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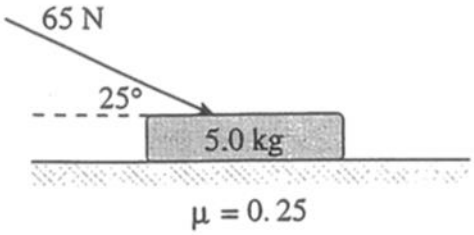
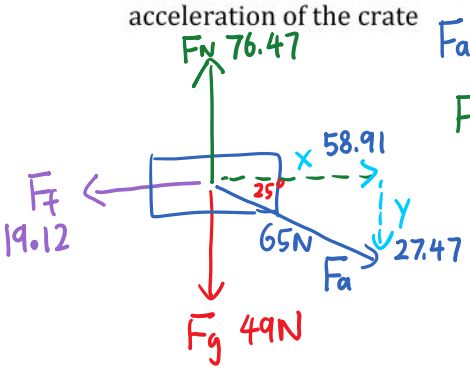
**PHYSICS 12 Dynamics Practice Test** **Name:** Spider Cheung

**Short Answer Questions**

1) A 65 N force is applied to a 5.0 kg object as shown [8 marks]

a) draw a free-body diagram showing all forces acting on the crate. b) Find the normal force, friction and acceleration of the crate




$F_{ay} = 65 \sin 25 = 27.47$

$F_N = F_{ay} + F_g = 76.47$

$F_f = \mu F_N = 19.12$ (0.25)

$F_{net} = F_{ax} - F_f = ma$

$58.9 - 19.1 = 5(a)$

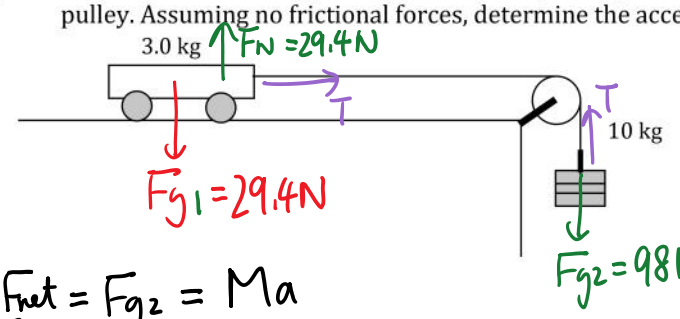
$a = 7.96$

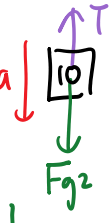
Fnormal: 76.5 N

Ff: 19.1 N

Acceleration: 7.96 m/s²

2) The diagram shows apparatus where a 3 kg trolley is being pulled along by a 10 kg load on a string over a pulley. Assuming no frictional forces, determine the acceleration of the trolley and the tension on the string.




$F_{net} = F_{g2} - T = ma$

$98 - T = 10(7.54)$

$T = 22.6$

a) $F_{net\ sys} = F_{g2} = Ma$

$98 = (13\text{kg})a$ $a = 7.54\ m/s^2$

Acceleration: 7.54 m/s² 10kg [Down]

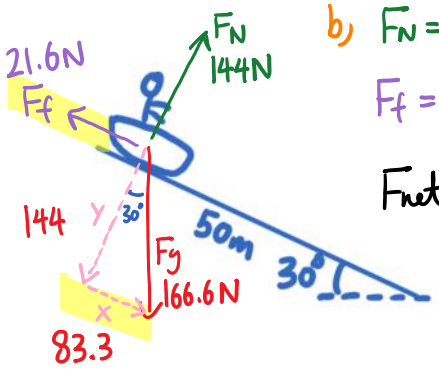
Tension: 22.6 N

3) In the name of Physics, Mr.Cheung's son slides down a 30° slope on a snow tube.

a) draw a free-body diagram showing all forces acting on my son.

b) What is the magnitude of the acceleration if the combined mass is 17 kg and the coefficient of friction between the snow tube and the snow is 0.15

c) The slope is 50 m long, how long is the ride assuming he starts from rest? (time?)




b) $F_N = F_{gy} = F_g \cos(30°) = 144.3N$

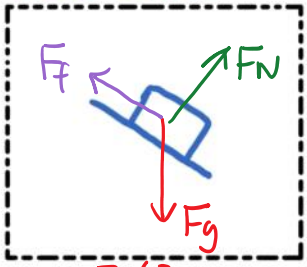
$F_f = \mu F_N = 0.15(144) = 21.64\ N$

$F_{net} = F_{gx} - F_f = ma$

$83.3 - 21.64 = 17(a)$

$a = 3.63\ m/s^2$

FBD here.




Acceleration: 3.63m/s²

c) $V_i = 0$, $d = 50$, $a = 3.63$

$d = V_i t + \frac{1}{2}at^2$

$50 = \frac{1}{2}(3.63)t^2$ $t = 5.25$ sec

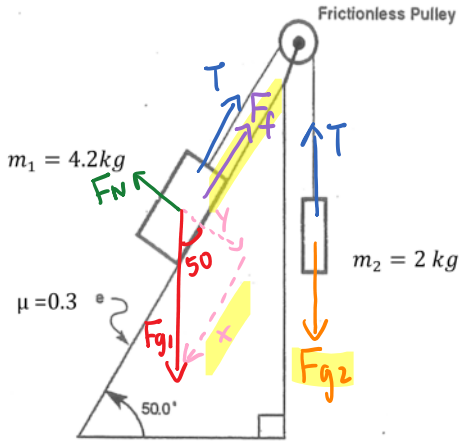
Time: 5.25 sec

5) Two objects are connected by a light thread over a frictionless pulley, as shown below. What is the acceleration of the 4.2 kg mass? [8 pts]

win

$F_{g1x} = m_1 g \sin 50 = 31.53\ N$ $\quad F_{g2} = m_2 g = 19.6$

$\therefore F_f$ points up hill.




$F_N = F_{gy} = 4.2 \cdot g \cdot \cos 50° = 26.46\ N$

$F_f = \mu F_N = 0.3\,(26.46) = 7.94\ N$

$F_{net\ sys} = F_{g1x} - F_{g2} - F_f = Ma$

$31.53 - 19.6 - 7.94 = (6.2\ kg)\,a$

$a = 0.644\ m/s^2$

$F_{Normal}$ (on 4.2 kg) : 26.5N

Ff : 7.94 N

Fnetsys : 4 N

Accel : 0.644 m/s²

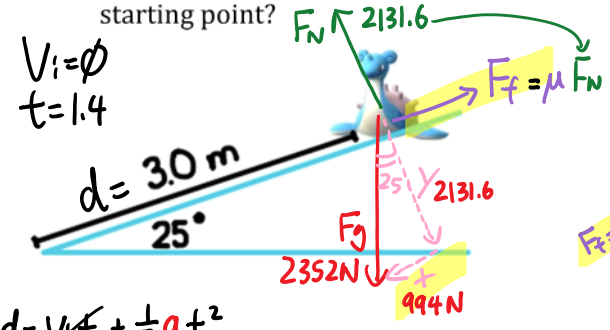
Dir: 2kg box [up]

$V_i = \emptyset$

6) (2 pts only time consuming question) A 240 kg Lapras is sliding down an icy slope. It takes 1.4 seconds to reach the bottom.

a) What is the coefficient of friction? ($\mu$)

b) If a 1500 N force is applied directly up the incline, how much time will it take to reach its starting point?



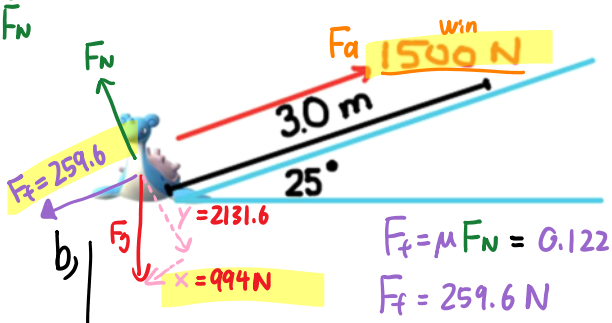

i) $d = v_i t + \frac{1}{2} a t^2$

$3 = \frac{1}{2}(a)(1.4)^2$ $\quad a = 3.06\ m/s^2$

ii) $F_{net} = F_{gx} - F_f = ma$

$994 - \mu(2131.6) = 240\,(3.06)$

$\mu = 0.122$




b)

$F_f = \mu F_N = 0.122\,(2131.6)$

$F_f = 259.6\ N$

$F_{net} = F_a - F_{gx} - F_f = ma$

$1500 - 994 - 260 = (240)\,a_{new}$

$a = 1.027\ m/s^2$

$V_i = \emptyset$ $\quad t = ?$

$d = 3m$

$a = 1.027$

$d = v_i t + \frac{1}{2} a t^2$

$3 = \frac{1}{2}(1.027)\,t^2$ $\quad t = 2.42$ sec