1}{2} Mg = \boxed{0.5}\ Mg$

$F_{T2} = F_{T1} = \boxed{0.5}\ Mg$

$F = F_{T2} = \boxed{0.5}\ Mg$ (Part a)

$F_{T3} = F_{T1} + F_{T2} + F_{T3} = (0.5 + 0.5 + 0.5)\ Mg$

$F_{T3} = \boxed{1.5}\ Mg$

12. Giancoli6 4.P.081. [351623] **0/3 points** Show Details

A 6490 kg helicopter accelerates upward at 0.60 m/s^2 while lifting a 1210 kg frame at a construction site, Fig. 4-62.

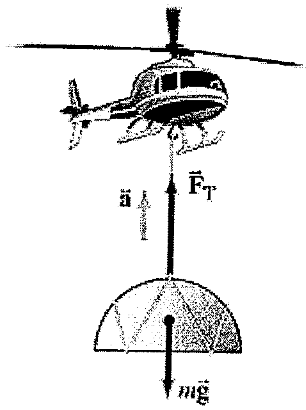


Figure 4-62

(a) What is the lift force exerted by the air on the helicopter rotors?

[ ] ✗ ~~80100~~ N

(b) What is the tension in the cable (ignore its mass) that connects the frame to the helicopter?

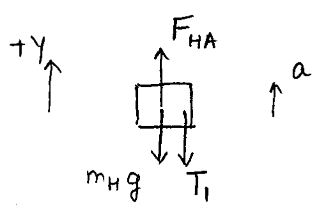
[ ] ✗ ~~12600~~ N

(c) What force does the cable exert on the helicopter?

[ ] ✗ ~~12600~~ N

Sol 12 Free body diagrams for helicopter, frame and cable tied to frame.

Helicopter



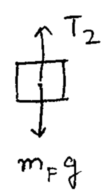
F_{HA} = Lift force on helicopter due to air.

$m_H g$ = weight due to gravity.

$$\boxed{\Sigma F_y = m a}$$

$$F_{HA} - m_H g - T_1 = m_H a \quad -(1)$$

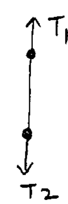
Frame



$m_F g$ = weight of frame due to gravity

$$T_2 - m_F g = m_F a \quad -(2)$$

Cable



T_1 = tension due to pull by helicopter

T_2 = tension due to pull by frame

$$T_1 - T_2 = \underbrace{m_C}_{=0} a = 0 \quad \text{massless cable !!}$$

$$T_1 = T_2 \quad -(3)$$

using (3) in (1) and (2)

$$F_{HA} - m_H g - T_1 = m_H a \quad -(4)$$

$$T_1 - m_F g = m_F a \quad -(5)$$

(12) contd...

12 Contd...

(a) Lift force on helicopter by air.

from 4

$$T_1 = -m_H a - m_H g + F_{HA} = -m_H(a+g) + F_{HA}$$

from 5

$$T_1 = m_F a + m_F g = m_F(a+g)$$

equating.

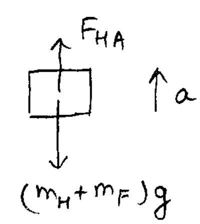
$$m_F(a+g) = -m_H(a+g) + F_{HA}$$

$$\Rightarrow F_{HA} = m_F(a+g) + m_H(a+g) = (m_F+m_H)(a+g)$$

$$F_{HA} = \left(\boxed{6490}\ \text{kg} + \boxed{1210}\ \text{kg}\right)\left(\boxed{0.60}\ \text{m/s}^2 + 9.8\ \text{m/s}^2\right)$$

$$F_{HA} = \boxed{80090.4}\ \text{N} = \boxed{80100}\ \text{N}$$

Note:
This can be obtained just by considering helicopter and frame as one mass



$$F_H - (m_H+m_F)g = (m_F+m_H)a$$

$$F = (m_F+m_H)(g+a)$$

(b) Tension in the cable.

from 5

$$T_1 = m_F a + m_F g = m_F(a+g)$$

$$T_1 = \left(\boxed{1210}\ \text{kg}\right)\left(\boxed{0.60}\ \text{m/s}^2 + 9.8\ \text{m/s}^2\right) = \boxed{12584}\ \text{N} = \boxed{12600}\ \text{N}$$

(c) Force due to cable on helicopter is same as tension in the cable.

$$\Rightarrow T_1 = \boxed{12600}\ \text{N}$$