

Lesson Plan

Subject: Grade 5 Science

Lesson: Knock Out!

Standard Addressed:

- Understand force, motion, and the relationship between them (NC.5.P.1)

Objectives:

- Analyze how factors such as gravity, friction, and change in mass affect the motion of objects.
- Predict the effect of a given force or a change in mass on the motion of an object.

Materials Needed:

- Device for showing “Knock Out!” video
- “Mass, Marbles, and Motion” Activity
- Marbles of varying sizes (standard size marbles and the larger “shooters”)
- Stopwatch or timer function of electronic device
- Long cardboard tubes (such as those on which wrapping paper comes)
- Textbooks or other items that can be stacked to raise and lower track made from cardboard tubes

Outline:

- Prior to this lesson, students will understand the concepts of *gravity* and *mass*. Students will be familiar with using a stopwatch or the timer function of a personal electronic device.
- Show the video.
- Discuss the directions for “Mass, Marbles, and Motion” Activity.
- Model how to set up the materials.
- Students complete Part 1 and Part 2 with a partner or in a small group.
- Students complete Part 3 independently.

Take It Further: Line the cardboard tubes with thin strips of bubble wrap to introduce *friction*. Repeat the activity and compare the results.

Cross-Curriculum Connection: Have students write an advertisement for the National Marbles Tournament. Students should include when it began, where it will be hosted this year, what prizes may be won, and who is eligible to participate.

Follow the link below for details:

<https://www.nationalmarblestournament.org/>





Mass, Marbles, and Motion

Grade 5 Science

Name: _____ Date: _____

In the *Knock Out!* video, you learned about the game of marbles. In this activity, you will investigate the science behind the game. This activity is best done on the floor or on a large table. You will work with a partner or in a group and will need the following:

- A standard-sized marble
- A “shooter” (a larger marble)
- A long cardboard tube
- 3 textbooks
- A stopwatch (such as found on a personal electronic device)

PART 1: INVESTIGATING THE FORCE OF GRAVITY

You will time how long it takes for the **standard-sized marble** to roll down the cardboard tube. You will use different amounts of textbooks to raise your cardboard tube to different heights.

Use this table to record your results, then answer the questions below.

NUMBER OF TEXTBOOKS USED	TIME IT TAKES MARBLE TO EXIT TUBE (in seconds)
1	
2	
3	

1. What happens as you increase the number of textbooks? _____

2. Why does this happen? (Use the word “gravity” in your response.) _____

3. How long do you think it would take the marble to exit the tube if you put one end of the cardboard tube on top of 6 textbooks? _____





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Mass, Marbles, and Motion

Grade 5 Science

Name: _____ Date: _____

PART 2: INVESTIGATING THE EFFECT OF MASS

Now you will time how long it takes for the “**shooter**” to roll down the cardboard tube.

Use this table to record your results, then answer the questions below.

NUMBER OF TEXTBOOKS USED	TIME IT TAKES MARBLE TO EXIT TUBE (in seconds)
1	
2	
3	

1. What are the differences between the first marble you used and the “shooter”? _____

2. How are the results using the “shooter” different from the results using the standard-sized marble? _____

3. What do you think would happen if you used a marble with a mass twice as much as that of the “shooter”? _____

PART 3: CONCLUSION

Using what you have learned in this investigation, list two things that can affect an object's motion.

1. _____
2. _____



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Mass, Marbles, and Motion

Grade 5 Science

ANSWER KEY

In the *Knock Out!* video, you learned about the game of marbles. In this activity, you will investigate the science behind the game. This activity is best done on the floor or on a large table. You will work with a partner or in a group and will need the following:

- A standard-sized marble
- A “shooter” (a larger marble)
- A long cardboard tube
- 3 textbooks
- A stopwatch (such as found on a personal electronic device)

PART 1: INVESTIGATING THE FORCE OF GRAVITY

You will time how long it takes for the **standard-sized marble** to roll down the cardboard tube. You will use different amounts of textbooks to raise your cardboard tube to different heights.

Use this table to record your results, then answer the questions below.

NUMBER OF TEXTBOOKS USED	TIME IT TAKES MARBLE TO EXIT TUBE (in seconds)
1	(Should be greatest number in table.)
2	(Should be median number in table.)
3	(Should be least number in table.)

1. What happens as you increase the number of textbooks?

Responses may be similar to: “As I increase the number of textbooks, the time it takes the marble to exit the tube decreases.”

2. Why does this happen? (Use the word “gravity” in your response.)

Responses may be similar to: “As the height from which the marble gets started rolling increases, the force of gravity increases. This increase in gravity causes the marble to take less time to roll down the tube.”

3. How long do you think it would take the marble to exit the tube if you put one end of the cardboard tube on top of 6 textbooks? Responses may be similar to: “I think it will take less time than it did when 3 textbooks were used.” Students may also give an estimate in seconds that is smaller than any of the other values they recorded on their table.





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Mass, Marbles, and Motion

Grade 5 Science

ANSWER KEY

PART 2: INVESTIGATING THE EFFECT OF MASS

Now you will time how long it takes for the “**shooter**” to roll down the cardboard tube.

Use this table to record your results, then answer the questions below.

NUMBER OF TEXTBOOKS USED	TIME IT TAKES MARBLE TO EXIT TUBE (in seconds)
1	(Should be greatest number in table.)
2	(Should be median number in table.)
3	(Should be least number in table.)

1. What are the differences between the first marble you used and the “shooter”?

Responses may be similar to: “The first marble is smaller than the shooter”, “The first marble has a smaller mass than the shooter”, “The first marble was not as heavy as the shooter”

2. How are the results using the “shooter” different from the results using the standard-sized marble?

Responses may be similar to: “The time it took for the shooter to exit the tube was less than the time it took for the standard-sized marble to exit the tube.”

3. What do you think would happen if you used a marble with a mass twice as much as that of the “shooter”?

Responses may be similar to: “I think a marble with a mass twice as much as that of the shooter will move faster through the tube than the shooter did.”

PART 3: CONCLUSION

Using what you have learned in this investigation, list two things that can affect an object’s motion.

1. Force of Gravity
2. The Object’s Mass



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