Conceptual Physics: *Toboggan Calculation Sheet*

Name:_____

Name:_____

Jack R. Williams Toboggan Chute

The original chute was built in 1936 by volunteers who also built a ski lodge and ski hill, one of the earliest in America. The chute was rebuilt in 1954 by local Coast Guardsmen and lasted until 1964 when it was brought to an end because of rot and neglect.

In 1990 it was resurrected once again out of pressure treated wood by another group of volunteers and material donors and became known as the Jack Williams Toboggan Chute. The week before the race many hours are spent during the night, when it is the coldest, to coat the wooden chute with layer upon layer of ice. This is accomplished by a "Rube Goldberg" invention of David Dickeys, which pulleys a tub up the chute to slowly dispense water from holes in its back.

The chute is 400 feet (120 m) long, 70 feet (21 m) in elevation, and speeds up to 40 miles per hour (64 km/h) are attained. The run-out is on to frozen Hosmers' pond. If there is clear ice on the pond, some sleds will go the entire way across, 0.25 miles (0.40 km).

Calculate the following based on the information above and you and your partners weight as well as the weight of your toboggan:

To begin you will need to have the following information:

Your Weight: **Your Partners Weight:**

_____lbs.   _____lbs.

_____kg   _____kg

_____N   _____N

Weight of your toboggan:

_____lbs.

_____kg

_____N

1. What is your potential energy at the top of the toboggan chute?

2. What is your kinetic energy at the bottom of the toboggan chute?

3. What is your momentum at the bottom of the hill?

4. What is the F_f between the chute and your sled on your ride down the hill?

5. How many Joules of work will be accomplished on your ride down the toboggan chute?

6. What is your calculated velocity at the bottom of the chute neglecting friction in m/s and miles per hour?

7. The record time on the Jack R. Williams Toboggan Chute for a four-person team weighing 750 lbs (sled + mass) is 8.16 s. Find the velocity final in m/s of the team? What about miles per hour? How much power was generated?

Helpful Equations:

$W = Fd$

$KE = \frac{1}{2}mv^2$

$PE = mgh$

$p = mv$

$F_f = \mu F_N$

$Power = \frac{Fd}{t}$

$V_f = g\Delta t Sin\theta$