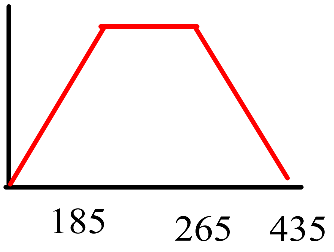
1) 3HR 5 MIN = 185 min
1HR 20 MIN = 80 min
2HR 50 MIN = 170 min

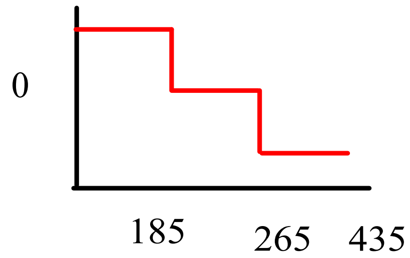
A S = 310 * 1609 / 26100s = 19.1 m/s

B v = 0 m / 26100s = 0 m/s

C



F



D v = 249395 m / 10200s = 24.5 m/s

E v = 249395 m / 11100s = 22.2 m/s

Dec 11-7:53 AM

2. A glider of mass = 750 grams is placed on a level air track. The glider is joined by strings to two hanging masses. $m_1 = 4.65$ kg and $m_2 = 3.76$ kg. The masses are attached to each side of the glider.

a. What is the acceleration of the glider if it is released with the air track turned on? (that means no friction)

b. What is the acceleration of the glider if the air track is off and the coefficient of sliding friction between the track and the glider is .12?

c. What is the maximum coefficient of friction which could exist between the glider and the track if you want the glider to move?

Dec 10-9:04 AM

2)

0.75
4.65
3.76
9.16kg

A

$m_1 = 4.65(9.81) = 45.6N$

$m_2 = 3.76(9.81) = 36.8N$

$F_T = 45.6 - 36.8 = 8.71N$

$8.71 = 9.16\ (a)$ a= 0.91 m/s^2

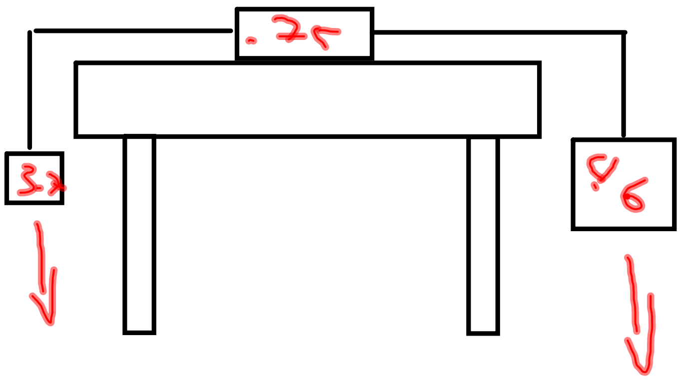
B

$F_T = 8.71 - \mu(.75)(9.81)$

$F_T = 9.16(a) =$ 0.81 m/s^2

C

$F_f = 8.71 = \mu(7.35) =$ 1.19



Dec 11-7:51 AM

3)

t= 12.62 sec

Δx= 0.34 miles

Δx= 175ft

a) $\Delta x = v_i t + 1/2\ at^2$

$547m = 0 + 1/2\ a(12.62)^2 =$ 6.86 m/s^2

b) $v_f^2 = 0 + 2\ (6.86)(547) =$ 86.6 m/s

c) 522m = 86.6 m/s(t) = 6 sec

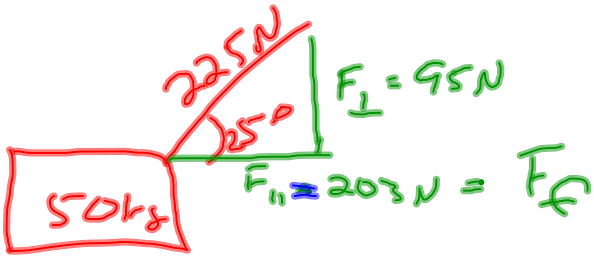
d) $t^2 = 2\Delta x/g$ t = 3.3sec

$v_f = 0 + (9.81)3.3 =$ 32.2 m/s

e) $\Delta x = 86(3.3) =$ 287m

Dec 11-7:59 AM

4. A rope tied to a box (50 kg) makes an angle of 25° with the horizontal as you drag it. You are able to pull the box across the floor at a constant speed of 5 m/s by applying a constant force of 225 N along the rope.
a. What is the coefficient of sliding friction between the box and the floor?
b. What is the total force acting on the box given the situation described above?
c. What force would you need to apply in order to maintain constant box speed if the box had a mass of 75.0 kg?



$F_f = \mu F_N$

$203N = \mu(mg - 95N)$ (75; 50(9.81))

$\mu = 0.51$

Dec 10-9:04 AM

4)

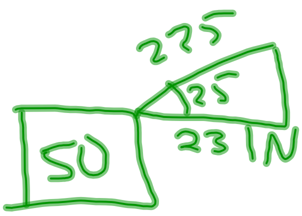
a) $F_f = F_A$

$231N = \mu(50 \times 9.81)$

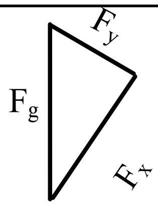
$\mu = .47$

b) 0

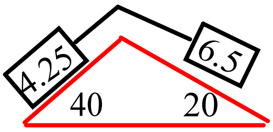
c) $F_f = .47(75 \times 9.81) = 345N$



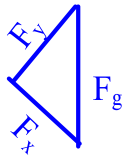
Dec 11-8:56 AM



5)



$F_g = 4.25 * 9.81$



$\cos(\theta) = F_y/F_g$ $F_y = 59.8$ N

$\sin(\theta) = F_x/F_g$ $F_x = 21.7$ N

$\cos(\theta) = F_y/F_g$ $F_y = 31.86$ N

$\sin(\theta) = F_x/F_g$ $F_x = 26.7$ N

A) $F_T = 26.7 - 21.7 = 5$ N

$5N = 10.75\,a$ $a = 0.47\ m/s^2$

5)

B) $F_T = (4.25 + m_2)(0.02)$

$F_T = 41.6N \sin(40) - 9.81 m_2 \sin(20)$

$(4.25 + m_2)(0.02) = 41.6N \sin(40) - 9.81 m_2 \sin(20)$

$m_2 = 7.89kg$

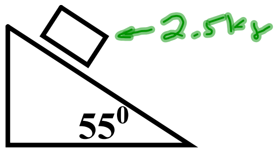
Dec 11-8:02 AM

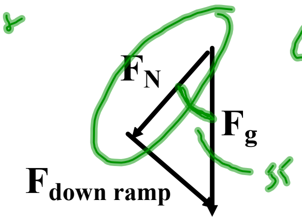
6. Mr. Holzworth has lost his marbles. It is a blustery winter day and he decides to head to the beach on Sullivan's Island for a run and swim. As he approaches the beach he sees a box sitting on a dune. The box is perched precariously on the top of one side of the dune with a meter stick holding it in place, so that it does not slide down the dune. The surface of the dune was flat and made a 55^0 angle with the level beach in front of the dune. The total mass of the box and its contents was 2.5 kg (it didn't appear to have much in it). Mr. Holzworth removes the meterstick (thinking he could use that in physics) from in front of the box and it begins to slide down the dune. When it reaches the base of the dune (5 meters away) it breaks open and out pour its contents, Mr. Holzworth exclaims, "Oh, there are my marbles"

a. What is the total force due to gravity acting on the box?
b. What normal force is the dune applying to the box?
c. What force must the stick be applying to the box?
d. How fast will the box accelerate down the dune when the stick is removed and we assume frictionless sliding?
e. If the actual coefficient of sliding friction between the box and the dune is 0.30, at what rate will the box actually accelerate?
f. How long would it take the box to slide down the dune?

Dec 10-9:05 AM

6)





a) $F_w = mg = 24.5N$

b) $F_N = mg\cos\theta = 14N$

c) $F_{ll} = F_y = mg\sin\theta = 20.1N$

d) $20.1N = 2.5a = 8.04\ m/s^2$

e) $F_T = 20.1N - .3(14N) = 15.9\ N$
$15.9N = 2.5a = 6.4\ m/s^2$

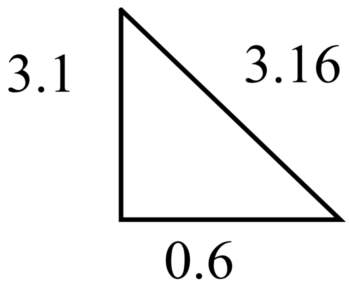
f) $5m = 0 + 1/2(6.4)t^2 = 1.25\ s$

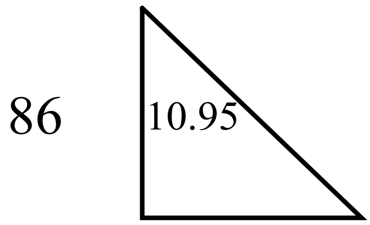
Dec 11-8:07 AM

7)

a) 3.16 m/s

b) $\tan(\theta) = 0.6/3.1 = 10.95^0$





c) $\cos(10.95) = 86/x$

$x = 87.6m$

$87.6m = 3.16\ m/s\ t$
$t = 27.7\ s$

d) $\tan(10.95) = x/86$

$x = 16.6m$

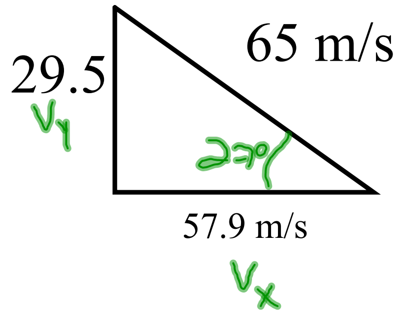
Dec 11-8:14 AM

9)

$\Delta x = V_i t + \frac{1}{2} a t^2$

$-4.9t^2 + 29.5t + 1.6 = 0$

t= 6.1 sec



a) 57.9 (6.1)= 353m

b) 10.6 (39.1)= 414m

c) 45^0

d) no effect

Dec 11-8:16 AM

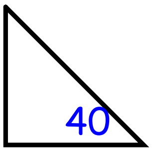
#10) a) $9.81 m/s^2$

b) $\Delta x = 1/2\ (9.81 m/s^2) t^2$ = 8.8s

c) $V_f^2 = 0 + 2(9.81)(380)$ = 86 m/s

Dec 11-8:20 AM

11)



$F_x =$ 657-(Sin(40)) =422 N

$F_y =$ 657-(Cos(40)) =503N

$F_T =$ 422N- 65.7N = 356 N

356 = 67(a) 5.3 m/s^2

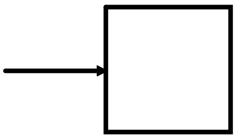
$(35.7\ m/s)^2 = 0 + 2(5.3)(\Delta x) = 120m$

35.7 m/s = 0 + (5.3)(t) = 6.6 sec

35.7 m/s = 80km/hr

Dec 11-8:24 AM

12)



$F_f =$ 0.5(120kg * 9.81m/s^2) = 588.6N

Dec 11-8:24 AM

13)

A) m = 800N/9.81 = 81.5kg m = 600N/9.81 = 61.1kg

m_t = 81.5kg + 61.1+ 3500kg = 3642kg

b) 1500 m/s = 0 + a(18sec) = 83.3 m/s^2

c) F = (3642kg)(83.3+9.81) = 35811N

d) V_F = 0+ 83.3(38) = 3154m/s

e) 2500m = 1/2(a)$(15)^2$ = 22.2 4m/s^2

f) F = (3642kg)(22.2) = 80933N

g) 80933N = 8.6x10^{25}(a) = 9.4x10^{-22} m/s^2

$$\frac{R_{ma}^2}{R_{ea}^2} = \frac{7.35\times10^{22}}{5.98\times10^{24}}$$

$$\frac{(GmM_m)}{R_{ma}^2} = \frac{(GmM_E)}{R_{ea}^2}$$

Dec 11-8:53 AM

14)

a) W = 0.2kg(15.2m/s^2) = 3.04N

b) F_f = 0.12(0.2kg)(15.2) = 0.3648N

C) Δx = 1/2(a)$(4.5)^2$ = 0.24m/s^2

F_t = 0.2kg(0.24m/s^2) = 0.049N

d) Ft = Ff + FBeep + FBoop

0.049N= 0.3648 + F_w + 1.56N = 1.97N

e) V_f^2 =0+ 2(0.24)(2.5) = 1.1 m/s

f) 800/15.2 = 52.6 kg and 600/15.2= 39.5kg

Nov 22-9:44 AM

15

a) $V = \sqrt{\dfrac{G(1.9\times10^{27})}{(3.869 \times 10^{9}\text{m})}}$ 5723m/s

b) $V = \sqrt{\dfrac{G(2\times10^{30})}{7.78\times 10^{11}\text{m})}}$ 13094m/s

c) $\omega=(5723^2)/\ 3.869\times10^{9}\text{m}= 1.47\times10^{-6}$ rad/s

d) $a= (1.47\times10^{-6})^2\ 3.869\times10^{9}\text{m} = 0.008\ \ \text{m/s}^2$

e) $T= \sqrt{\dfrac{4\pi^2 3.869\times10^{9}}{G(1.9\times10^{27}\text{kg})}}$ $= 4.2\times10^{6}\text{sec}$

Dec 11-8:57 AM

16)

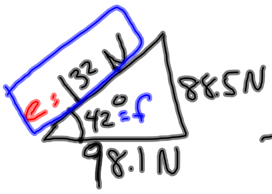
$F = \dfrac{6.67\times10^{-11}(60)(7.35\times10^{22})}{(6.2\times10^{5})^2}$ 765N

b) $F = \dfrac{G\ (60)(5.98\times10^{24})}{(6.2\times10^{5})^2}$ 62257N

Nov 22-10:07 AM

17)
a) 250Nx + 0 Ny
b) -68.4Nx + 188Ny
c) -83.5Nx + -99.5Ny

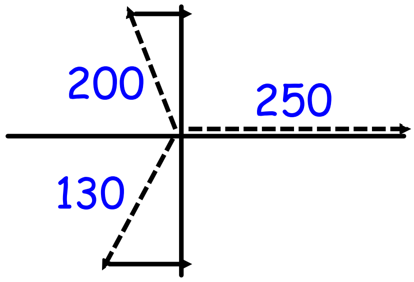
D 98.1Nx + 88.5Ny

e)


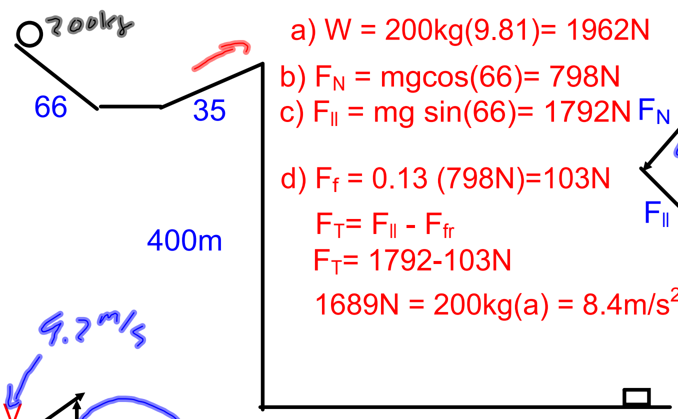
$\tan\theta = \frac{88.5N}{98.1N}$

g 132N = 10kg(a)

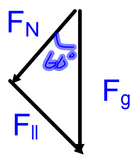
13.2 m/s²



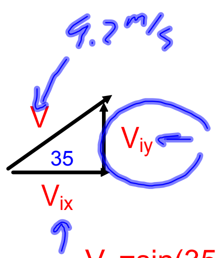
Dec 11-2:25 PM

18)


a) W = 200kg(9.81)= 1962N
b) F_N = mgcos(66)= 798N
c) $F_{||}$ = mg sin(66)= 1792N



d) F_f = 0.13 (798N)=103N
$F_T = F_{||} - F_{fr}$
F_T= 1792-103N
1689N = 200kg(a) = 8.4m/s²



f) $V_f^2 = 0 + 2(8.4)(54.7m) = 30.3$ m/s

V_{iy}=sin(35)30.3m/s=17.4m/s V_{ix}=cos(35)30.3 m/s= 24.8m/s

g) $\Delta x = v_{iy}t + 0.5at^2$
$400m = 17.4t - 4.9t^2$
$0 = -4.9t^2 + 17.4t + 400m$ quad form
t = 10.98 sec

h) x = 24.8m/s (10.98sec)=272.4m

Dec 10-9:07 AM

19) a) 20kg(9.81)45m = 8829 J

a) 8829 J - 3924J = 4905J

c) 20kg(9.81)20m = 3924 J

Dec 6-3:06 PM

20) F_f= 0.2(0.4kg)(9.81 m/s^2)=0.78N

W =$F_f\Delta x$ 250J =0.78NΔx

Δx= 318.5m

Nov 27-11:06 AM

21) KE= $1/2mv^2$ PE=mgh

$V_f^2 = 8.1m/s^2 + 2(9.81)(15.2)$
19.07 m/s

KE = $1/2\ mv^2$

460J = $1/2\ m\ (19.07m/s)^2$
m = 2.52kg

b) $v_f^2 = 8.1^2 + 2(9.81)(30.5m) = 25.8\ m/s$

$0^2 = 25.8^2 + 2(a)(0.65m)$ $a = 512.03\ m/s^2$

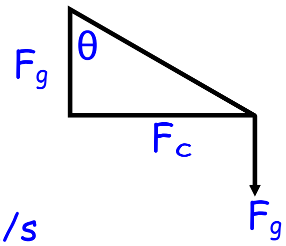
F = $2.52kg(512.03m/s^2)$ = 1280N

Nov 27-11:07 AM

22)

a) $g = \frac{6.67 \times 10^{-11}(1.9 \times 10^{27})}{(7.18 \times 10^7)^2} = 24.58\ m/s^2$

b) $\frac{1}{4\ rev/s} = 0.25sec$



c) $F_c = mv^2/r$ v= $2\pi r/0.25 = 43.9\ m/s$
$F_c = 0.65kg(43.9^2)/0.25$ =5010 N

d) $F_g = ma$ = $0.65kg(24.58m/s^2) = 15.98\ N$

e) Tan(θ) = 5010N/15.98N = 89.9°

Dec 6-3:11 PM

23) $PE_i = PE + KE$

a) PE_i= 1000kg(9.81)40m = 394,200J

PE_f = 1000kg (9.81)(15m)= 147,150J

394,200 - 147,150 = 245,250J lost

W= FfΔx

245,250J = F_f(300m)

F_f= 817.5N

Nov 22-10:17 AM

24) KE= $1/2mv^2$ PE=mgh

PE = 20kg(9.81)(2.75m)= 539.55J

PE = 20(9.81)(.65m)= 127.53J

539.55- 127.53 = 412.02

412.02j = 1/2 (20)v^2

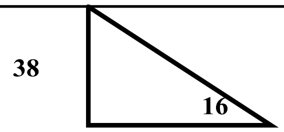
V= 6.42 m/s

b)

KE = 1/2 (20)(2.5^2) = 62.5J

412.02-62.5= 349.5J

Nov 27-11:06 AM



a) $0 = V_{iy}^2 + 2(9.81)(38) = 27.3$ m/s

$\sin(16) = 27.3/V_i = 99$ m/s

b) $90 - 16 = 74$

c) $\Delta x = 27.3$ m/s $t + 1/2(-9.81)t^2$ Quadform

$t = 5.5$ sec

d) $\Delta x = 95 * 5.5 = 522.5$m

Dec 11-8:05 AM