Mouse Trap Catapult

Name _____

Teacher _____

Period _____

Overview - Each team will enter a **Mouse Trap Catapult** to compete in Physics Olympics. Each team is to complete their project according the design requirements and due date. All work is to be completed in class. The catapult will be stored in class and may not be taken home.

Purpose - To construct a catapult that launches a projectile (small marshmallow) the greatest distance. The minimum distance requirement is 5 meters.

The mouse trap catapult project requires the fabrication of a catapult which may require the use of hand tools. Common tools used are scissors, pliers and knife. Follow all manufacture safety guidelines and directions including the use of safety goggles. Tools should be used under adult supervision.

Construction Requirements

1. The ONLY materials allowed in the construction of the catapult are:
    - one standard mouse trap. The dimensions of the mousetrap are approximately 10 cm x 4.5 cm.
    - one plastic spoon or fork. The size of the spoon/fork is approximately a teaspoon.
    - (Optional) one standard #2 pencil or dowel. The length of the pencil/dowel is approximately 18-19 centimeters.
    - wire
    - string
    - masking
    - duct tape
    - Popsicle sticks
    - Zip ties
2. The spring on the mousetrap may NOT be altered.
3. No other materials are allowed without teacher approval.
4. More than one catapult may be built but only one design will be tested.

Launching Requirements

1. The catapult will be tested on the floor.
2. The mouse trap must be level with the floor.
3. The mousetrap arm may be released at any point along its range of travel.
4. The mousetrap must be held to prevent the catapult from moving when launched. A thin base may be attached to the mouse trap to provide a hold-down. The base may elevate but not angle the mouse trap.
5. The ONLY approved projectile is a small marshmallow.
6. Load the projectile after the catapult is "set".
7. Before launching make sure no one is going to be struck by your catapult's projectile.

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Competition Scoring

1. The catapult will be tested on the hallway/classroom floor. The mousetrap/base will be flat and level with the floor.
2. The distance launched will be measured from the launch line along the centerline of the hallway/floor.
3. A projectile that hits the ceiling or wall will be scored according to the rubric.
4. Each catapult will get three launches. The better of the three launches will be scored.
5. All catapults will be destroyed after the competition.

Distance Scoring Rubric

	Distance (Point of Impact)	Score
Distance Beyond Minimum	10 meters	100
	9 meters	98
	8 meters	96
	7 meters	94
	6 meters	92
	5 meters	90
	4 meters	88
	3 meters	86
	2 meters	84
	1 meter	82
	Minimum Distance 5 meters	80
	Exceed Minimum but HITS Ceiling/Wall	70
	Distance < 5 meters	65

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Catapult
Score Card

Name _____
Name _____
Name _____
Teacher _____
Period _____

Distance

First Attempt	Second Attempt	Third Attempt

Score

Construction Notes

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Mouse Trap Catapult
Pre-Build Questions

Name _____

Teacher _____

Period _____

Go to http://www.GravityKills.net for mousetrap car directions and course calendar to answer the questions below.

1. How many group members are allowed per building team? May you work alone?
2. Where are you allowed to construct your catapult?
3. Where are you NOT allowed to construct your catapult?
4. Are you allowed to design your catapult outside of class?
5. Where will your catapult be stored?
6. Describe the type and size of mousetrap you're allowed to use.
7. What materials are allowed in the construction of your catapult?
8. What object will your catapult launched? What is the penalty for launching unapproved objects?
9. How must the catapult be position when launched?
10. How far must your projectile travel to get a passing grade?
11. What grade do you want to earn on this project?
12. How far must your projectile travel to earn this grade?
13. How is the distance your projectile traveled measured?
14. What happens if the projectile hits the ceiling?
15. How many attempts do you get to launch your catapult for a grade?
16. How many different designs can you build? How many designs will be tested?
17. When will your catapult be tested/graded?
18. What will happen to your catapult after its final testing?

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Mouse Trap Car
TEKS/Objectives

Introduction TEKS

(1) Physics. In Physics, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students study a variety of topics that include: laws of motion; changes within physical systems and conservation of energy and momentum; forces; thermodynamics; characteristics and behavior of waves; and atomic, nuclear, and quantum physics. Students who successfully complete Physics will acquire factual knowledge within a conceptual framework, practice experimental design and interpretation, work collaboratively with colleagues, and develop critical thinking skills.

Knowledge and Skills TEKS

(1) Scientific processes. The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom. The student is expected to:
  (A) demonstrate safe practices during laboratory and field investigations; and
  (B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

(2) Scientific processes. The student uses a systematic approach to answer scientific laboratory and field investigative questions. The student is expected to:
  (E) design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, ~~and evaluating numerical answers for reasonableness~~;
  (K) communicate valid conclusions supported by the data through various methods such ~~as lab reports, labeled drawings, graphic organizers, journals, summaries~~, oral reports, ~~and technology-based reports; and~~

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to
  (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;
  (E) research and describe the connections between physics and future careers; and

(4) Science concepts. The student knows and applies the laws governing motion in a variety of situations. The student is expected to:
  (C) analyze and describe accelerated motion in two dimensions using equations, including projectile and circular examples;
  (D) ~~calculate the effect of forces on objects~~, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects;

(6) Science concepts. The student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum. The student is expected to:
  (B) investigate examples of kinetic and potential energy and their transformations;
  (D) demonstrate and apply the laws of conservation of energy ~~and conservation of momentum~~ in one dimension;
  (G) analyze and explain everyday examples that illustrate ~~the laws of thermodynamics~~, including the law of conservation of energy ~~and the law of entropy~~.

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