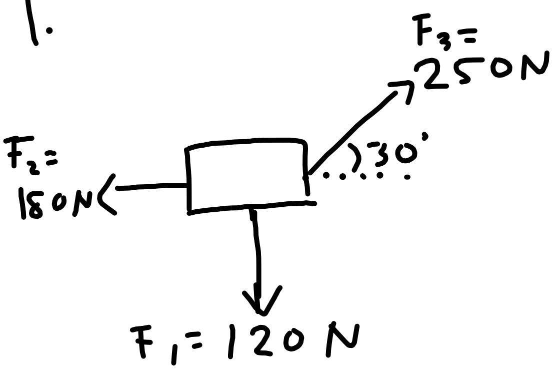
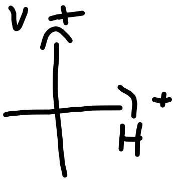
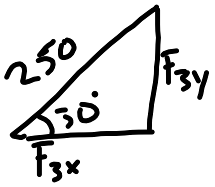
1.







$F_{3x} = 250\cos 30°$
$= 216.5\ N$

$F_{3y} = 250\sin 30°$
$= 125\ N$

Horizontal

$F_2 = -180\ N$

$F_{3x} = 216.5\ N$

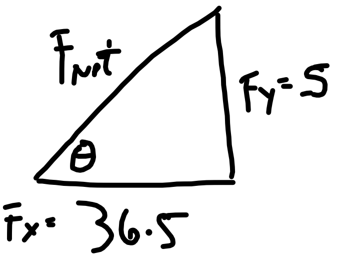
$F_x = F_2 + F_{3x}$
$= -180 + 216.5$
$= 36.5\ N$

Vertical

$F_1 = -120\ N$

$F_{3y} = 125\ N$

$F_y = F_1 + F_{3y}$
$= -120 + 125$
$= 5\ N$



$F_{Net}^2 = F_x^2 + F_y^2$
$= 36.5^2 + 5^2$
$= 1957.25$

$F_{Net} = \sqrt{1957.25}$

$\boxed{F_{Net} = 44.24\ N}$

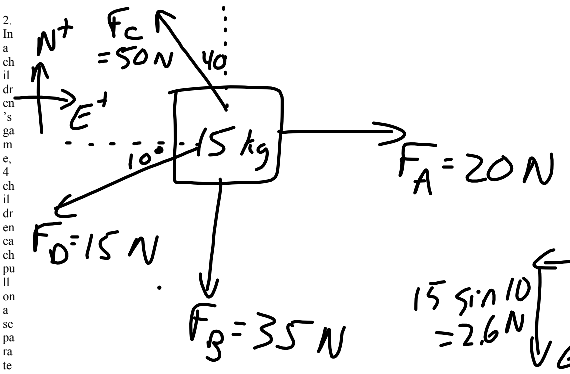
$\tan\theta = \frac{5}{36.5}$

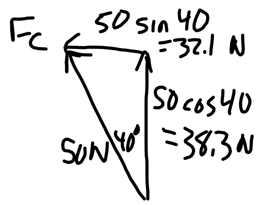
$\theta = \tan^{-1}\left(\frac{5}{36.5}\right)$

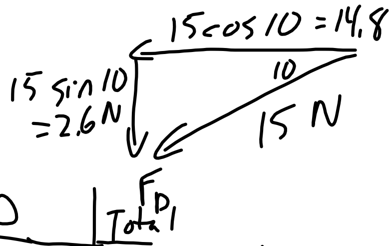
$\boxed{\theta = 7.8°}$

$\therefore F_{Net} = 44.24\ N$ [forward 7.8° up].

2. In a children's game, 4 children each pull on a separate rope tied to a 150 kg toy. Adam pulls with a force of 20 N [E], Bonnie pulls with a force of 35 N [S], Carl pulls with a force of 50 N [N 40° W] and Diane pulls with a force of 15 N [W 10° S]. Determine the net force and the acceleration of the toy.

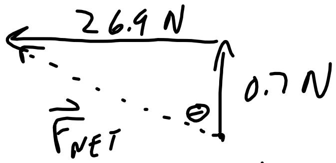






	A	B	C	D	Total
$N^+ - S$	0	-35N	38.3N	-2.6	0.7 N [N]
$E^+ - W$	20N	0	-32.1N	-14.8 N	26.9 N [W]

Recombine



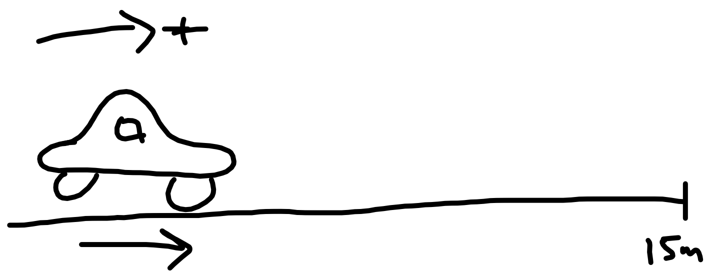
$$|F_{NET}|^2 = 26.9^2 + 0.7^2$$
$$F_{NET} = 26.9$$

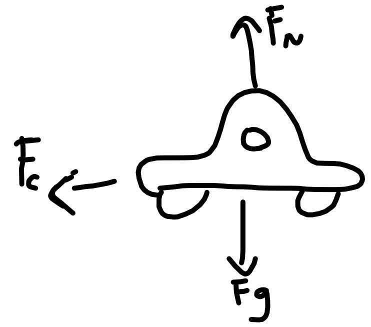
$$\tan\theta = \frac{26.9}{0.7}$$
$$\theta = 88.5^\circ$$

$$\vec{F}_{NET} = 26.9\,N\ [N\ 88.5^\circ\ W]$$
or [W 1.5° N]

$$\vec{a} = \vec{F}/m$$
$$= F_{NET}/m_T$$
$$= \frac{26.9}{15}$$
$$= 1.8\,m/s^2\ [W\ 1.5^\circ\ N]$$

3.





$V_i = 90\,km/h$

$$V_i = \frac{90\,\cancel{km}}{\cancel{h}} \times \frac{1000\,m}{\cancel{km}} \times \frac{\cancel{h}}{3600\,s}$$

$$= 25\,m/s$$

$m = 1200\,kg$
$V_i = 25\,m/s$
$V_f = 0$
$d = 15\,m$

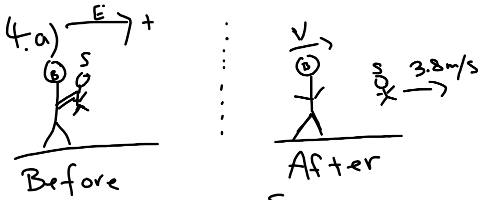
$a = ?$
$t = ?$
$F_c = ?$

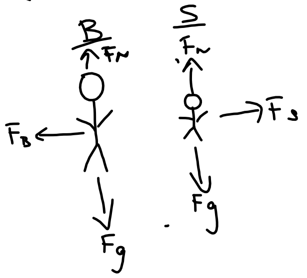
$$V_f^2 = V_i^2 + 2ad$$
$$0 = 25^2 + 2(15)a$$
$$= 625 + 30a$$
$$a = -625/30$$
$$= -20.83\,m/s^2$$

$$F_c = ma$$
$$= 1200(-20.83)$$
$$\boxed{= -25000\,N}$$

∴ the ground exerts a force of 25000N [backwards] on the car.

4.a)





Brian

$m_B = 22\,kg$

$V_B = V?$

$a_B = ?$

$F_B = ?$

$t = 0.75\,s$

Stewie

$m_s = 12\,kg$

$V_s = 3.8\,m/s$

$a_s = ?$

$F_s = ?$

$t = 0.75\,s$

$F_B = -F_s$ (N3L)

$F_B = -F_s$
$= -60.8\,N$

$F_B = m_B a_B$

$a_B = \frac{F_B}{m_B}$
$= \frac{-60.8}{22}$
$= -2.76\,m/s$

* $a_s = \frac{V_f - V_i}{t}$
$= \frac{3.8 - 0}{0.75}$
$= 5.07\,m/s^2$

$F_s = m_s a_s$
$= 12(5.07)$
$= 60.8\,N$

$a_B = \frac{V_f - V_i}{t}$

$V_f = a_B t + V_i$
$= -2.76(0.75) + 0$
$\boxed{= -2.07\,m/s}$

∴ Brian's Velocity after throwing Stewie is 2.07 m/s [W]

b) Starting from *, and let $t = 0.75 = T$

$a_s = \frac{V_f - V_i}{t}$
$= \frac{3.8 - 0}{T}$
$= 3.8/T$

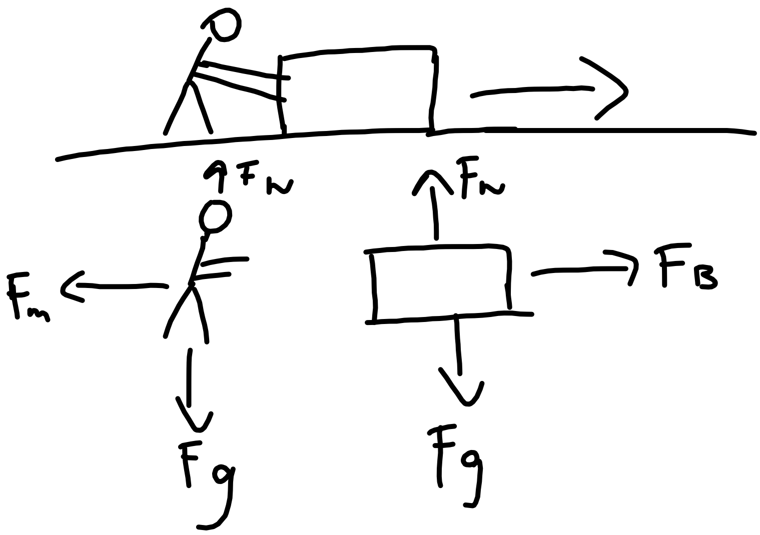
$F_s = m a_s$
$= 12(3.8/T)$
$= \frac{45.6}{T}\,N$ → $F_B = -\frac{45.6}{T}\,N$

$a_B = F_B/m$
$= \frac{-\frac{45.6}{T}}{22}$
$= \frac{-2.07}{T}\,N$ →

$a_B = \frac{V_f - V_i}{t}$

$V_f = a_B t + V_i$
$= -\frac{2.07}{T}(T) + 0$
$\boxed{= -2.07\,m/s}$

5.



$$F_m = -F_B$$

The box can be accelerated because the forces being applied on different objects (mover + box). If two forces equal in magnitude but opposite direction were applied on the SAME object then there would be no acceleration.

6.

I would lay on my stomach at the edge of the pond and apply a force backward on the ground. This would result in the ground applying a force forward on me via N3L. Since no force is opposing the force applied by the ground, I will accelerate in the direction the ground is pushing me via N2L.

My forward motion would cause me to land on the frictionless frozen pond with some $\vec{v}$. Since the surface of the pond is frictionless, my forward motion will continue via N1L. I will eventually reach the blue circle. However, if I don't stop myself, I will shoot past the money! To stop my motion, I throw my backpack in the same direction I am moving. This will cause the backpack to apply a force on me via N2L. I will have to apply enough force so that it cancels out the force of my forward motion. This results in a Ø total force on me, thus halting my motion via N2L. I will then stop inside the circle and win the prize.