The Ice Demon (Forces in 1 dimension)

Name: _____

Date: _____

Period:_____

This problem will give you a chance to begin using the Problem Solving Guide you've received.

A new amusement park ride is being considered for Great America. Its preliminary name is the "Ice Demon". It consists of a giant hockey puck that can hold up to 4 passengers, which is accelerated across the ice at a constant rate. Once it reaches its highest speed, the puck carries the passengers at a constant speed, then decelerates them at a constant rate that is one half the initial acceleration.

Your task is to get a general idea of how the ride will behave. Complete tasks 1-3 without reading further. After 1-3 are done, share your results, then continue.

Answer these questions on **another sheet of paper**:

1) For starters, determine the number of events in the problem.

2) Draw a sketch of the ride, showing all events.

3) Sketch a graph showing all events as accurately as the information will allow. Share your results.

4) Lets assume you want to find the force necessary to accelerate and decelerate the puck when empty. What information would you need to have in order to find the necessary forces? List the necessary information and assign appropriate symbols to variables. What physics principles are relevant here?

5) Use the following information to find the unknown forces, as well as the total distance of the ride (Show ALL WORK):

> The initial acceleration of the puck takes place in 10 seconds over a distance of 200 meters.
>
> The empty puck has a mass of 200 kg.
>
> The constant speed section is 200 m long (since this section is on ice, what assumptions can be made?)

6) Now we are going to explore the idea of varying the forces in the ride so that every passenger has the same experience, regardless of the number of passengers or their mass. If we assume that passengers may range in mass from 40kg to 160 kg, what range of forces must be available to properly operate the ride (so that everyone experiences the acceleration mentioned in #5 above)? Show all work, equations, etc…

7) Now that you have found the forces, think for a moment about what other kinds of problems could have been created from the same situation. Rather than asking for forces, if another problem was created from the same situation, what might have been asked for? What information would need to be given in the problem in order to solve this problem? Now go ahead and create a new problem on another sheet of paper and solve it, using the same strategies we employed above.