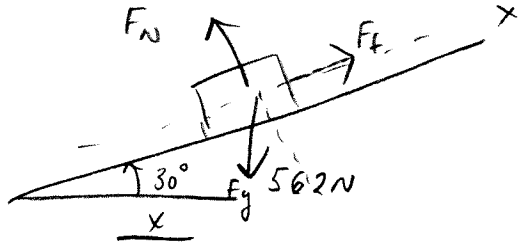
Worksheet - Incline Planes

(1)



$F_g = 562N$

$mg = 562N$

$m = \frac{562N}{9.8\ m/s^2} = 57.35\ kg$

y

(A) $F_g \sin 30 = ma$

$562 \sin 30 = (57.35)\, a$

$a = 4.9\ m/s^2$

(B) $F_g \sin 30 - F_f = ma$

$562 \sin 30 - 146.1 = (57.35)\, a$

$134.9 = (57.35)\, a$

$a = 2.35\ m/s^2$

$F_N - F_g \cos 30 = 0$

$F_N - 562 \cos 30 = 0$

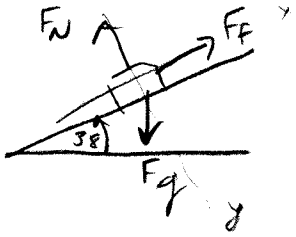
$F_N = 487\ N$

$F_f = \mu F_N$

$= .30\,(487\ N)$

$= 146.1\ N$

(2)



$F_g = mg$

$F_f = \mu F_N$

x

$F_g \sin 38 - F_f = 0$

$F_g \sin 38 - \mu F_N = 0$

y

$F_N - F_g \cos 38 = 0$

$F_N = F_g \cos 38$

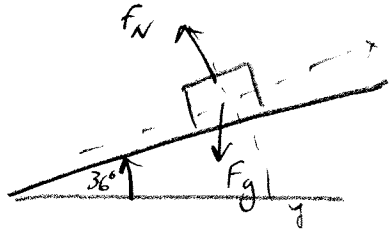
$F_g \sin 38 - \mu F_g \cos 38 = 0$

$F_g \sin 38 = \mu F_g \cos 38$

$\mu = \frac{\sin 38}{\cos 38} = \tan 38$

$\mu = .781$

(3)



$F_g = mg$

(A) x

$F_g \sin 36 = ma$

$mg \sin 36 = ma$

$a = 9.8(\sin 36)$

$= 5.76 \text{ m/s}^2$

(B) $v_i = 0$

$a = 5.76 \text{ m/s}^2$

$d = 30 \text{ m}$

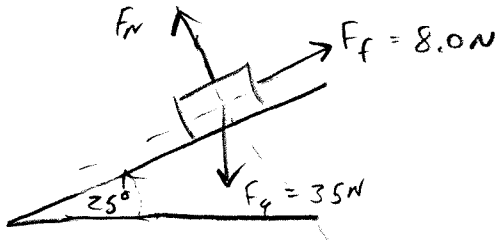
$v_f = ?$

$v_f^2 = v_i^2 + 2ad$

$v_f^2 = 2(5.76)30$

$v_f = 18.6 \text{ m/s}$

(4)



$F_g = mg$

$35N = m(9.8)$

$m = 3.57 \text{ kg}$

x

(A) $F_g \sin 25 - F_f = ma$

$35 \sin 25 - 8 = (3.57)a$

$6.79 = (3.57)a$

$a = 1.9 \text{ m/s}^2$

(B) $F_f = \mu F_N$

$8 = \mu (28.67)$

$\mu = 0.28$

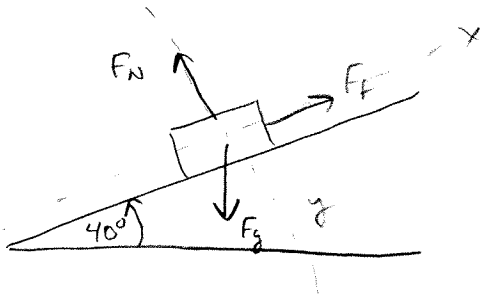
y

$F_N - F_g \cos 25 = 0$

$F_N - 35 \cos 35 = 0$

$F_N = 28.67$

(5)



x

$F_g \sin 40 - F_f = ma$

$mg \sin 40 - \mu F_N = ma$

$4(9.8)\sin 40 - (0.15)(30.03) = 4a$

$20.69 = 4a$

$a = 5.17 \text{ m/s}^2$

y

$F_N - F_g \cos 40 = 0$

$F_N - mg \cos 40 = 0$

$F_N - 4(9.8)\cos 40 = 0$

$F_N = 30.03 \text{ N}$

$v_i = 0$

$v_f = 12 \text{ m/s}$

$a = 5.17 \text{ m/s}^2$

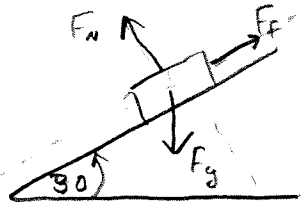
$t = ?$

$v_f = v_i + at$

$12 = 0 + 5.17t$

$t = 2.32 \text{ s}$

(6)



x

$F_g \sin 30 - F_f = ma$

$mg \sin 30 - \mu F_N = ma$

$20(9.8)\sin 30 - .3(169.74) = 20a$

$47.078 = 20a$

$a = 2.35 \text{ m/s}^2$

y

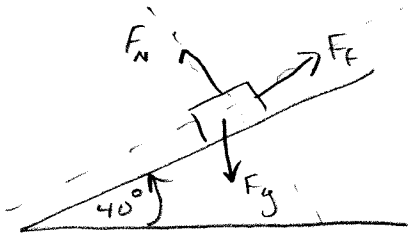
$F_N - F_g \cos 30 = 0$

$F_N - mg \cos 30 = 0$

$F_N - 20(9.8)\cos 30 = 0$

$F_N = 169.74 \text{ N}$

(7)



(A)

x

$F_g \sin 40 - F_f = ma$

$mg \sin 40 - F_f = ma$

$12(9.8)\sin 40 - 60 = 12a$

$15.59 = 12a$

$a = 1.3 \text{ m/s}^2$

(B) $v_i = 0$

$d = 5.0 \text{ m}$

$a = 1.3 \text{ m/s}^2$

$t = ?$

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

$5 = \frac{1}{2}(1.3) t^2$

$t = 2.77 \text{ s}$

(C) $F_f = \mu F_N$

$60 = \mu(90.09)$

$\mu = 0.67$

y

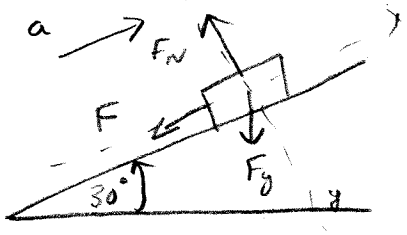
$F_N - F_g \cos 40 = 0$

$F_N - mg \cos 40 = 0$

$F_N - 12(9.8)\cos 40 = 0$

$F_N = 90.09 N$

(8) (A)



no friction

(down the slope is positive)

x

$F + F_g \sin 30 = ma$

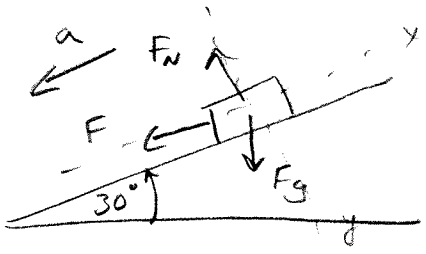
$F + mg \sin 30 = ma$

$F + 15(9.8)\sin 30 = 15(-1.2)$ * acceleration is negative because it is up the slope

$F + 73.5 = -18$

$F = -91.5 N$ * The force is pointing up the incline plane

8 (B)



no FRICTION
(down the slope is positive)

x

$F + F_g \sin 30 = ma$

$F + mg \sin 30 = ma$

$F + 15(9.8) \sin 30 = 15(1.2)$ * acceleration is positive because it is down the slope

$F + 73.5 = 18$

$F = -55.5N$ * The force is pointing up the incline plane.