

Unit 7.1 Lesson 05: Who Has the Bigger Increase in Splat?

Directions: Watch the Splat-o-Meter video with your classmates. Answer the questions.



The Situation:

Robin and Katelyn are learning about how the speed or mass of a moving object affects that object's kinetic energy. To study this, they have been dropping watermelons off ladders and off the school roof. They've tried dropping watermelons from different heights (to change the speed) and they've tried dropping different sizes of watermelons (to change the mass). They've seen that with each change that the size of the watermelon "splat" changes, which shows that the kinetic energy of the watermelon has changed.

Robin and Katelyn now want to conduct an experiment.

- **Katelyn** decides she will **change the speed** (and only the speed) of the watermelons she drops.
- **Robin** decides he will **change the mass** (and only the mass) of the watermelons he drops.

Robin and Katelyn will then compare their results to see how each change affected the falling watermelons' kinetic energy.

Name: _____ Hour: _____ Date: _____

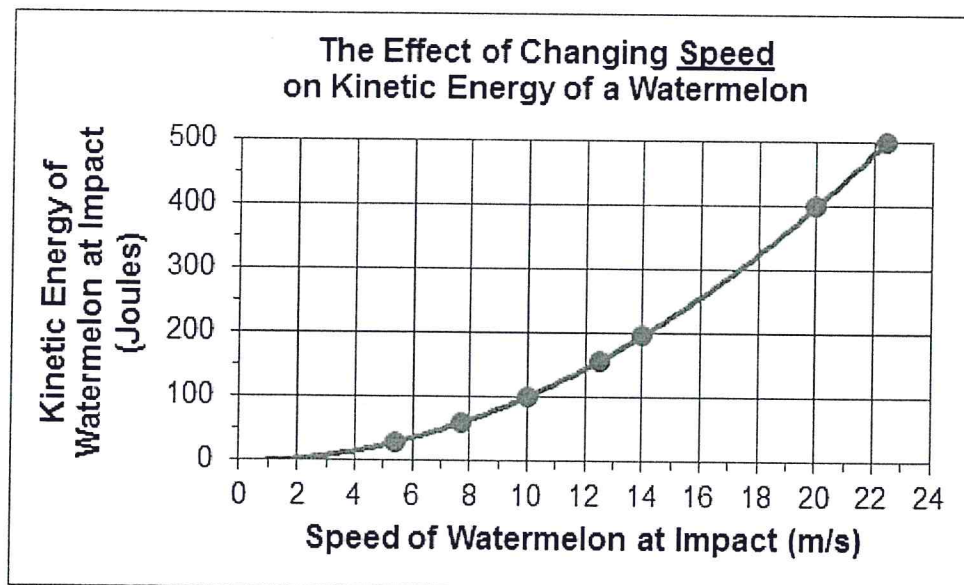
Part I: Organizing the data.

Katelyn's Experiment - How does changing speed affect the splat?

Katelyn collected data from dropping watermelons of the **same mass** from **different heights** and studying the amount of kinetic energy in the splat (by comparing the the size of the splat). Below is her data table and graph.

The Effect of Changing Speed on Kinetic Energy of a Watermelon

Height Watermelon Dropped (meters)	Speed of Watermelon at Impact (m/s)	Mass (kg)	Kinetic Energy of Watermelon at Impact (Joules)
1.5	5.4	2	29
3.0	7.7	2	59
5.0	10.0	2	100
8.0	12.5	2	157
10.0	14.0	2	196
20.5	20.0	2	400
25.5	22.4	2	500



1. For Katelyn's experiment, identify the **independent variable** (the thing we change in the experiment) by putting an "I" in the provided space below, and identify the **dependent variable** (the thing affected by the independent variable) by putting a "D" in the provided space below. *Hint: In Katelyn's experiment there is only 1 independent variable and only 1 dependent variable.*

_____ Height _____ Mass _____ Speed _____ Kinetic Energy

Name: _____ Hour: _____ Date: _____

Robin's Experiment - How does changing mass affect the splat?

Robin collected data from dropping watermelons of **different mass** from **the same height** and studying the amount of kinetic energy in the splat. Below is his data table.

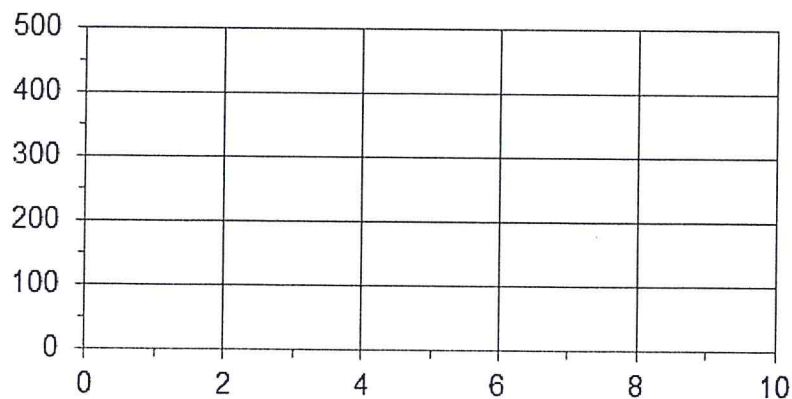
The Effect of Changing Mass on the Kinetic Energy of a Watermelon

Height Watermelon Dropped (meters)	Speed of Watermelon at Impact (m/s)	Mass (kg)	Kinetic Energy of Watermelon at Impact (Joules)
5.0	10.0	2	100
5.0	10.0	4	200
5.0	10.0	6	300
5.0	10.0	8	400
5.0	10.0	10	500

2. For Robin's experiment, identify the **independent variable** (the thing we change in the experiment) by putting an "I" in the provided space below, and identify the **dependent variable** (the thing affected by the independent variable) by putting a "D" in the provided space below. *Hint: In Robin's experiment there is **only 1 independent variable** and **only 1 dependent variable**.*

_____ Height _____ Mass _____ Speed _____ Kinetic Energy

3. Using Robin's data table (above), complete a graph of Robin's experiment. Remember to include a title and labels on both axes. The independent variable goes on the x-axis.



Name: _____ Hour: _____ Date: _____

Part III: Drawing Conclusions

Robin and Katelyn have been dropping watermelons off of ladders and off of the school roof. They've tried dropping the watermelons from different heights and they've tried dropping different sizes of watermelons. Their teacher now asks them which change would have a bigger effect on the kinetic energy of the watermelon: doubling the **mass** or doubling the **speed**?

Katelyn says if they keep the **same mass** but **double the speed from 10 m/s to 20 m/s** they'll get a bigger increase in kinetic energy and therefore a bigger increase in the size of the splat.

Robin says if they keep the **same speed** but **double the mass from 2 kg to 4 kg** they'll get a bigger increase in kinetic energy and therefore a bigger increase in the size of the splat.

6. Who is right, and why?

Hint: In addition to saying who has the bigger increase in kinetic energy, be sure to include by how much their kinetic energy increased.

Be sure to include numerical values from the experiments as evidence for your argument.

Name: _____ Hour: _____ Date: _____

Part II: Analyzing the Data

4. Using the data in Katelyn's and Robin's graphs, identify which of the following statements is correct about the relationship between speed, mass, and the kinetic energy of a moving object.

- a. Kinetic energy *increases* if the speed or the mass of the object *increases*.
- b. Kinetic energy *does not change* if the mass of the object *increases*, but does change if the speed increases.
- c. Kinetic energy *does not change* if the speed of the object *increases*, but does change if the mass increases.
- d. Kinetic energy *decreases* if the speed or the mass of the object *increases*.

5. Using Robin's and Katelyn's graphs do either of Katelyn's or Robin's graphs contain evidence that their variables have a nonlinear relationship? Explain your thinking.
