

## AP Physics Mousetrap Racer Project

### *Planet Holloway Physics*

**Objective:** Design and build a car capable of traveling straight for 30 feet powered only by a small mousetrap. Use your model racer to explain key physics concepts that relate to the motion of the car. Demonstrate mastery of four Scientific and Engineering Practices (SEP).

**Requirements:** The racer must have at least three wheels (on at least two axles) contacting the ground and be propelled solely by the power of a small mousetrap.

The racer may be up to 24" long, 12" wide and 24" tall, but may be any size under these maxima. The racer can be more than one piece, for example, a small car and a launching device.

**Testing:** The racer will be allowed three attempts in which to earn points. The best score will stand and extra credit can be earned if the 30 feet requirement is met. The racer will be tested in the long hallway outside the classroom and must be able to travel a relatively straight path. If the car crashes into the wall, that will be the end of the run.

**Write up:** Included with this project is a graphic model illustrating and explaining how the car is given energy from the spring and the resulting motion from that energy (all sources). Every topic should be included a well labeled visual, either a multi step model or other appropriate model. The model is to be created on no bigger than standard poster board size material.

- Identify and discuss in detail how the following concepts effect the motion of the racer: (try to keep each section neat, organized and clear)
  - **spring energy** (explain spring constant experiment)
    - Determine the torsion spring constant (graph data you collected and discuss how you found the constant.
  - **torque** (show how the wheels are rotated)
  - **kinetic energy** (both translational and rotational)
  - **friction** (discuss both positive and negative effects)
  - **motion** (types of motion the car has during the run)

The model is worth 100 points overall. I am looking for how well the model covers all physics we have learned as it applies to your racer. Think cause and effect, as well as dependent versus independent variables.

**Oral examination:** an oral question and answer period will occur during the testing of the racer. Also, SEPs mastered will be discussed during the examination. Answers to questions involving all of the above topics is worth 100 points.

**Grading:** There are three grades for this project, one for the performance of the racer, one for the oral exam and one for the graphic novel. The performance is worth 100 points and the graphic model and the oral exam are each worth 100. Total score out of 300 points.

**Scoring for racer –**

Three attempts will be allowed to score performance points. Highest score stands.

Objective	Points
Travel 60 feet	145
Travel 50 feet	125
Travel 40 feet	110
Travel 30 feet	100
Travel 25 feet or more	90
Travel 20 feet or more	80
Travel 15 feet or more	70
Travel 10 feet or more	60
Travel 5 feet or more	50
Moves forward	40
If racers meets 30 feet, can stop at 20 feet (+/- 1 ft)	+ 25 extra credit
If racers meet 30 feet and can stop at 20, stop at 12 feet (+/- 1 ft)	+ 25 extra credit

**Mousetrap racer**

*(Bring this entire page with you to your testing session)*

Names: \_\_\_\_\_ period \_\_\_\_\_

Grade sheet	Points possible	Points earned
Performance score	100	
Oral examination	100	
Model		
- spring energy	20	
- torque	20	
- kinetic energy	20	
- friction	20	
- motion	20	
Total	300	