“Mousetrap Car Challenge”

Purpose: The purpose of this challenge is to illustrate to students the concepts of potential and kinetic energy through applying these energy sources to a vehicle. Students will also put to work their knowledge of simple machines and their applications. Students will build a vehicle that will be powered by a mousetrap which will demonstrate both potential (stored) and kinetic (energy in motion) energy in use and applied through the use of a variety of simple machines. Efficiency in the machine is key, since the competition is to go the furthest with the power supplied by one mousetrap.

Objective: Upon completion of this unit, the student should be able to:
1. Draw, plan and construct a project (mousetrap car) from the planning process.
2. Use problem-solving skills in the construction of a vehicle that will satisfy given rules.
3. Construct a vehicle with an adjustable navigation system that guides the vehicle in a straight line.
4. Construct a mouse trap powered vehicle that can carry a passenger (golf ball) over a distance.
5. Apply knowledge of force and friction in while satisfying a given set of rules for the challenge.
6. Demonstrate the application of kinetic and potential energy through the vehicle they design.

Materials Provided:
1. Mousetrap (you may only use the provided mousetrap !!)
2. Mousetrap kit
3. Wood Glue and available fasteners
4. 3 hot glue sticks
5. Necessary tools

- Students can use provided materials or bring other materials from home. Materials other than what is provided, must be approved with instructor first!!

Guidelines:
1. Build a vehicle that will move a measurable distance, carrying a passenger, when a mousetrap is sprung. The trap must be part of the car and move with the car. You must use the trap provided by the instructor.
2. The passenger must also stay on the vehicle and cannot be held in by adhesives.
3. You only get one mousetrap so do not destroy it or alter it beyond your repair capabilities. You will not get a replacement.
4. No other means of locomotion/propulsion are allowed in the competition.
5. No team cars will be allowed. You may work together, but you each must have a completed car on the day of the competition!
6. The object of the competition is to travel the furthest distance in a straight line. We will launch the cars on a straight line and measure the distance traveled from the starting point. Then we will measure the distance from the straight line and deduct that from the distance traveled.
7. You must design a remote launch system for your vehicle. You cannot make direct personal contact to initiate launch. (for example, you cannot hold a pencil and tap the bait tray.) Your launch sequence must have a minimum of five different, clearly separate, steps to initiate the launch and include 4 of the six simple machines.
8. A minimum of two full-size drawings will be required as part of the planning process for the vehicle challenge.
9. Student will be required to name and appropriately decorate the car.
10. Each student will get 3 attempts to score maximum distance points.
11. The frame, wheels and axles may be made from any safe material.
12. A pit area will be available but you must provide your own tools and repair materials.

Project Requirements on back of this page
Mousetrap Car Project Requirements:

- 4 sketches of **different** design ideas showing major systems & parts of car labeled.
- 2 full-size **detailed** drawings of final design choice (top and side view of same car).
- Finished vehicle properly decorated and named, race-ready for race day.
- Navigation system on board mousetrap vehicle.
- Passenger (golf ball) travels with car—not glued in!
- Mousetrap game-like launching mechanism to initiate start of the vehicle’s motion.
- Your mousetrap launching mechanism cannot employ the use of more than 1 marble or rolling/falling ball.

Launching Machine Requirements:

- 3 different sketches of **totally different ideas** for planning the machine
- 5 separate steps clearly labeled and described on the drawings
- Built to specs on the included grading sheet
- Must include 4 of the 6 simple machines in the steps of operation the launching machine and label them on the drawings
### Transportation and Energy

#### Planning and Drawings Evaluation Criteria

1. **Student provided at least 4 sketches of different ideas to develop into a final plan drawing**
   - Student provided more than 4 sketches
   - Minimal 4 sketches
   - Less than 4 different sketches
   
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2. **Sketches showed evidence of brainstorming, many options and all parts/details clearly labeled**
   - Sketches show many ideas, parts clearly labeled
   - Fewer ideas some labeled
   - Very few ideas, none labeled
   
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3. **Student provided 2 full size detailed final design drawings**
   - Two well drawn detailed design pictures, to full scale
   - Two drawings minimal detail
   - Little detail in drawing
   
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4. **Student provided in the full size drawings both a full top and side view of the car**
   - Drawings full size both views
   - Drawings less than scale missing views
   - Drawings lacking
   
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5. **Student provided 3 sketches of different ideas for their launching machine**
   - Three excellent sketches of different ideas
   - Sketches included
   - Minimal sketches included
   
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6. **Student clearly labeled at least 5 separate steps and described them on the drawings**
   - Five clearly labeled steps and descriptions
   - Five steps missing label or description
   - Few labels, descriptions
   
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7. **Launcher drawings clearly show at least 4 of the 6 simple machines and have them labeled.**
   - At least 4 of the 6 simple machines clearly labeled
   - Few machines labeled
   - No apparent labeled simple machines
   
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**TOTAL POINTS (70 points possible)**
### Evaluation Criteria: Mousetrap Vehicle

1. Finished, operable, *ready to race*, car.
   - Car appears complete: 10
   - Mostly finished: 8
   - Somewhat finished: 6
   - Not ready to go: 4
   - Ready to go: 2
   - Not ready: 0

2. Mousetrap is part of the car, well secured, and moves down the track with the car.
   - Mousetrap part of car: 10
   - Trap not clearly secured: 8
   - Trap not part of car: 6

3. Passenger is secure in the vehicle, not glued in place
   - Passenger secure and safe: 10
   - Safety and security questionable: 8
   - Hold on baby!: 6

4. Vehicle includes an *easily adjustable* steering mechanism to steer the vehicle in straight line while going down the track during competition.
   - Vehicle includes steering system: 10
   - No steering system evident: 8

5. Vehicle makes excellent use of provided materials and creative use of additional materials
   - Innovative use of materials: 10
   - Used little additional materials: 8
   - Only supplied materials: 6

6. Vehicle shows interesting *DESIGN* modifications and ideas
   - Vehicle has 4+ very cool ideas: 10
   - Vehicle has 2+ cool mods: 8
   - Vehicle is pretty box stock: 6

### Total Vehicle Points
60 pts possible
### Transportation and Energy - Mousetrap Car Project Grade Sheet

**NAME______________**

#### Evaluation Criteria: Mousetrap Vehicle Launching Mechanism

7. Student provided a remote launching system for the vehicle to initiate launch sequence of vehicle.  
   - Student has finished launcher: **10**  
   - Launcher doesn’t seem ready: **0**

8. Student launching mechanism is neatly assembled showing evidence of craftsmanship and quality.  
   - Carefully constructed launcher: **10**  
   - Adequate launcher: **8**  
   - In pretty tough shape: **6**

9. Student developed launching mechanism that completes **at least** 5 different steps to initiate launch.  
   - More than 5 steps: **10**  
   - 1+ bonus for each additional minimal 5 steps: **8**  
   - Less than 5 steps: **0**

10. Launcher can operate through its 5 steps with student only initiating sequence.  
    - Launcher works flawlessly: **10**  
    - Launcher needs assistance: **8**  
    - Launcher needs constant help: **6**

11. Launching mechanism and vehicle are decorated with appropriate color/theme etc.  
    - Excellent, neat decorations: **10**  
    - Little decoration: **8**  
    - No decoration: **6**

12. Launching mechanism uses at least 4 of the 6 simple machines and student can describe them  
    - 4 or more simple machines and description: **10**  
    - Minimal 4 and description: **8**  
    - Fewer than 4/little or no description: **6**

**Total Launching Machine Points 60 pts possible**

**Scoring Notes:**
- 1 point awarded for each linear foot traveled from the starting line.
- Points will accumulate as you make your 3 scored runs. We will run two cars side by side.
- 1 point deducted for every foot left or right of the straight line of launch.
- Measurement will be taken from the point of the car nearest the center-line and starting line.
- Cars will be launched with the back wheels on the starting line.