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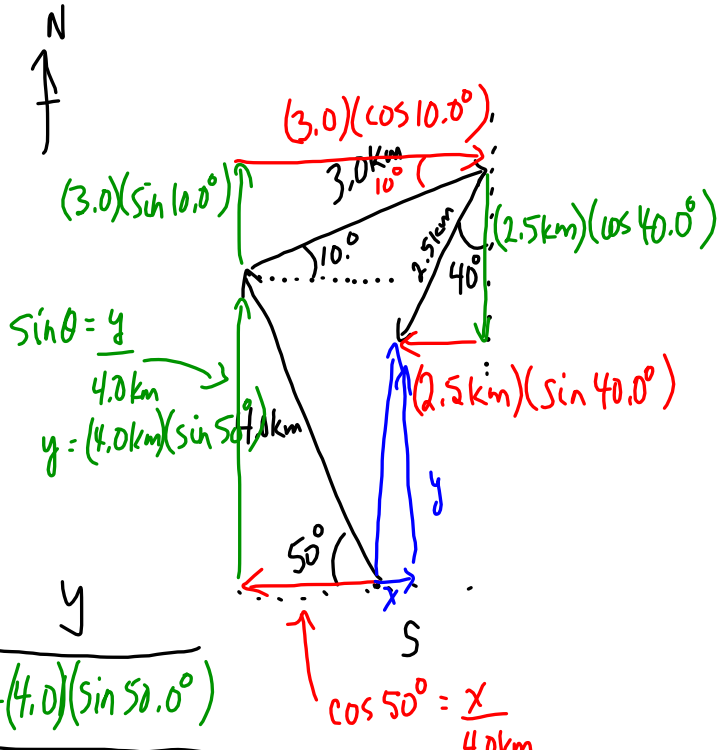
26.

4.0km [N 40.0°W]

3.0 km [E 10.0°N]

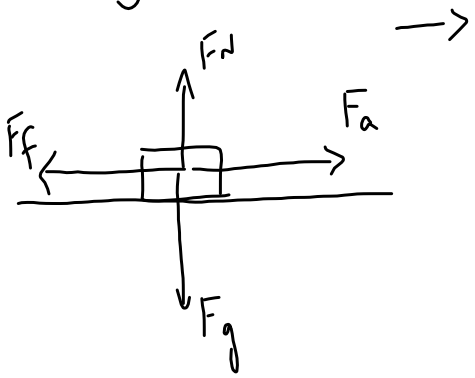
2.5 km [S 40.0°W]



	x	y
Δd_1	$-(4.0)(\cos 50.0)$	$+(4.0)(\sin 50.0^\circ)$
Δd_2	$+(3.0)(\cos 10.0^\circ)$	$+(3.0)(\sin 10.0^\circ)$
Δd_3	$-(2.5)(\sin 40.0^\circ)$	$-(2.5)(\cos 40.0^\circ)$
TOTAL	x	y

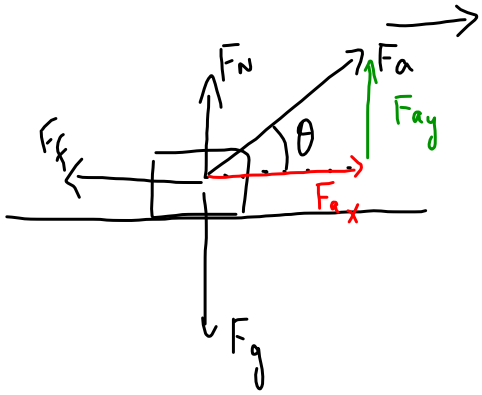
Forces at Angles

Consider pulling a toboggan on horizontal surface so that the rope is parallel to the ground.



$F_N = F_g$

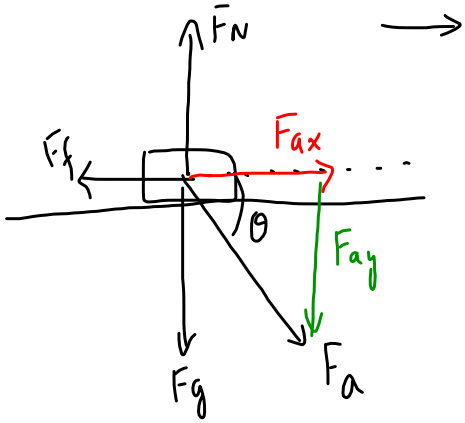
Consider pulling a toboggan on a horizonal surface so that the rope is at an angle θ to the horizontal.



$F_g = F_N + F_{ay}$

$(F_N < F_g)$

Consider pushing your lawnmower on a level surface at an angle θ to the horizontal.



$F_N = F_g + F_{ay}$

$(F_N > F_g)$

SP (FOP Sheet)

$m = 20\,kg$

$F_a = 100\,N$

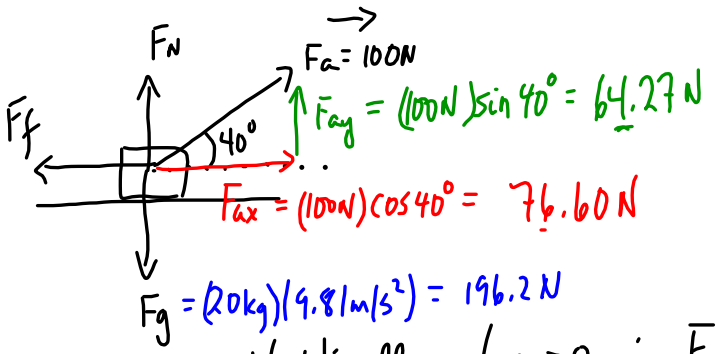
$\theta = 40^\circ$

$\mu_k = 0.32$

$a = ?$

↑ need to find F_{net}

↓ DRAW A FBD!



Vertically ($a = 0 \therefore F_{net} = 0$)

$F_N + F_{ay} = F_g$

$F_N = F_g - F_{ay}$

$F_N = 196.2N - 64.27N$

$F_N = 131.93N$

Horizontally (there is acceleration)

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

$F_{ax} - F_f = ma$

$F_{ax} - \mu F_N = ma$

$F_f = \mu F_N$

$76.60N - 0.32(131.93N) = (20kg)a$

$76.60N - 42.22N = (20kg)a$

$34.38N = (20kg)a$

$a = 1.7\,m/s^2$

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* Bird's Eye View

$\vec{F}_1 = 45N\,[E]$

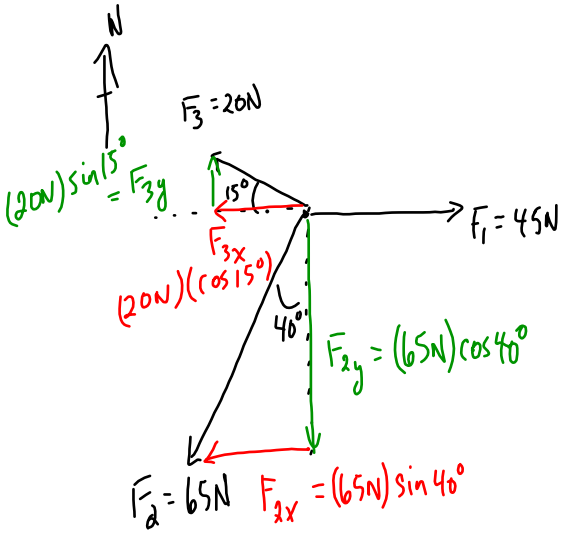
$\vec{F}_2 = 65N\,[S40°W]$

$\vec{F}_3 = 20N\,[N75°W]$

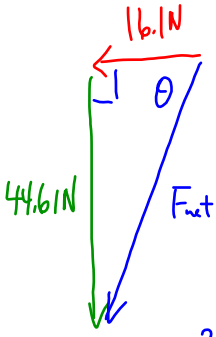
$m = 65kg$

$a = ??$

↑ need F_{net} => DRAW a FBD.



	x	y
F_1	$+45N$	$0N$
F_2	$-(65N)\sin 40° = -41.78$	$-(65N)\cos 40° = -49.79$
F_3	$-(20N)\cos 15° = -19.32$	$+(20N)\sin 15° = 5.18$
F_{net}	$-16.1N$	$-44.61N$



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

$c^2 = 16.1^2 + 44.61^2$

$c = 47N$

$\tan\theta = \frac{44.61}{16.1}$

$\theta = 70°$

$\vec{F}_{net} = 47N\,[W70°S]$

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

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

$\vec{a} = \frac{47N[W70°S]}{65kg}$

$\vec{a} = 0.73 m/s^2\,[W70°S]$