PERFORMANCE TASK:

You will construct simple racetracks each made of a different material. You will then race a car on each of these tracks while calculating the average speed the car. By measuring the average speeds and comparing them with one another, you can infer which of the tracks produced the most friction.

1. You will work in pairs, construct a simple racing ramp from an extra bookshelf or large sheet of corrugated cardboard. The ramp should be at least 24 inches long.

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PERFORMANCE TASK:

2. Once you have constructed ramps, divide the surface of the ramp into four equal sections.
3. Cover each section from top to bottom with a 2 inch wide strip of each of the following materials: sandpaper, waxed paper, aluminum foil and one material of your choice (it is okay if you use the ramp itself as the fourth material).
4. Use your backpack, books, or other objects to make a simple ramp. Elevate the ramp to a height where you think the car will move smoothly down the ramp.
5. Predict and record which of the four materials will allow your car to move from the fastest to the slowest speeds.
6. Measure the total distance that the car will move on each track.

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PERFORMANCE TASK:

7. Race the car at least 3 times over each of the different surfaces and, using a stopwatch, record the time taken to complete each race.
8. Calculate the average speed of the car on each of the four different surfaces.

Track Material	Predicted Finish	Distance of Track	#1	#2	#3	Ave Time	Average Speed
Sandpaper							
Waxed Paper							
Aluminum Foil							

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PERFORMANCE TASK:

9. Graph the race results showing the relationship between the average speed (vertical axis) and the track material (horizontal axis).
10. Complete the following questions:
    1) Why was it a good idea to race the car 3 times over each material instead of just once?
    2) Overall, did the cars move faster on the smooth surfaces or the rough surfaces?
    3) In your own words, explain how the type the surface influences the amount of friction that is produced.

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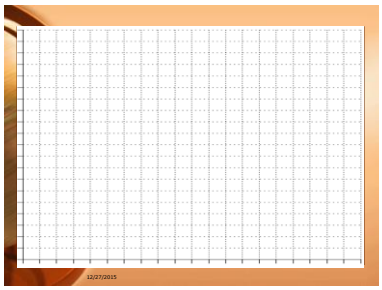

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RUBRIC:

3	2	1
Student demonstrate they have developed an understanding of: An object that is not being subjected to a force will continue to move at a constant speed and in a straight line (Newton's 1st Law). - The relationship between an object's mass, acceleration and the force applied (Newton's 2nd Law).Objects in contact exert forces on one another (friction, elastic, pushes & pulls). Newton's 3rd Law and its application to practical situations.	***Student demonstrates partial understanding of:*** An object that is not being subjected to a force will continue to move at a constant speed and in a straight line (Newton's 1st Law). - The relationship between an object's mass, acceleration and the force applied (Newton's 2nd Law).-Objects in contact exert forces on one another (friction, elastic, pushes & pulls). Newton's 3rd Law and its application to practical situations.	***Student does not have understanding of:*** An object that is not being subjected to a force will continue to move at a constant speed and in a straight line (Newton's 1st Law). - The relationship between an object's mass, acceleration and the force applied (Newton's 2nd Law). -Objects in contact exert forces on one another (friction, elastic, pushes & pulls). Newton's 3rd Law and its application to practical situations.

Checklist: Did you remember to…

- Make sure you have submitted these items in this order

1. **Question**: Which of the tracks (sandpaper, waxed paper, aluminum foil and one material of your choice) produced the most friction?
2. **Hypothesis**
3. **Data Table** (complete all parts of the data table)
4. **Answer all the questions in complete sentences.**
5. **Complete a graph based on your data**
6. **Include the number range, labels, and a title for your graph.**

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