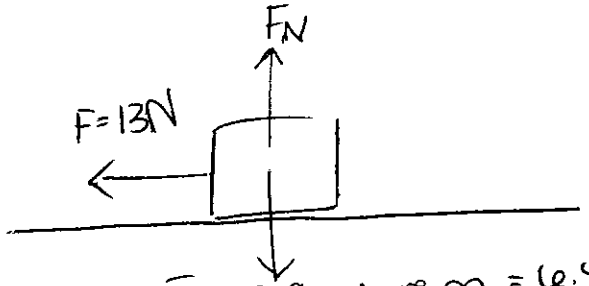
Force & Motion Practice Problem Answer Key:

① 

$v_i = 2.5\,m/s$

$t = 2.1s$

$F_g = mg$ where $m = 6.4kg$

$F = ma$. find a. $\frac{13N}{6.4} = \frac{6.4kg \cdot a}{6.4}$

$a = 2.03\,m/s^2$

$v_f = v_i + at \therefore v_f = 2.5\frac{m}{s} + 2.03\frac{m}{s^2}(2.1s) = \boxed{6.8\frac{m}{s}}$

② 

$v_i = 0\frac{m}{s}$

$v_f = ?$

$x = 20.1m$

$F = ma$

$\frac{18N}{35kg} = \frac{35kg \cdot a}{35kg}$ $a = 0.5\,m/s^2$

$v_f^2 = v_i^2 + 2a\Delta x$

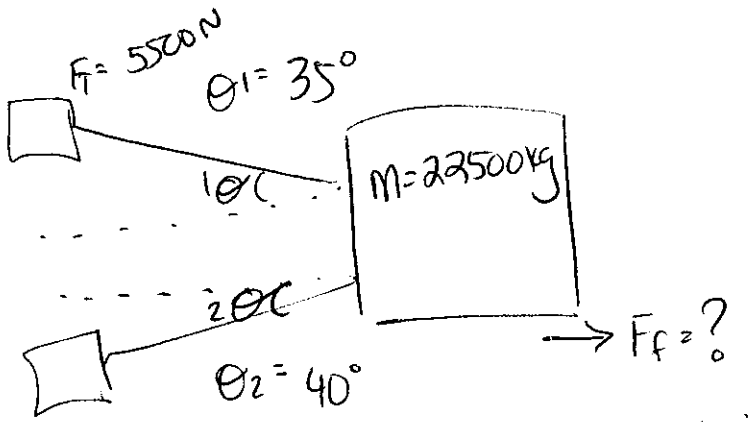
$v_f^2 = 0 + 2(0.5\frac{m}{s^2})(20.1m)$

$\sqrt{v_f^2} = \sqrt{20.1\frac{m^2}{s^2}}$

$v_f = 4.5\frac{m}{s^2}$

3 & 4 were done in class. See me if you need help.

(5)



Constant velocity = zero a.
∴ $F_{net} = 0$

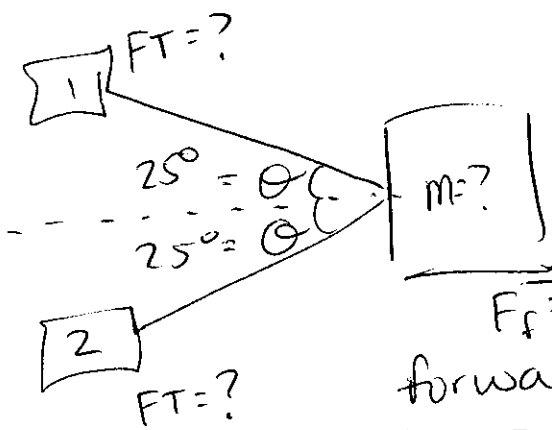
*If boat is moving East, Vertical Forces should balance:

$5500\sin 35 + 4907.8\sin(40) = 0$ ✓

since a=0, net force = 0 ∴ drag(F_f) is equal to the sum of the forward components of the tug boats!

$5500N\cos(35°) + 4907.8N\cos(40°) = 8,265N$

(6)



F_f = 4000N find F_{T_1} & F_{T_2}

forward force = Drag(F_f)

$F_{T_1} + F_{T_2} = 4000N$

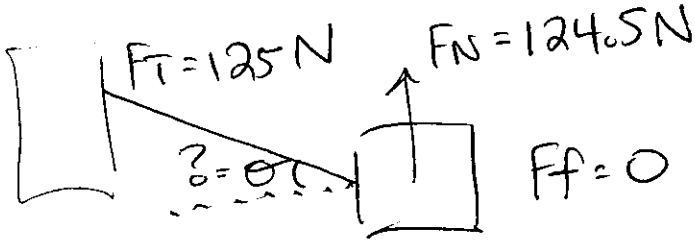
$F_{T_1}\cos 25° + F_{T_2}\cos 25° = 4000N$

$FT(0.906 + 0.906) = 4000N$

$FT(1.81) = 4000N$

FT = 2,200N *1 rounded to 2 sig figs.

(7)



F_N(no movement) = $20\,kg \times 9.8\frac{m}{s^2} = 196N$

196 − 124.5 = 71.5N (upward force (y))

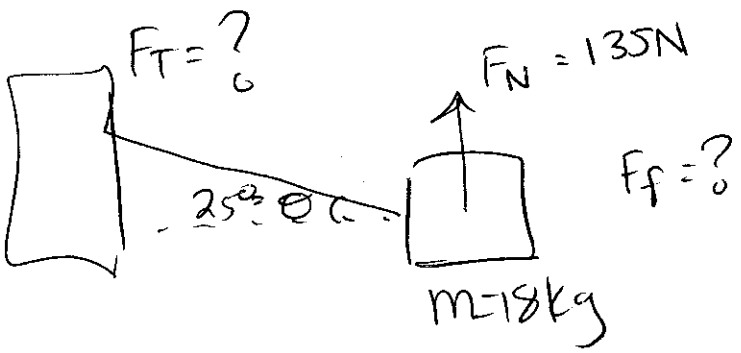
$\frac{71.5\,N}{125N} = \frac{125N \sin\theta}{125N}$

$\sin\theta = 0.572N$

$\theta = \sin^{-1} 0.572N$

$\theta = 35°$

(8)



$18\,kg \times 9.8\frac{m}{s^2} = 176.4N$

176.4N − 135 N = 41.4N = y component

$41.4N = F_T \sin 25°$

$\frac{41.4N}{0.4226} = F_T$

$F_T = 98N$