

# Kentucky Summative Assessments

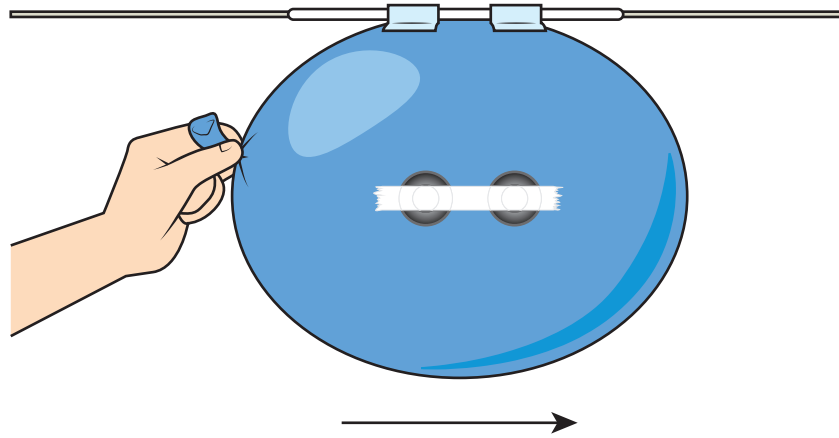


## Grade 7 Science Released Items 2022



SC071616\_00

Kalil and Sophia were learning about space and space travel in school. They were designing models of transport systems to learn about motion and forces. Their first activity was to build a balloon rocket that would transport a load of washers from one end of a string to the other.



They recorded the results of their first attempts in the table below.

Diameter of Balloon (inches)	Number of Washers	Distance Traveled (meters)
6	2	1.5
8	2	1.8
10	2	2
12	2	2.4

**1**

SC071616\_01\_2

Which one question is **best** answered by the patterns in the data?

- A** Will changing the mass affect the distance the rocket flies?
- B** Will changing the force affect the distance the rocket flies?
- C** Will changing the distance the rocket flies affect the mass of the rocket?
- D** Will changing the distance the rocket flies affect the force of the rocket?



SC071616\_00a

After the initial investigation, the teacher asked the students to begin a new investigation. In this investigation, the students were asked to change the number of washers while controlling the other variables. The table contains their findings.

Diameter of Balloon (inches)	Number of Washers	Distance Traveled (meters)
10	1	2.4
10	2	2.0
10	3	1.7
10	4	1.4

2

SC071616\_02\_3

Which one conclusion is **best** supported by the data?

- A A heavier object can't go as fast as a lighter object.
- B It takes less force to change the motion of a heavier object.
- C It takes more force to change the motion of a heavier object.
- D It takes longer for a heavier object to travel the same distance.

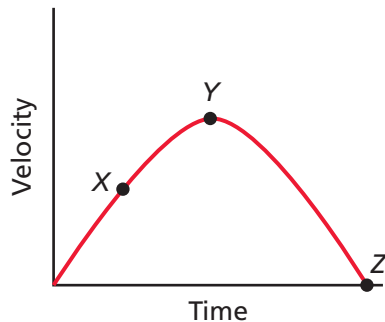


SC071616\_00b

For the next investigation, the teacher had Kalil and Sophia use a motion detector to graph the balloon rocket from the beginning of the launch to the end. Following is a graph of the rocket's motion.

**3**

SC071616\_03\_4



The information at point Y on the graph **best** supports which one of the following claims? Ignore air resistance on the rocket.

- A** The force of friction from the string is greater than the force of the air being forced from the rocket.
- B** The force of the air being forced from the rocket is greater than the force of friction from the string.
- C** The force of the air being forced from the rocket and the force of friction from the string are the same size and are acting together.
- D** The force of the air being forced from the rocket and the force of friction from the string are the same size but are acting to oppose each other.

**4**

SC071616\_04\_2

Kalil and Sophia's teacher challenged them to carry five washers on their rocket for a distance of exactly two meters. Which one of the variables will they **most likely** need to manipulate in their investigation to meet the challenge?

- A** Mass
- B** Force
- C** Distance
- D** Acceleration



SC071616\_00c

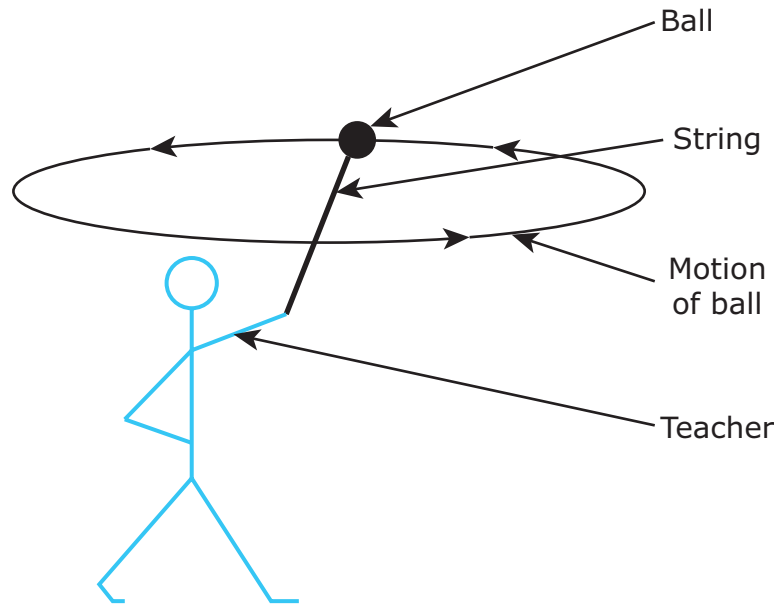
After Kalil and Sophia completed their investigations for the class, the teacher asks the class to think about how real rockets are different from the balloon rockets they made in class. He asked the question, “If we launched one of these rockets toward space, what would happen?” The students said it would just fall back to Earth because the rocket would not have enough stored energy to overcome the force of gravity. The teacher agreed and explained that gravity is a very important force everywhere in the universe, not just on Earth.

The teacher demonstrated a model of gravity in the Sun-Earth system by swinging a small ball above his head on a string. After discussing the parts of the system and how they interacted, the teacher gave the students a drawing of the activity on paper.



5

SC071616\_10\_2,5



Select one statement that correctly identifies what the components of the model are supposed to represent. Select one statement that uses the model to describe the role of gravity in the motions of objects within the Sun-Earth system.


Select the TWO **best** answers.

- A** The ball is the Sun, the string is the orbit, the teacher is Earth, and the motion of the ball is gravity.
- B** The ball is Earth, the string is gravity, the teacher is the Sun, and the motion of the ball is the orbit.
- C** The motion of the ball in a circle keeps the ball attracted toward the teacher. This is similar to how gravity pushes the Earth to move in a circle around the Sun.
- D** The teacher spins the ball around to increase the attraction of the ball to the teacher. This is similar to how the Sun causes Earth to orbit and be attracted to the Sun.
- E** The teacher holding the string keeps the ball from flying off and keeps the ball moving around the teacher. This is similar to how gravity keeps the Earth moving around the Sun instead of flying off into space.



To help the students better understand how gravity works, the teacher gave the students a different model to explore. The teacher shared this diagram with the class.

**The force of gravity varies with distance from Earth**



Earth	Distance in miles from Earth's surface.	Acceleration due to gravity in feet per second	Amount that a 100-pound person would weigh at each location in pounds
	0	32	100
	4,000	8	25
	8,000	3.6	11
	12,000	2	6.25
	16,000	1.3	4
	20,000	0.9	2.77
	24,000	0.6	2

One student looked at this diagram and said, “Wow, I’ll bet you don’t have to travel very far until the force of Earth’s gravity drops to zero.”





6

SC071616\_06\_1

What one piece of evidence **best** demonstrates that this student's claim was incorrect?

- A** The moon is in a stable orbit around Earth.
- B** Comets orbit the sun in long, narrow, elliptical orbits.
- C** Astronauts are weightless when they are in orbit around Earth.
- D** Rocket motors only need to provide thrust for a few minutes in order to escape Earth.

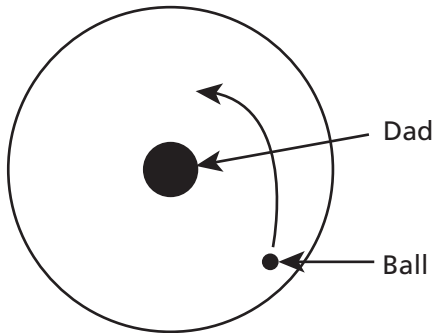


SC071616\_00e

“Why doesn’t Pluto orbit one of the planets instead of orbiting the sun?” Kalil asked the teacher. To help Kalil understand, the teacher gave the class another model to think about. “Imagine that your dad is sitting in the middle of a trampoline. You roll a ball across the trampoline. What happens to the ball?”

7

SC071616\_07\_4



What one relationship does this model illustrate that can **best** help Kalil answer his question about Pluto’s orbit?

- A The gravitational attraction is stronger between two small objects.
- B The less massive the object, the greater the gravitational attraction.
- C The gravitational attraction is not as strong between massive objects.
- D The more massive the object, the greater the gravitational attraction.



SC071616\_00f

The teacher asked the students to think about all they had explored about forces, motion, and gravity in order to design an investigation to solve a new problem that involved using forces to work against gravity.

The class was asked to launch a balloon rocket vertically. The rocket needed to carry a load of five washers to a height of three meters. To conduct the investigation they had the following materials available:

### **Materials**

Fishing line

Yarn

Cotton string

Small-diameter straws

Medium-diameter straws

Large-diameter straws

7-inch round balloons

8-inch round balloons

9-inch round balloons

**8**

SC071616\_08\_::

Describe how you would use these materials to investigate the challenge of launching a balloon rocket carrying five washers to a vertical height of three meters.

#### **Part A**

Explain which variable you will change and which you will keep constant.

#### **Part B**

Describe how you will measure your variables.

#### **Part C**

Describe how your choice(s) of materials affected the forces acting on the rocket.



*Investing in Kentucky's Future, One Student at a Time*