Name:_____ **Date:**_____

Teacher: _____

Force and Motion Assessment
"Up the Hill"

Part 1: In part 1 you will answer some questions about what you have learned regarding forces and motion. Read the questions carefully and write down your answers.

1a) A heavy truck and a light car are stopped on a road. Explain what is needed to get the vehicles to move.

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1b) Explain the relationship between the weight of the vehicles, the truck and the car, and what is needed to get each vehicle to move.

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2) Once an object is moving, explain what we would have to do in order to make the object move faster.

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3) Here on Earth, all objects are pulled by a force. Explain what that force is and give an example of something that is affected by it.

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_____

4) What are two measurements you could record to describe the motion of a car?

_____

_____

Part 2: In part 2 you will work with a partner to investigate the effect of force on a moving car.

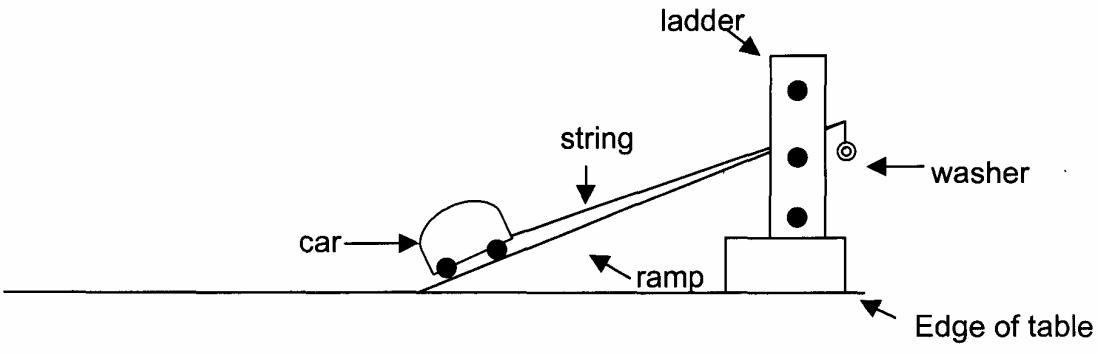
"Up the Hill"

Alex and Mia were in their family's car one day, driving to a favorite summer campground. When the car started to travel up a hill, they noticed that the engine seemed to get louder. Mia thought about the force and motion ideas that her class investigated before school closed for the summer. She wondered if the engine got louder because the car needed more force to go up hill. When she shared her ideas with Alex, he said, "I think you have a good prediction Mia, but we can't test it because experimenting with a car engine would be too dangerous". Mia agreed, but she added, "We could experiment with a toy car as a model and see if the amount of force needed to move the car up a ramp **changes** when you make the ramp (hill) steeper. Since Alex and Mia will be camping for the next couple of weeks, they are depending on you to complete the investigation for them.
Your investigation question is: **Does the force needed to move a toy car up hill change when the hill gets steeper?**

Look at the equipment that is in front of you. The drawing below shows how you will set up the equipment to investigate the force needed to move the vehicle up the ramp. You will change the **amount of force** by changing the number of washers attached to the string. More washers on the string will provide more force to pull the car up the ramp.

Use these materials to try out some ideas that you have about moving vehicles uphill.

Materials for Ramp Investigations



5) Predict how the amount of **force** changes when you need to move the vehicle up a steeper ramp (hill)? **Explain or justify** your prediction.

6) Think of an experiment you can do to test your prediction. Develop a detailed plan for your experiment that uses the materials in front of you. Write the steps to your plan.

(Add more steps or a diagram related to your plan on the back of the page if you need to.)

7) What will you do to make sure that your plan is a fair test?

8) Use the materials in front of you to do the experiment that you planned. Record data from you experiment here.

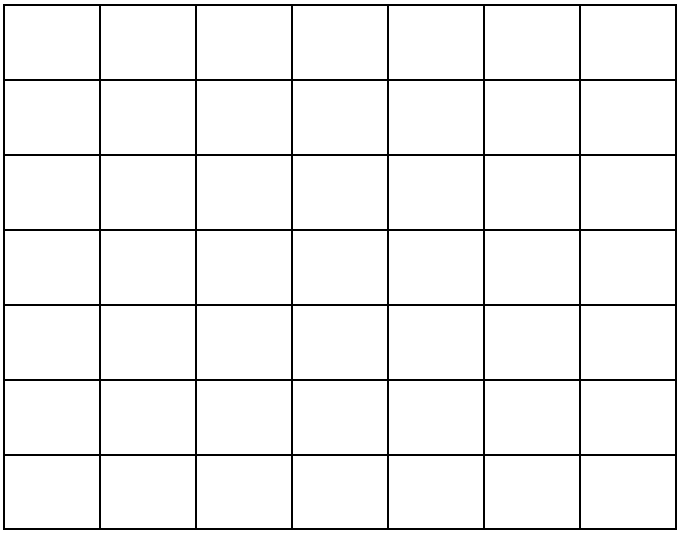
Uphill Vehicle Experiment

Level of Ramp	Amount of Force Trial 1	Amount of Force Trial 2

Record your observations here.

Part 3: Individual Work: Now you will be asked to use the data that you collected when you investigated the relationship between the steepness of the hill and the amount of force needed to move a vehicle up the hill. Use your data from your investigation to answer the following questions.

9) In order to help explain the results of your experiment, use the information in your table to make a graph below.



10) Look at the information in your graph. What did you discover about the force needed to move a vehicle uphill when you make the hill steeper?

Use data from your graph to help explain your discovery.

11) Look back at your prediction (Question 6) Explain how the data either supported or did not support your prediction.

Part 4: In part 4 you will apply what you have learned about force and motion to solve the following problem.

Your town has to decide **where it will dump its garbage.** The hill dump is 10 miles away, but the garbage truck has to go up a steep mountain to get there. The Level dump is also 10 miles away, but there are no hills to climb to get there.

12) Your town has to pay for the gasoline the trucks use to take the garbage to the dump. Which dump do you think would cost the town more to use? Please circle your answer.

a. Hill dump would cost more.
b. Level dump would cost more.
c. Both dumps would cost the same.
d. Cannot tell which dump would cost more.

13) Use what you learned from your experiment to **explain the reason for your answer.**

If you want to, use the back of this page to draw a diagram that explains the reason for your answer.