2008-09-24 Physics — Richard X. Thripp — ①

5.24

→ in N

2nd floor Science Bldg. 208 ?

next meeting

$\vec{F} = m\vec{a} \rightarrow \vec{F} = mg - n$

$\frac{m\vec{a}}{m} = \frac{mg - n}{m} \rightarrow \vec{a} = \frac{mg - n}{m} = \frac{mg - n}{\left(\frac{550N}{9.8\frac{m}{s^2}}\right)} =$

$m = \frac{550N}{9.8\frac{m}{s^2}}$ normal weight

(a) $\frac{mg - n}{56.1224} = \frac{550N - 450N}{56.1224} =$

$m = \frac{mg}{m} \quad \frac{100^N}{56.1224N} =$ **1.7818 m/s down.**

$mg = \left(\frac{550N}{9.8\frac{m}{s^2}}\right) \cdot 9.8\frac{m}{s^2}$

(b) Scale says 670N

$\frac{550N - 670N}{56.1224} = \frac{-120}{56.1224} = -2.1382\frac{m}{s}$ down

+2.1382 m/s up

c ON

$\frac{550N - 0N}{56.1224} =$ **9.8 m/s down**

Same as gravity. The cable has broke!

(d) $T = mg - ma = m(g - a) = 850kg\left(9.8\frac{m}{s^2} - 1.7818\frac{m}{s}\right) =$

6815.555 N

$mg - T = ma$

$mg = ma + T$

$T = mg - ma$

5.24 d. c = ON

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(2)

d_1 15s d_2 100s

$d_1 = x - x_0 = v_0 t + \frac{1}{2} a t^2$

$d_1 = \frac{1}{2} a t^2 = \frac{1}{2}\left(2 \frac{m}{s^2}\right) 15^2 =$

$1 \frac{m}{s^2} \cdot 225 =$ 225 meters

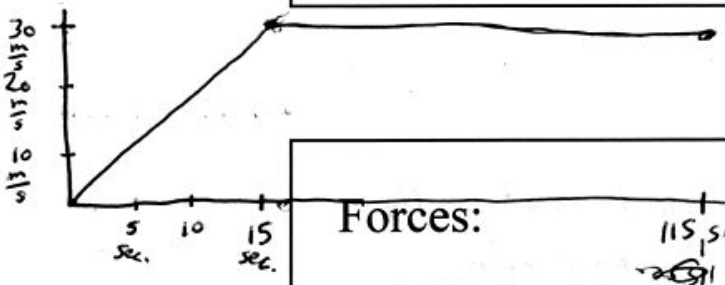
Train problem (exam 1.3)

Newton's Laws Of Motion

Chapter 04

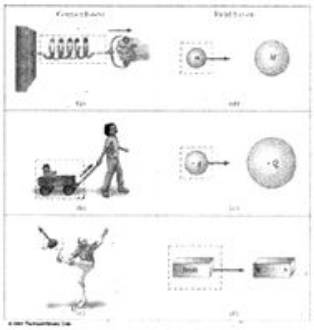
$d_2 \quad x - x_0 = v_0 t + \frac{1}{2} a t^2$

Dr. Gajendra Tulsian DSC 1



Forces:

- We classify forces into two broad categories: contact and field forces.
- If net force exerted on a object is zero, acceleration of the object is zero.
- Forces are vector quantities.



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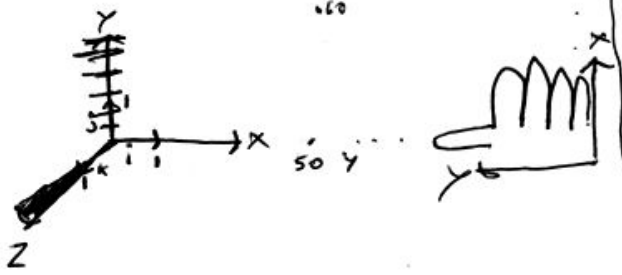
(3) 2008-09-24 Physics Richard X. Thripp

tensor = everything in physics

[scalar 52F° 0th tensor
vector have both magnitude and direction 1st tensor

~~6 cos 60°~~

$\vec{V_1} = 50i + 60j + 100k$



big-endian

x small-endian

most important data is first

least important 1st

50.024 } sort of like diff. between right & left-hand coord. sys.
420.05 }

i j k } unit vector -linked- axis
1 1 1
x y z

~~Bo~~

0.2364

$\theta = \arccos 0.2364 =$

76.3287°

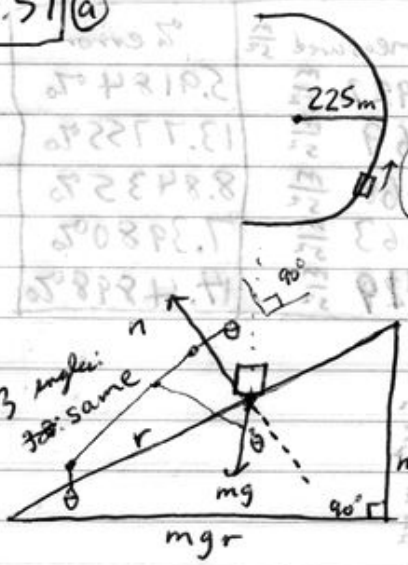
Exam answers have 76.1° because of a round error: 0.2364... is rounded up to 0.24. This is considered acceptable.

programming

acos
atan
asin
cos Variable, like θ, x, ϕ
tan
Sin ($num)

arc preferred over $^{-1}$ because it can be easily typed on the computer

5.51 (a)



$n\cos\theta = mg$ (force down)

$n\sin\theta = \frac{mv^2}{r}$ (mv^2) (mass times velocity squared, all divided by the radius of 225m)

We want to divide the opposite side (mv^2) over the adjacent (mgr) to find the angle. Tangent function

trig. ID: $\tan\theta = \frac{\sin\theta}{\cos\theta}$ SO, $\frac{n\sin\theta}{n\cos\theta} = \frac{\frac{mv^2}{r}}{mg}$ } n's cancel, $\frac{\sin\theta}{\cos\theta}$ becomes tan:

$\tan\theta = \frac{\frac{mv^2}{r}}{mg}$ What is $\frac{\frac{mv^2}{r}}{mg}$? Break it up:

mass cancels — mass is irrelevant

$\frac{1}{1}\cdot\frac{mv^2}{r}\cdot\frac{1}{mg} = \frac{v^2}{rg}$

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

$\arctan\frac{v^2}{rg} = \theta$

What is V in meters/second?

Use conversion factors:

1 meter = 39.37 inches

1 mile = 5280 ft.

5280 ft. × 12 = 63,360 inches

$\frac{63,360}{39.37} \approx 1609.3472$ meters in a mile

$\frac{1609.3472\text{m} \cdot 65\text{ mph}}{3600\text{ sec}} \approx \frac{104607.5692}{3600} \approx \boxed{29.0577\ \frac{m}{s}}$

$\arctan\frac{29.0577^2}{225 \cdot 9.8\ \frac{m}{s^2}} \approx \arctan 0.3829 =$

$\boxed{20.9530°}$

KNOW THESE:

4.6, 4.10, 4.12, 4.15, 4.20, 4.21, 4.38, 4.46
5.10, 5.18, 5.20, 5.24, 5.29, 5.36, 5.50, 5.51, 5.55, 5.56 } 18 problems

5.29 in student solution manual