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QuickView

Students change the mass of a straw rocket to increase the rocket's range.

Standards Addressed

NSTA 9-12
Students develop the abilities to do scientific inquiry.

- Students design and conduct scientific investigations.
- Students formulate and revise scientific explanations and models using logic and evidence.
- Students communicate and defend a scientific argument.

NCTM 9-12
Students understand measurement attributes of objects and the units, systems, and processes of measurement.

- Students make decisions about units and scales that are appropriate for problem situations involving measurement.

Students formulate questions that can be addressed with data collect, organize, and display relevant data.

- Students understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable.

ITEA 9-12
Students develop the abilities to do scientific inquiry.

- Students learn to evaluate final solution and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.

Time Required

90-180 minutes (will vary with class size)

Content Areas

Primary: Science
Secondary: Math; technology; language arts

Vocabulary

- control
- hypothesis
- nose cone
- variable
- weight
- mass

Materials

- Pitsco Straw Rocket Launcher
- Precision Straws
- Index cards
- Modeling clay
- Ruler or measuring tape
- Scissors
- Transparent tape
- Balance or scales
- Pencil
- "Mass vs. Range Data Sheet"

Procedure

1 Locate the "Mass vs. Range Data Sheet" and write a hypothesis stating how you think variations in the rocket mass will affect the rocket's range.

2 Construct one 15-centimeter-long straw rocket with a minimum of two fins and a maximum of five fins.

3 Add a one-gram clay nose cone to the rocket.

The difference between weight and mass can be found in the glossary.

4 Perform three launches at a 45-degree launch angle and a calibration mark of five. Record the ranges on the data sheet.

5 Remove the one-gram nose cone and replace it with a two-gram nose cone. Perform three launches with the same launch angle and calibration mark. Record the results.

6 Repeat the process with three-gram, four-gram, and five-gram nose cones, keeping the angle and calibration mark the same. Record all results.

7 Analyze the data generated from your tests and write a conclusion explaining how the difference in mass affects the rocket's range. Make a recommendation concerning mass and rocket range. Support your recommendation for future rocket scientists with a graph of your experimental data.

Conclusions should be supported by data.

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Mass vs. Range Data Sheet

Hypothesis

How do you think mass will affect the straw rocket? Record your hypothesis, describing how you think mass will affect the range achieved by the rocket. _____

_____

_____

_____

Design Description

Describe the controls of your design including all numerical values and dimensions. _____

_____

_____

_____

Experiment Description

Describe the controls of your experiment including all numerical values and dimensions._____

_____

_____

_____

_____

Data

Record your data in the appropriate area of the table below.

	Nose Cone Mass	Range Launch 1	Range Launch 2	Range Launch 3
Rocket 1				
Rocket 2				
Rocket 3				
Rocket 4				
Rocket 5				

Conclusion

What conclusion can you make about the relationship between the rocket's mass and the range achieved? How does this conclusion compare to your original hypothesis? _____

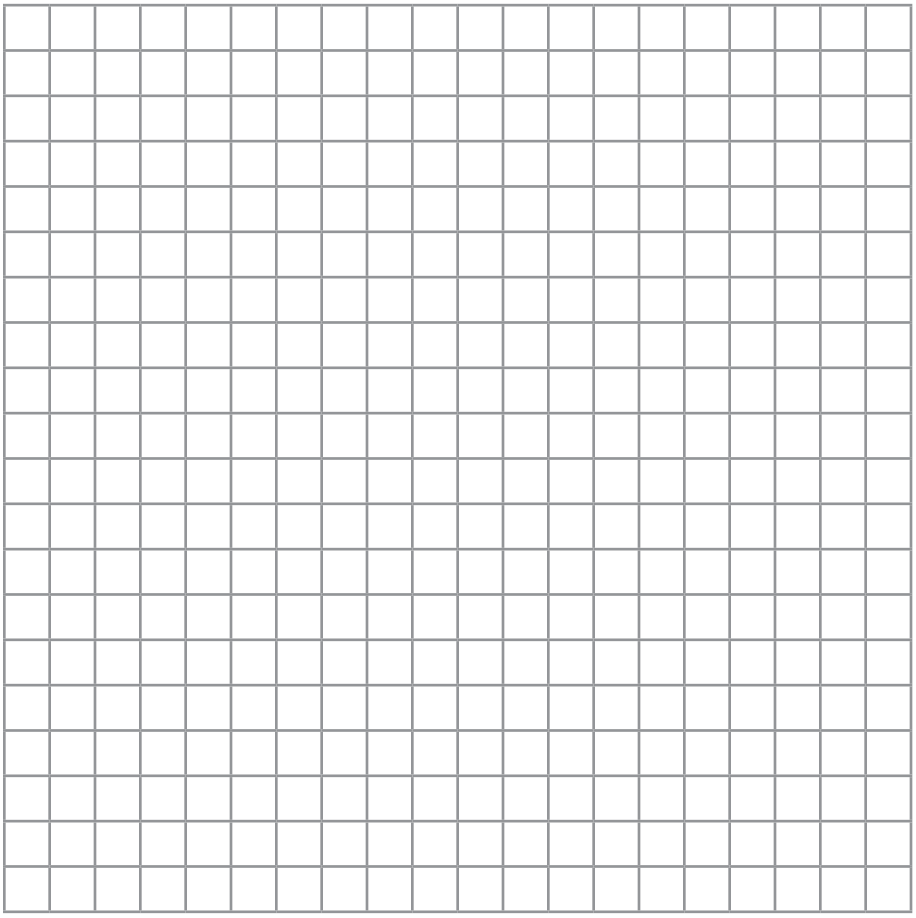
_____

_____

_____

Graph

Use the data on the previous page to create a graph showing the relationship between mass and distance.



Recommendations

What recommendations would you make to future rocket scientists concerning mass and range? Refer to the graph above in your recommendations. _____

_____

_____

_____

_____