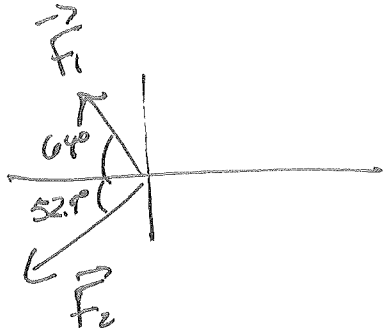
Physics 160

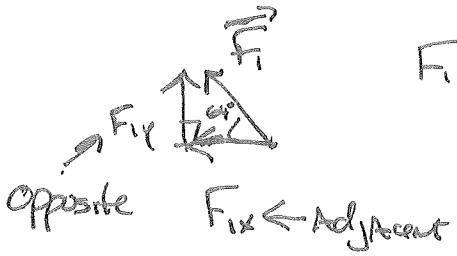
Extra Credit #9

Two forces:



$F_1 = 9.8N$, $F_2 = 5.8N$

Let's Practice with Non-Standard Angles

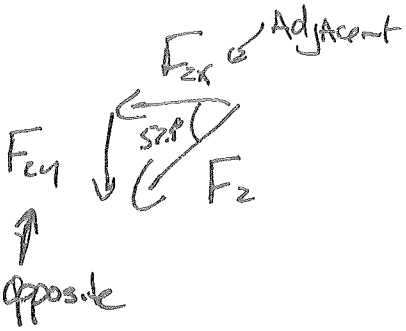


F_{1x} to left $\Rightarrow F_{1x} = -F_1 \cos 64° = -9.8N \cos 64°$

$= -4.296N$

F_{1y} up $\Rightarrow F_{1y} = +F_1 \sin 64° = 9.8N \sin 64°$

$= 8.808N$



F_{2x} to left $\Rightarrow F_{2x} = -F_2 \cos 52.9°$

$= -5.8N \cos 52.9° = -3.4986N$

F_{2y} down $\Rightarrow F_{2y} = -F_2 \sin 52.9° = -5.8N \sin 52.9°$

$= -4.626N$

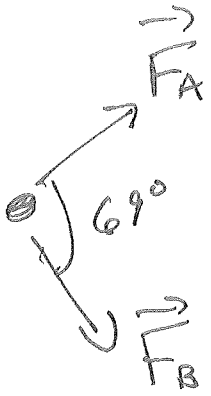
Net Force $\sum \vec{F} = \vec{F_1} + \vec{F_2} \Rightarrow \sum F_x = F_{1x} + F_{2x} = -4.296N - 3.4986N$

$\Rightarrow \sum F_x = -7.7946N = -7.79N$

$\sum F_y = F_{1y} + F_{2y} = 8.808N - 4.626N = 4.182N = 4.18N$

$\sum F_{\text{net}} = \sqrt{\sum F_x^2 + \sum F_y^2} = \sqrt{(7.79N)^2 + (4.18N)^2} = 8.84N$

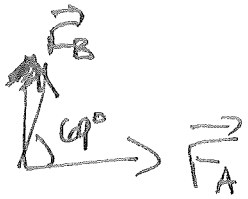
4.5



$F_A = 282N$, $F_B = 350N$

$\Sigma_i \vec{F} = \vec{F}_A + \vec{F}_B$

Looking AHEAD, THE PROBLEM WANTS the ANGLE with respect to Dog A's ROPE $\Rightarrow$ REDRAW with $\vec{F}_A$ Along X-Axis



So now $F_{Ax} = F_A$, $F_{Ay} = 0$

$F_{Bx} = F_B \cos 69°$; $F_{By} = F_B \sin 69°$

↑ Standard Angle

$\Sigma_i F_x = F_{Ax} + F_{Bx} = 282N + 350N \cos 69° = 407.43N$

$\Sigma_i F_y = F_{Ay} + F_{By} = 0 + 350N \sin 69° = 326.75N$

$\Sigma F = \sqrt{\Sigma_i F_x^2 + \Sigma_i F_y^2} = \sqrt{(407.43N)^2 + (326.75N)^2} = 522.27N$

$= 522N$

$\theta = \tan^{-1}\left(\frac{\Sigma_i F_y}{\Sigma_i F_x}\right) = \tan^{-1}\left(\frac{326.75}{407.43}\right) = 38.729° = 38.7°$

4.3

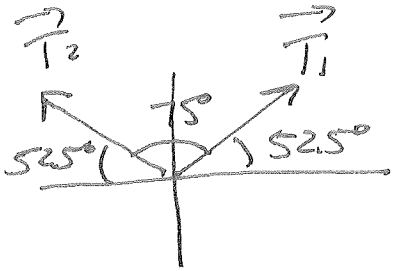
What $\vec{T}_1$ AND $\vec{T}_2$ to make

$\Sigma \vec{F} = 5N$, up $\Rightarrow \Sigma F_x = 0$

$\Sigma F_y = 5N$

$\Sigma \vec{F} = \vec{T}_1 + \vec{T}_2 \Rightarrow \Sigma F_x = T_{1x} + T_{2x} = 0$

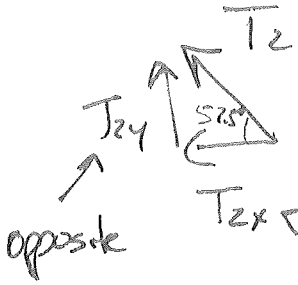
$\Sigma F_y = T_{1y} + T_{2y} = 5N$



$\frac{180° - 75°}{2} = \frac{105°}{2} = 52.5°$ ON EACH SIDE

$\vec{T}_1$ at Standard $\Rightarrow T_{1x} = T_1 \cos 52.5°$

$T_{1y} = T_1 \sin 52.5°$



T_{2x} to LEFT $\Rightarrow T_{2x} = -T_2 \cos 52.5°$

T_{2y} up $\Rightarrow T_{2y} = +T_2 \sin 52.5°$

$T_{1x} + T_{2x} = 0 \Rightarrow T_1 \cos 52.5° - T_2 \cos 52.5° = 0$

$\Rightarrow T_1 = T_2$ (why only ONE ANSWER NEEDED)

To Simplify $T_1 = T_2 = T$, $T_{1y} + T_{2y} = 5N \Rightarrow T_1 \sin 52.5° + T_2 \sin 52.5°$

$T \sin 52.5° + T \sin 52.5° = 5N \Rightarrow 2T \sin 52.5° = 5N \Rightarrow T = \frac{5N}{2 \sin 52.5°} = 3.15N$