AP Physics QZ. 8.28.'09

Name KEY

A few conversions to warm up with.

1. Convert 72 mph (miles per hour) to feet/sec. If you don't know how many feet are in one mile, you may ask your instructor.

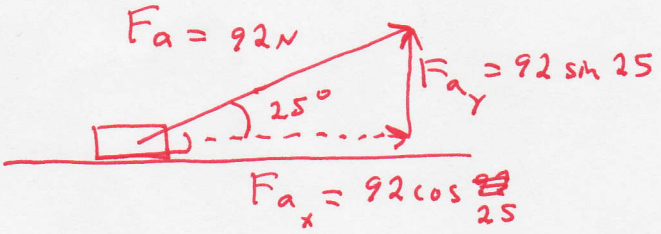
$$\frac{72 \text{ miles}}{1 \text{ hour}} \left| \frac{5280 \text{ ft}}{1 \text{ mile}} \right| \frac{1 \text{ hr}}{3600 \text{ sec}} = \boxed{105.6 \frac{\text{ft}}{\text{sec}}}$$

2. Convert $13 cm^3$ to mm^3

$$1 \text{ cm} = 10 \text{ mm}$$
$$\Rightarrow (1 \text{ cm})^3 = (10 \text{ mm})^3$$
$$1 \text{ cm}^3 = 1000 \text{ mm}^3$$

$$\frac{13 \text{ cm}^3}{} \left| \frac{1000 \text{ mm}^3}{1 \text{ cm}^3} \right. = \boxed{13{,}000 \text{ mm}^3}$$

3. A student is pulling a sled across level snow covered ground applying a force of 92 N, at an angle of 25° above the horizontal. Calculate the horizontal and vertical components of this force.



$$\boxed{F_{a_x} = 83.4 N}$$
$$\boxed{F_{a_y} = 38.9 N}$$

4. A mass is suspended by cables as shown in the figure at the right. Calculate the tension in each cable (it would be easy to label them in terms of left and right). Do these two numbers add up to 218? Should these two numbers add up to 218?

Do they? NO

should they? no

$T_{L_x} = T_{R_x}$

$T_L \cos 18 = T_R \cos 59$

$T_L = \dfrac{T_R \cos 59}{\cos 18}$

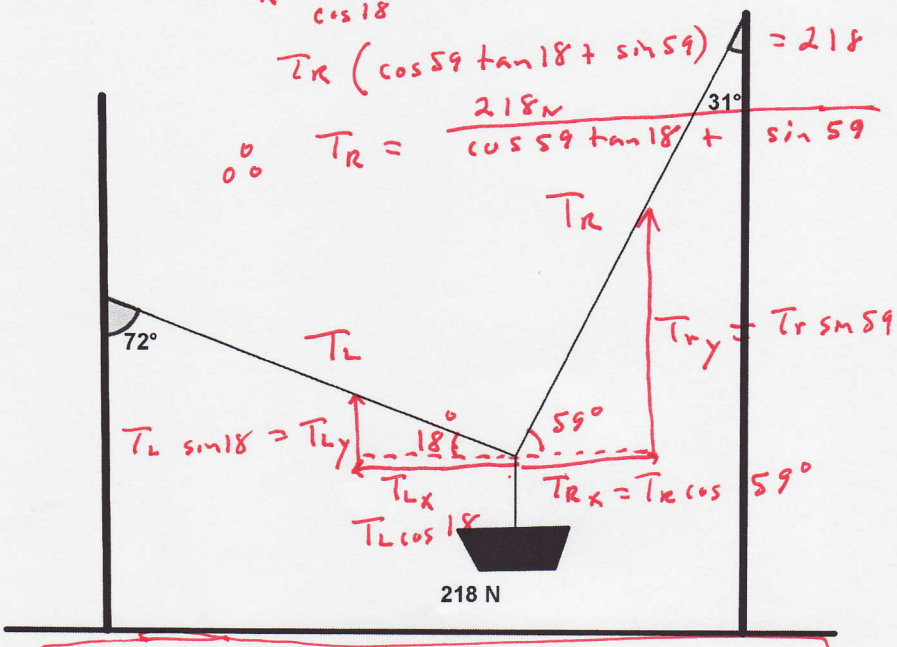
$T_{L_y} + T_{R_y} = 218N$

$T_L \sin 18° + T_R \sin 59 = 218$

$T_R \dfrac{\cos 59 \cdot \sin 18}{\cos 18} + T_R \sin 59 = 218$

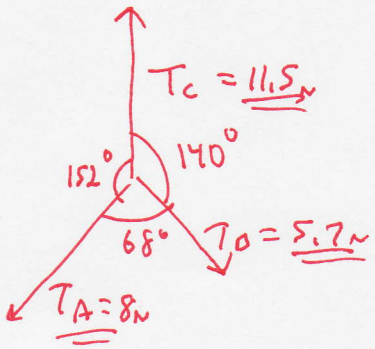
$T_R (\cos 59 \tan 18 + \sin 59) = 218$

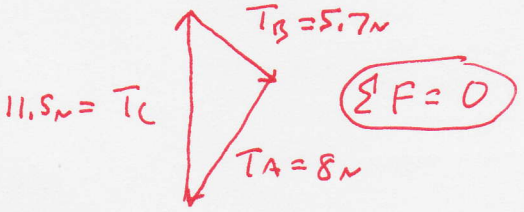
$T_R = \dfrac{218N}{\cos 59 \tan 18 + \sin 59}$



$\boxed{T_L = 115.2 N \qquad T_R = 212.8 N}$

5. Consider the force table assembled at the front of the classroom. Construct a force diagram showing how the forces transmitted through cables (ok, they're strings) A, B, and C add together. On the force diagram clearly indicate how many newtons of force are transmitted through each string. Clearly indicate the numerical sum one should get when these three forces are added. [If answered in an efficient manner, this question should not require the use of a calculator, although you may use one if you wish]





It must be zero since the system is in equilibrium.

Bonus: Mr D is off to Council Grove, KS to bicycle 225 km this Sat. How many feet is 225 km. yes, really

1 km ≈ 3280.84 feet ← we can figure this out, if we know any English/metric length conversion factor.

$$225 \text{ km} \left| \frac{3280.84 \text{ ft}}{1 \text{ km}} \right.$$

738,189 ft

8-28-09