



LESSON PLAN

Subject: Grade 5 Science

Lesson: Springtide Sports

Standards Addressed:

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

Objectives:

- Students will demonstrate the force of gravity on objects.
- Students will understand that the greater a force is, the greater the change in motion it produces. The greater the mass of the object being acted on, the less the effect of the same force.
- Students will explain how factors such as friction, gravity, and change in mass affect the movement of objects.

Materials Needed:

- A device for watching the “Springtide Sports” video
- The “Springtide Sports” activity sheet
- One ball per pair of students

Outline:

- Students will watch the “Springtide Sports” video. Teacher may pause video at intervals to relate the topics to things learned in class.
- Teacher will review forces such as gravity and friction as well as mass with the class.
- Students may complete the pages of the activity individually or in pairs.

Take It Further: Ask students to review misconceptions about gravity in this episode of [Good Thinking](#) on PBS. <https://ssec.si.edu/node/446>

Cross-Curriculum Connection: Various works of art were highlighted in the video. Art is considered a primary source. Have the students study the art to find similarities and differences through time. Make assumptions about the way the clothing styles would affect the motion needed for game play. Do research on other works of art that depict people playing games.

Artwork highlighted in the video:

- Mosaic of a child playing with hoops (trochos), Great Palace Mosaic Museum, Istanbul. Byzantine, 6th century AD
- “Courtesan Striking a Shuttlecock with a Battledore,” by Okumura Masanobu, Allen Memorial Art Museum, 1710
- “Afonso” by Johann Moritz Rugendas, 1846
- “Reifspiel auf der Terrasse” by Adolph von Menzel, 1851
- “Girl With a Hoop” by Pierre-Auguste Renoir, 1885
- “Le Jeu Des Graces” by Paquin, 1913



Springtide Sports: Keep Moving Forward

Grade 5 Science

Name: _____

Date: _____



Activity 1: What goes up, must come down. Do the following experiments and observe how gravity affects the objects, and the forces needed to move them.

A. Roll a ball across the floor

B. Toss a ball into the air

1. How do you need to apply force differently when you roll the ball from when you throw the ball?



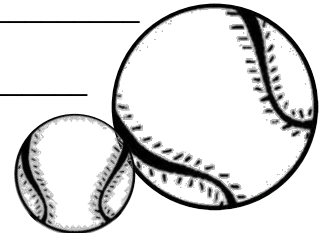
A. Roll the ball up a hill

B. Roll a ball across the floor

2. Explain why you must use more force to roll the ball up the hill than along the flat ground.

3. What force causes the ball to come back when you roll it up the hill?

4. Explain why it is more difficult for a ball to roll in the grass than a polished floor?



Springtide Sports: Keep Moving Forward

Grade 5 Science

Name: _____

Date: _____

Activity 2: Make predictions to answer the following questions based on what you know about forces and mass.

1. How can these brothers make the hoop roll slower? (list 2 ways)



2. How can the sisters make the hoops go higher?



3. What forces can Ben use to slow the bicycle down?



4. Explain how a ball with more mass will they have to apply more or less force to the ball in order to get it to the other player?



Springtide Sports: Keep Moving Forward

Grade 5 Science

Name: _____

Date: _____

Activity 3: Explain how factors such as friction, gravity, and change in mass affect the movement of the following objects.

1. Imagine a place far from all gravitational and frictional influences. Suppose that you visit that place (just suppose) and toss a grace ring. The ring will: (circle the best answer)

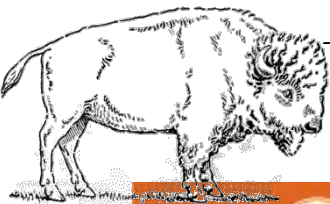
- a. gradually stop.
- b. continue in motion in the same direction at constant speed.

Why? _____

2. Brother Clewell and Brother Reuz are arguing at the Toy Store. Brother Clewell says that if he flings the shuttlecock with a greater force it will travel further. Brother Reuz argues that force does not affect the distance an object travels. Who is right?



3. Ben dropped a ball in the woods and is being chased by a very large buffalo that he startled. The enormous mass of the buffalo is extremely intimidating. Yet, if Ben makes a zigzag pattern through the woods, he will be able to use the large mass of the animal to his own advantage. Explain how?



Springtide Sports: Keep Moving Forward

Grade 5 Science

ANSWER KEY



Activity 1: What goes up, must come down. Do the following experiments and observe how gravity affects the objects, and the forces needed to move them.

A. Roll a ball across the floor

B. Toss a ball into the air

1. How do you need to apply force differently when you roll the ball from when you throw the ball?

Rolling a ball across the floor takes less force than tossing a ball into the air



A. Roll the ball up a hill

B. Roll a ball across the floor

2. Explain why you must use more force to roll the ball up the hill than along the flat ground.

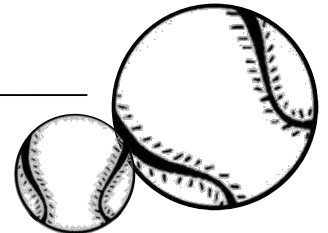
Gravity slows the ball down as you roll it up the hill

3. What force causes the ball to come back when you roll it up the hill?

Gravity

4. Explain why it is more difficult for a ball to roll in the grass than a polished floor?

There is less friction on the polished floor



Springtide Sports: Keep Moving Forward

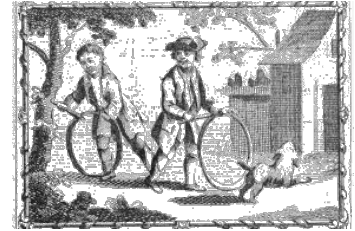
Grade 5 Science

ANSWER KEY

Activity 2: Make predictions to answer the following questions based on what you know about forces and mass. *answers may vary*

1. How can these brothers make the hoop roll slower? (list 2 ways)

HIT THE HOOP WITH LESS FORCE,
ROLL IT UP HILL, ROLL IT OVER HIGH GRASS...



2. How can the sisters make the hoops go higher?



THROW IT WITH MORE FORCE

3. What forces can Ben use to slow the bicycle down?

FRICTION, USING THE BRAKES, STOP APPLYING FORCE TO THE PEDALS



4. Explain how a ball with more mass will they have to apply more or less force to the ball in order to get it to the other player?



MORE FORCE

Springtide Sports: Keep Moving Forward

Grade 5 Science

ANSWER KEY

Activity 3: Explain how factors such as friction, gravity, and change in mass affect the movement of the following objects.

1. Imagine a place far from all gravitational and frictional influences. Suppose that you visit that place (just suppose) and toss a grace ring. The ring will: (circle the best answer)

- a. gradually stop.
- b. continue in motion in the same direction at constant speed.

Why? **NEWTON'S 1ST LAW OF MOTION: AN OBJECT IN MOTION TENDS TO STAY IN MOTION UNTIL ANOTHER FORCE ACTS UPON IT**

2. Brother Clewell and Brother Reuz are arguing at the Toy Store. Brother Clewell says that if he flings the shuttlecock with a greater force it will travel further. Brother Reuz argues that force does not affect the distance an object travels. Who is right?

_____ **BROTHER CLEWELL** _____



3. Ben dropped a ball in the woods and is being chased by a very large buffalo that he startled. The enormous mass of the buffalo is extremely intimidating. Yet, if Ben makes a zigzag pattern through the woods, he will be able to use the large mass of the animal to his own advantage. Explain how?

Ben can more easily change his own state of motion (make quick changes in direction) while the large mass of the buffalo makes it extremely difficult to change its state of motion.

