Dynamics Worksheet #1

① (a) $F = ma$

$3.8\,N = (5.5\,kg)\,a$

$a = 0.69\ m/s^2$

(b) $V_i = 0$

$V_f = 5.2\ m/s$

$a = 0.69\ m/s^2$

$t = ?$

$V_f = V_i + at$

$5.2\ m/s = (0.69\ m/s^2)\,t$

$t = 7.5\ s$

② 90N ← □ → 92N

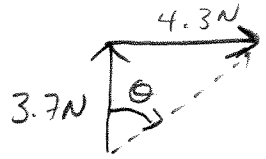
$F_{net} = 2\ N$

$F = ma$

$2N = (25\,kg)\,a$

$a = 0.08\ m/s^2$

③



$F = \sqrt{(3.7N)^2 + (4.3N)^2}$

$= 5.67\ N$

$\tan\theta = \frac{4.3}{3.7}$

$\theta = 49.2°$

$F_{net} = 5.7\ N \quad 49°\ E\ of\ N$

(4) the 5.2 N force is acting on both the girl and the sled (Newton's Third Law)

(a) $F = ma$

$5.2\,N = (40\,kg)a$

$a = 0.13\ m/s^2$

(b) $F = ma$

$5.2\,N = (8.4\,kg)a$

$a = 0.62\ m/s^2$

(5) strength = force

$F = ma$

$= (9\,kg)(-22.5\ m/s^2)$

$= -202.5\,N$

(negative sign is only indicating the direction of the force)

$a = ?$

$v_i = 3.0\ m/s$

$v_f = 0$

$d = .2\ m$

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

$0 = (3\ m/s)^2 + 2a(.2)$

$-9 = .4a$

$a = -22.5\ m/s^2$

strength of at least 203 N

(6)

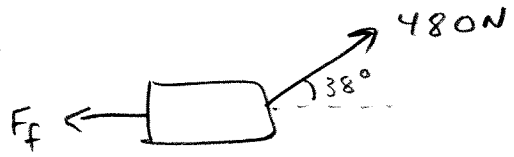
acceleration will be in x-direction

$F = ma$

$12\cos 25 = (5.1\,kg)a$

$a = 2.1\ m/s^2$

(7)



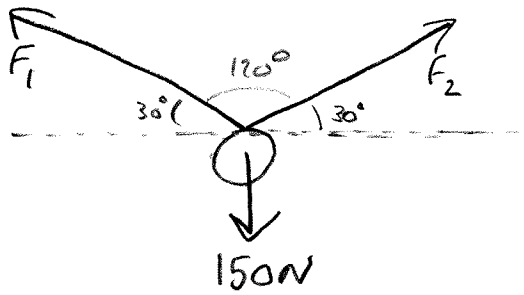
constant velocity so net force in x-direction is zero.

$F_{net} = 0$

$480 \cos 38 - F_f = 0$

$F_f = 378\ N$

(8)



supported equally so $F_1 = F_2$

(a)

x

$-F_1 \cos 30 + F_2 \cos 30 = 0$

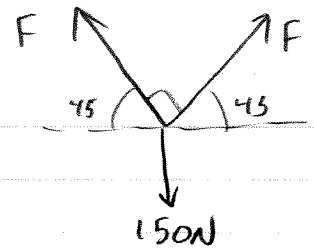
y

$F_1 \sin 30 + F_2 \sin 30 - 150N = 0$

$2F \sin 30 = 150N$

$F = 150N$

(b)



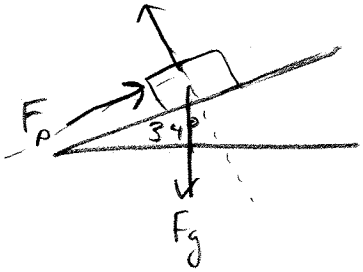
y

$F \sin 45 + F \sin 45 - 150 = 0$

$2(.707)\ F = 150$

$F = 106\ N$

(9)



x

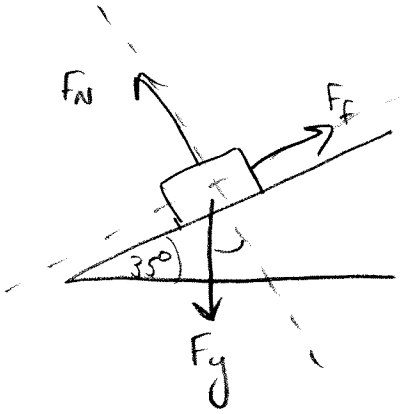
$F_p - f_g \sin 34 = 0$

$F_p - mg \sin 34 = 0$

$f_p - (118\ kg)(9.8\ m/s^2) \sin 34 = 0$

$F_p = 603N$

(10)



(a) $F_{net} = 0$

x

$F_g \sin 35 - f_f = 0$

$mg \sin 35 - f_f = 0$

$(20\,kg)(9.8\,m/s^2)\sin 35 - f_f = 0$

$F_f = 112\,N$

y

$F_N - F_g \cos 35 = 0$

(b) $F_x = ma$

$f_x = (20\,kg)(2.5\,m/s^2)$

$= 50\,N$

$F_g \sin 35 - f_f = 50\,N$

$mg \sin 35 - F_f = 50\,N$

$(20\,kg)(9.8\,m/s^2)\sin 35 - F_f = 50\,N$

$112.4 - F_f = 50$

$F_f = 62\,N$