Phys 111 2023

Review 2

Mon: Exam 2 - 50 min in class

Covers: Ch 3.7, 4, 5, 6

Lectures 13→21

HW 4→6

Bring: * Calculator (not communicating device)

* First Index Card.

* Second Index Card → 3"x5" single sided card.

Study: * 2016, 2019 Exam 2 - all questions

* HW, Discussion problems

* Class quizzes

* Concept Tests

Ch 4, 5

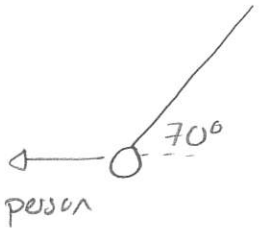
$\vec{F}_{net} = m\vec{a}$ $\quad \Sigma F_{ix} = ma_x$ $\quad \Sigma F_{iy} = ma_y$ $\quad w = mg$

$f_{s\,max} = \mu_s n$ $\quad f_k = \mu_k n$ $\quad$ Newton's Third Law

Quiz 1 40% - 80%

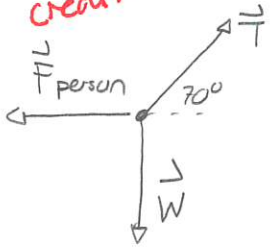
129 Suspended ball

A 6.0 kg ball is suspended from the ceiling. A person pushes horizontally on the ball so that the ball is at rest with the rope at an angle of 70° from the horizontal. Determine the force exerted by the person. *(111F2023)*



FBD

credit



Newton's 2nd Law

$\sum F_{ix} = Ma_x = 0$

$\sum F_{iy} = Ma_y = 0$

credit.

magnitudes

$W = Mg = 6.0\,kg \times 9.8\,m/s^2 = 59N$

components

$T_x = T\cos 70°$

$T_y = T\sin 70°$

	x	y
$\vec{W}$	0	$-59N$
$\vec{F}_{person}$	$-F_{person}$	0
$\vec{T}$	$T\cos 70°$	$T\sin 70°$

Thus:

$\sum F_{ix} = 0 \Rightarrow -F_{person} + T\cos 70° = 0$

$\Rightarrow F_{person} = T\cos 70°$

$\sum F_{iy} = 0 \Rightarrow -59N + T\sin 70° = 0 \Rightarrow T\sin 70° = 59N$

$\Rightarrow T \times 0.94 = 59N$

$\Rightarrow T = 59N / 0.94 = 63N$

Thus $F_{person} = 63N\cos 70°$

$= 63N \times 0.34 = 21N \Rightarrow F_{person} = 21N$

Quiz 2 60%

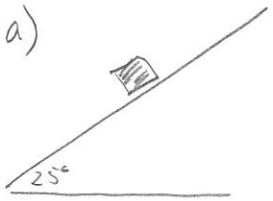
167 Box on a ramp

A 100 kg box is at rest on a ramp that is inclined at angle 25° from the horizontal. *(111F2023)*

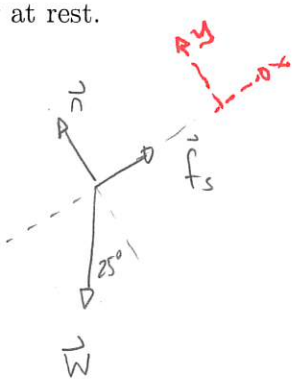
a) Determine the friction force on the box.

b) Determine the minimum coefficient of static friction between the box and ramp that allows the box to stay at rest.

a)



FBD



Newton's 2nd Law

$\sum F_{ix} = ma_x$

$\sum F_{iy} = ma_y = 0$ not moving off slope.

magnitudes

$W = mg = 100\,kg \times 9.8\,m/s^2 = 980N$

$f_s = \mu_s n.$

components

$W_x = -W \sin 25° = -980N \sin 25°$

$= -414N$

$W_y = -W \cos 25° = -980N \cos 25°$

$= -890N$

	x	y
W	-414N	-890N
n	0	n
f_s	f_s	0

Newton's 2nd Law $\sum F_{ix} = 0 \Rightarrow -414N + f_s = 0 \Rightarrow f_s = 414N$

$\sum F_{iy} = 0 \Rightarrow -890N + n = 0 \Rightarrow n = 890N$

$f_s = \mu_s n \Rightarrow 414N = \mu_s 890N \Rightarrow \mu_s = \frac{414N}{890N} = 0.46$

$\mu_s = 0.46$

Quiz 3

Ch 3.7 , 6

uniform circular motion

$\vec{a}$ inward $\quad a = \frac{v^2}{r}$

$T = 1/f \qquad v = \frac{2\pi r}{T}$

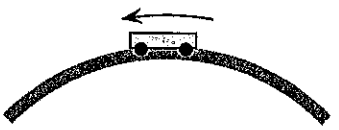
gravitation

$F_{grav} = G \frac{m_1 m_2}{r^2}$

Quiz 4 50%

203 Cart sliding over a hill

A 30 kg cart slides over a hill, which has a circular cross-section of radius 12 m. The speed of the cart at the highest point is 4.0 m/s. Determine the normal force exerted by the hill on the cart. *(111F2023)*



Ans: FBD

$\downarrow \vec{a}$ $\downarrow \vec{F}_{net}$

Newton's 2nd Law

$\Sigma F_{iy} = ma_y$ $a = \frac{v^2}{r}$

$a = \frac{(4.0\,m/s)^2}{12} = 1.33\,m/s^2$

magnitudes

$W = mg = 30\,kg \times 9.8\,m/s^2 = 294\,N.$

components, etc,

$\Sigma F_{iy} = ma_y \Rightarrow n - w = -m(1.33\,m/s^2)$

$\Rightarrow n - 294\,N = -30\,kg \times 1.33\,m/s^2$

$= -40\,N$

$\Rightarrow n = 294\,N - 40\,N$

$\Rightarrow n = 254\,N$