# **Motion Unit Assessment - Due 7/8 Oct**

We are losing customers at our amusement park! Our advertising department has tasked your group to create a new roller coaster that will attract the masses. This roller coaster must be fast, flashy, and, most importantly, safe! One roller coaster idea will be selected from each class to be built at our amusement park. At the end of your testing you will need the final specifications of your roller coaster to present to the advertising department. Criteria:

- Your roller coaster must have at least two of the following features
  - loop, hill, jump, spiral, corkscrew
- The marble must make it from the beginning hill to the cup at the end
- The group must use the entire length of the tube for the roller coaster
  - Hint, two pieces put together = total length in meters, measure this before you start!
- The roller coaster must be built in such a way that it can be taken apart at the end of class without damaging the foam tubing

#### - **ABSOLUTELY** no cutting, tearing, or bending the tubing!

## **Proficiency Scales - Student can...**

	Newton's 2nd Law	Momentum	Energy				
4	Calculate the force for multiple	Calculate momentum for multi-	Calculate the potential and ki-				
	marble materials.	ple marble materials.	netic energy for multiple marble				
	Compare and contrast the effect	Compare and contrast the effect	materials.				
	multiple marble materials has on	multiple marble materials has	Compare and contrast the effect				
	the <i>forces</i> in the roller coaster.	on the <i>momentum</i> in the roller	multiple marble materials has on				
		coaster.	the <i>energy</i> in the roller coaster.				
		Design a safe roller coaster,	Calculate in a design feature how				
		the cup that catches the marble	the energy changes and why.				
		moves less than 5cm.					
3	Calculate the force at some point	Calculate momentum at some	Calculate the potential and ki-				
	in the roller coaster.	point in the roller coaster.	netic energy at some point(s) in				
	Define and describe the relation-	Design a safe roller coaster,	the roller coaster.				
	ship between force, mass, and ac-	the cup that catches the marble	Explain in a design feature how				
	celeration.	moves less than 10cm.	the energy changes and why.				
2	Calculate the force at some point	Calculate momentum at some	Calculate the potential and ki-				
	in the roller coaster, with mini-	point in the roller coaster, with	netic energy at some point(s) in				
	mal errors.	minimal errors.	the roller coaster, with minimal				
	Define the relationship between	Design a safe roller coaster,	errors.				
	force, mass, and acceleration.	the cup that catches the marble	Explain in a design feature how				
		moves less than 15cm.	the energy changes.				
1	Build a roller coaster structure	Build a roller coaster structure	Build a roller coaster structure				
	but can not use force to explain	but can not use momentum to ex-	but can not use kinetic or poten-				
	how it works.	plain how it works.	tial to explain how it works.				

# Planning

#### Newton's 2nd Law

What do you need to measure to calculate the force on the marble? How are you going to measure it?

What?	How

#### Momentum

What do you need to measure to calculate the momentum? How are you going to measure it?

What?	How

#### Energy

What do you need to measure to calculate potential and kinetic energy in the roller coaster? How are you going to measure it?

What?	How

# **Roller Coaster Design**

Draw a DETAILED picture of your roller coaster that includes measurements in the space below. Be sure to reference heights (from the ground up), distances between track components, etc. Someone else should be able to construct your track solely from this drawing. Label the drawing with the letters listed in the table below to indicate where you measured those values.

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## Measurements

Note, only one marble material is needed to get a 3.

Label	Quantity	Steel Marble	Wood Marble	Glass Marble
Α	Force			
В	Momentum			
С	PE			
D	KE			

### **Sales Pitch**

This is where you are going to sell me on your roller coaster as the most awesome. You should include things like:

• Highest height, speed, name, runtime, description of roller coaster, safety, etc.

This is also where you should compare and contrast materials if you are going for a 4. Pretend that you are planning for different types, or capacities of cars. Remember, include ANYTHING you think is necessary to get the grade you want.

