

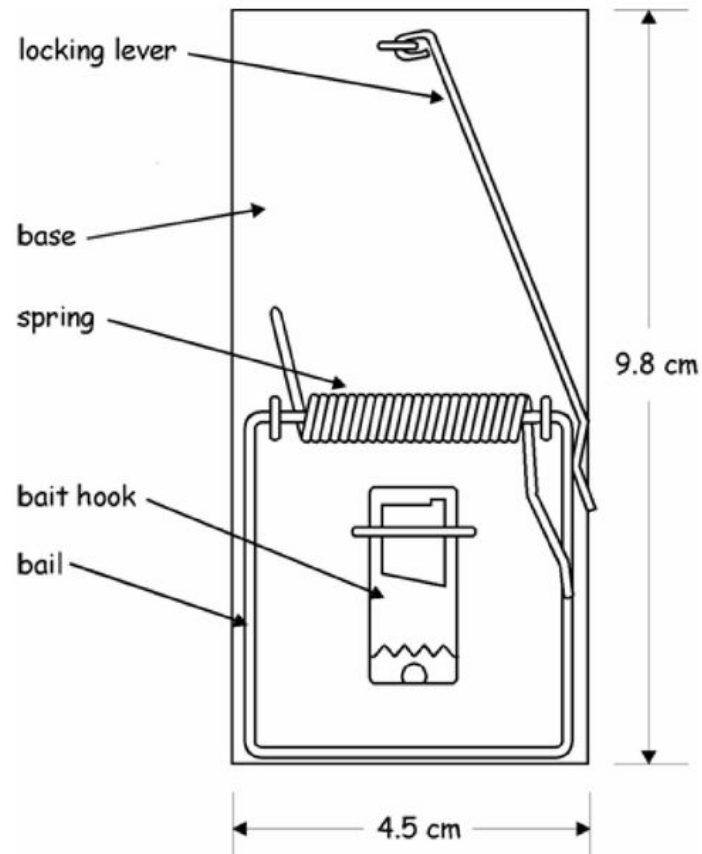
Mouse Trap Cars

Go The Distance

What is a mouse trap car?

- A mousetrap powered car is a vehicle that uses a mousetrap for a motor and a string to transmit force.
- In this method, one end of a string is attached or tied to the arm/bail on the mousetrap and the other end of the string is wound around the axle.
- By winding the string around the axle the mousetrap's string is stretched and now you have your stored/potential energy.
- As the mousetrap car is released the mousetrap's spring pulls the string off of the axle causing the wheels to turn and off the vehicle goes

Standard Mousetrap Diagram



Videos:

- Mark Rober – 1st place Mousetrap Car Ideas – using SCIENCE!
 - <https://youtu.be/b7zWwo9dbiU> – 14 minute video
- Get a paper out and you should take notes on:
 - How can we use Mechanical advantage to win this contest?
 - How do waste as little energy as possible?
 - Do you notice a difference with the thickness of string/fishing line/wire?
 - Lightweight vs heavyweight?
 - Should we test before race day?

Purpose:

- To design and construct the vehicle which will **travel the farthest distance using a standard mousetrap**,
- a minimum of 3 wheels, a string, and light weight building materials (glue, tape, dowel, foam, coffee stir sticks, etc)

Design Instructions

1. The vehicle must be powered by a single mousetrap (no rat traps allowed). The mousetrap spring must be the sole power source.
2. Original mousetrap spring and base must remain intact and unaltered. Locking lever and bait holder may be removed. Bail may be straightened but unaltered.
3. The spring must be visible and or accessible.
4. The car must have a minimum of 3 wheels.
5. You have complete design freedom concerning vehicle weight, size, and materials used.
6. Purchased car kits are not allowed. The intent of this project is for you to research, design, and build your own car from scratch i.e. from individual components you have around your home. Parts from toys (example: tires from models, erector set parts, etc.) are NOT allowed. Looks matter--make your car look good!
7. Distance traveled will be measured from starting point to the front –most part of the vehicle at its final resting point.
8. Your goal is for your vehicle to travel 10 or more meters. Please examine the grading rubric, car performance is a major part of your project grade—so test your design, make improvements and then test some more!

Observations and Data:

1. Look at the designs from the other class members.
 - Describe how they are similar
 - Describe how they are different
- Your vehicle may have RC steering but you may not use it to power the vehicles forward motion

Activity

- Answer the “science” questions on page 2 of your worksheet. You may use the internet/phones to search for answers
- Begin sketching 2-3 design ideas of what you want your vehicle to look like
- Figure out dimensions for the best possible distance
 - Wheels size
 - Axle size
 - String length
 - etc

Analysis – to be handed in on RACE DAY!

1. What are the two types of friction that affect the performance of your vehicle?
2. What problems related to friction did you encounter and how did you solve them?
3. What factors did you take into account to decide the number of wheels you chose in your design?
4. What kind of wheels did you use in each axle? What is the effect of using large or small wheels?
5. How does the distribution of weight of the vehicle affect the traction of the wheels?
6. Discuss the major problems you encountered in the performance of your vehicle and what you did to solve them.

Checkpoints - There are 2 progress checkpoints during this project.

1. You must have completed your final design and gathered all component parts and materials for assembly. You must bring in all component car parts to school for approval. You should be prepared to answer any construction questions presented to you at this time. The date will be provided when this checkpoint will happen.
2. You must have a working model to demonstrate. Finished cars can be tested and modified if necessary for performance improvement. Modifications can be made as often as desired up to the day before the race! The date will be provided when this checkpoint will happen.

Race Day notes

- There will be 2 runs for each car. The better run will be used for the final scoring

Tips for the best vehicle!

- Glue-Use quick drying hobby glue. Pay attention to the drying time specified on the bottle. Some glues will permanently set in as little as five seconds, giving you very little time to position the pieces.
- Wheels-Old CDs make great wheels, but have very little traction. Stretch a wide rubber band around each wheel; the rubber band can even be glued into place.
- String: Your string will need to be strong enough to withstand the forces exerted by the mousetrap spring. Fishing line or strong string works well. Winding the string in the wrong direction makes the car go backwards; painting a small arrow on the axle as a reminder can help.
- Alignment: A mousetrap car that always steers to one side will not be good for competition. Place shims (small pieces of scrap wood) in between the bushings or bearings of one or more of the wheels to align the wheels.
- Aerodynamics: Keep the number of flat surfaces facing the front of the car down to a minimum. Sanding the body of the car smooth also helps cut down drag.

Project Rubric – Marks out of 100

- **MOUSETRAP CAR CONSTRUCTION AND DESIGN (55 points possible)**
- **55 points**-Excellent application of design, construction and assembly.
- **45 points**-Very good construction and assembly and very good attention to detail.
- **35 points**-Good construction and assembly and some attention to detail.
- **25 points**-Fair construction and assembly. Minimal attention to detail.
- **15 points**-Last minute project. No attention to detail.
- **0 points**-Car is not homemade i.e. purchased kit was used. Car is disqualified from race.

Project Rubric – Marks out of 100

- **CHECKPOINTS (5 points possible per checkpoint)**
- **5 points**-All required checkpoint work completed.
- **0-3 points**-Less than all work accomplished at checkpoint.

Project Rubric – Marks out of 100

- **MOUSETRAP CAR PERFORMANCE (25 points possible)**
- **25 points**-Car traveled 15 meters or more.
- **20 points**-Car traveled at least 12 meters.
- **15 points**-Car traveled at least 10 meters.
- **12 points**-Car traveled at least 8 meters.
- **10 points**-Car traveled at least 5 meters.
- **5 points**-Car traveled at least 3 meters.
- **0 points**-Car traveled less than 3 meters.

Project Rubric – Marks out of 100

- **MOUSETRAP CAR ANALYSIS REPORT (10 points possible)**
- **8-10 points**-Demonstrates an excellent understanding of the analysis questions and answers them in complete sentences with vivid details.
- **5-8 points**- Demonstrates a good understanding of the analysis questions and answers them in complete sentences with some details.
- **2-4 points**- Demonstrates a minimal understanding of the analysis questions and answers them in complete sentences with few details.
 - **0 points**- Demonstrates a poor understanding of the analysis questions and answers them in incomplete sentences with no details.

Project Rubric – Marks out of 100

- **AWARDS**

- **Bonus Points** Awarded for:

- greatest distance travel, best engineered vehicle, and most artistic design.

- ***100 Points Possible*** ***Project***
Grade _____