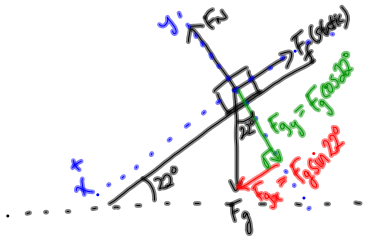
More Inclines

mp|471

$m = 84\,kg$
$\theta = 22°$
$\mu_s = 0.47$
$\mu_k = 025$

a) will it slide down?
b) if yes, a = ?
c) if no, F_a = ? (uphill)
d) a = ?, if still using F_a



a) To see if the crate slides down the hill, we need to see if $F_{gx} \geq F_f$ (static)

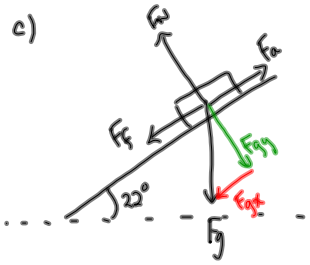
$F_{gx} = F_g \sin\theta$
$F_{gx} = mg\sin\theta$
$F_{gx} = (84kg)(9.81 m/s^2)\sin 22°$
$F_{gx} \doteq 308.69\,N$

$F_f = \mu F_N$
$F_f = \mu F_{gy}$
$F_f = \mu F_g \cos\theta$
$F_f = \mu mg\cos\theta$
$F_f = (0.47)(84kg)(9.81 m/s^2)\cos 22°$
$F_f \doteq 359.10\,N$

Since $F_{gx} < F_f$ (static), the crate will no slide down the hill.

b) N|A

c)



If you want the crate to just start moving then

$F_a = F_f(\text{static}) + F_{gx}$
$F_a = 359.10 + 308.69$
$F_a \doteq 667.79\,N$
$F_a \doteq 6.7 \times 10^2\,N$ (sd)

d) If you continue to apply 667.79N, what will be the acceleration?

$F_f(\text{kinetic}) = \mu_k F_N$
$F_f = \mu_k mg\cos\theta$
$F_f = (0.25)(84kg)(9.81 m/s^2)\cos 22°$
$F_f \doteq 191.01\,N$

$\vec{F}_{net} = m\vec{a}$
$F_a - (F_f + F_{gx}) = ma$
(uphill) (downhill)
$667.79N - (191.01N + 308.69) = (84kg)a$
$667.79N - 499.70N = (84kg)a$
$168.09N = (84kg)a$
$a \doteq 2.0\,m/s^2$
uphill

TODO:
① Lab
② PP|474-475

Determining g on an Incline

- Preliminary Questions
- Data/Observations
  - Sample graphs (d-t, v-t with slope) – identify the trial.
  - data table
- Analysis

  1 + 2 -> show sample calculation

  3. Insert GA graph (show LOBF + extrapolated value)

  4. Write equation -> use appropriate variables

  5. State the acc when $\sin\theta = 1$

  6. % error = $\frac{\text{exp} - \text{true}}{\text{true}} \times 100\%$

  7 + 8 N/A

  9. is extrapolation valid?

- Extensions 1 + 2

  3 (ADV) – estimate a value for μ_k

DUE THURS – OCT 11