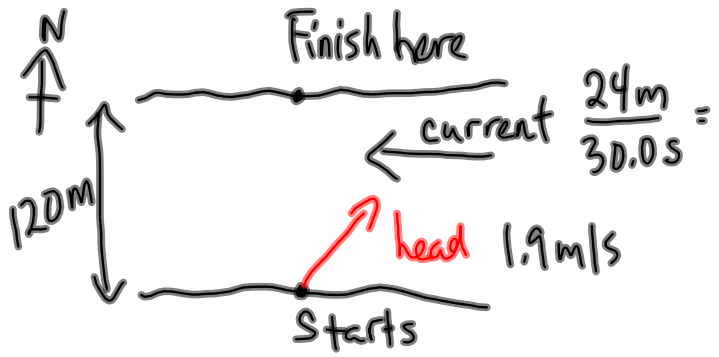
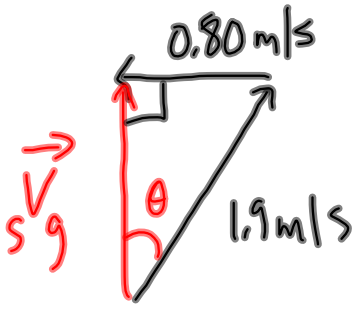
from PP 110

25.





To find the heading:

$\sin\theta = \frac{opp}{hyp}$

$\sin\theta = \frac{0.80\ m/s}{1.9\ m/s}$

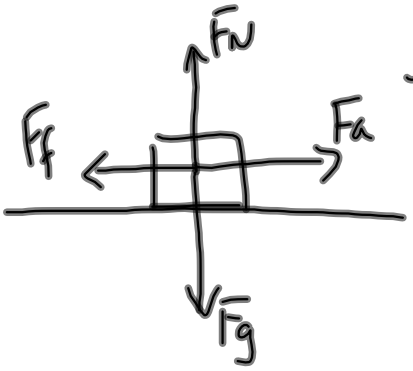
$\theta = \sin^{-1}\left(\frac{0.80}{1.90}\right)$

$\theta = 25^\circ$

The swimmer should head [N 25° E]

Forces & Vectors

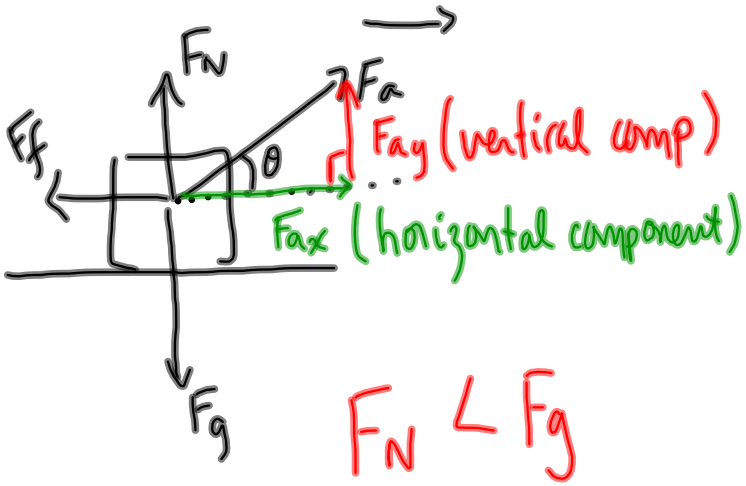
Horizontal Force
Horizontal Surface



$F_N = F_g$

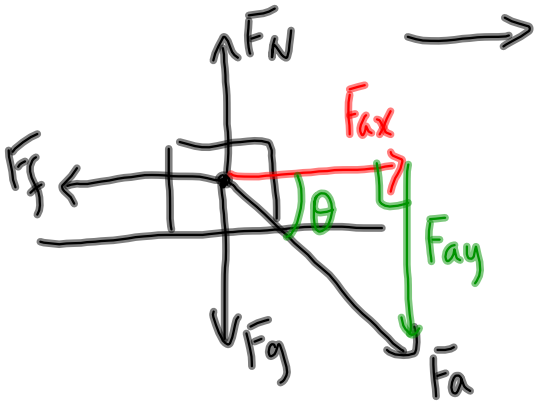
* F_N is ALWAYS perpendicular to the surface.

Horizontal surface
Force is upward at an angle
i.e.
(pulling a wagon)



$F_N < F_g$

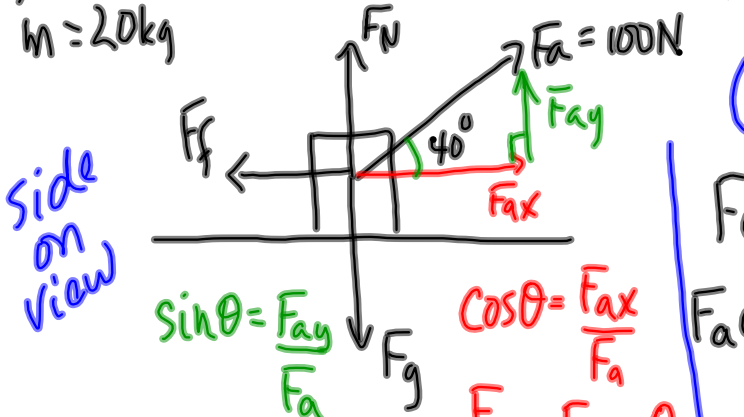
Horizontal surface
Downward force at an angle
(i.e. pushing a cart or a shovel)



$F_N > F_g$

SP (Sheet)

$\mu = 0.32$
$m = 20kg$



$\vec{F}_{net} = m\vec{a}$

$F_{ax} - F_f = ma$

$F_a\cos\theta - \mu F_N = ma$

$F_a\cos\theta - \mu(F_g - F_{ay}) = ma$

$F_a\cos\theta - \mu mg + \mu F_a\sin\theta = ma$

solve for a after you sub in values.

$\sin\theta = \frac{F_{ay}}{F_a}$

$F_{ay} = F_a\sin\theta$

$F_{ay} = 100N\sin 40°$

$F_{ay} = 64.3N$

$\cos\theta = \frac{F_{ax}}{F_a}$

$F_{ax} = F_a\cos\theta$

$F_{ax} = (100N)\cos 40°$

$F_{ax} = 76.6N$

$F_f = \mu F_N$

$F_f = 0.32(F_g - F_{ay})$

$F_f = 0.32(196.2 - 64.3N)$

$F_f = 0.32(131.9N)$

$F_f = 42.2N$

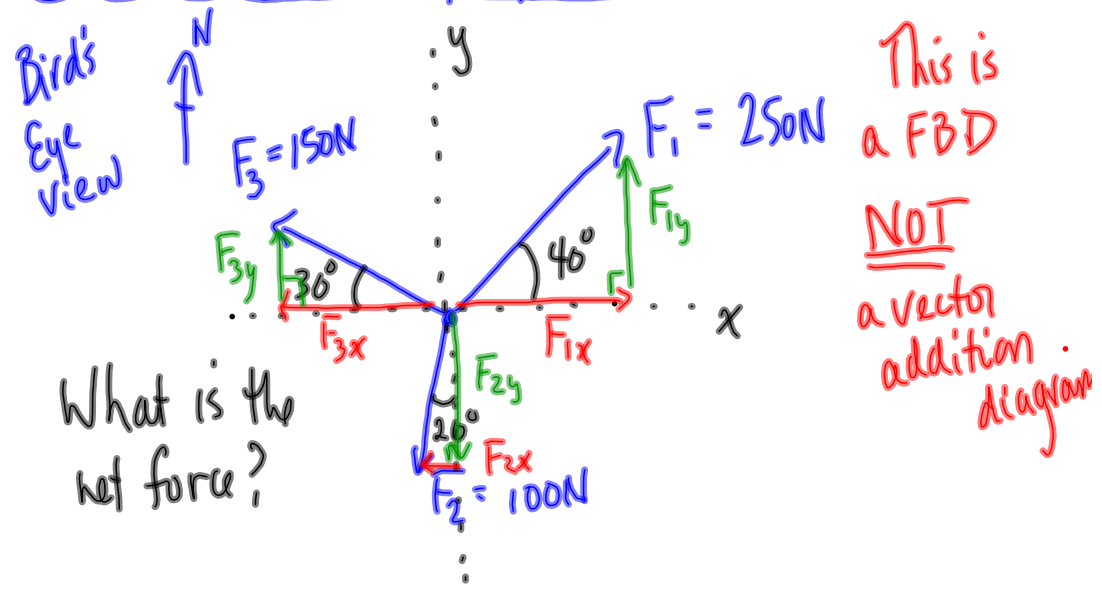
$F_{ax} - F_f = ma$

$76.6N - 42.2N = (20kg)a$

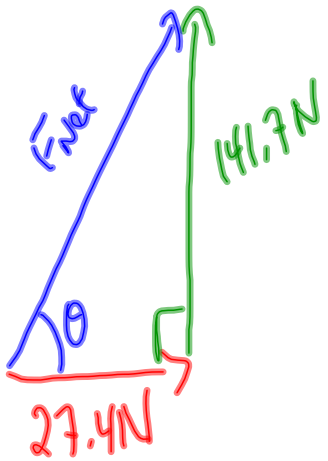
$34.4N = (20kg)a$

$a = 1.7 m/s^2$

One more example - 3-Way Tug-o-War



	x	y
F_1	$250N \cos 40^\circ$ 191.5	$250N \sin 40^\circ$ 160.7
F_2	$-100N \sin 20^\circ$ -34.2	$-100N \cos 20^\circ$ -94.0 N
F_3	$-150N \cos 30^\circ$ -129.9	$+150N \sin 30^\circ$ 75N
F_{net}	27.4N	141.7N



$c^2 = a^2 + b^2$

$c^2 = (27.4)^2 + (141.7)^2$

$c = 144.3\ N$

$\tan\theta = \frac{141.7N}{27.4N}$

$\theta = 79.1^\circ$

$\vec{F}_{net} = 144N\ [E\ 79^\circ N]$