



LESSON OF THE MONTH:

## PRINCIPLE OF FLIGHT: FORCE

### TITLE: PRINCIPLE OF FLIGHT: FORCE

#### CONTENT AREA:

Physical Science

#### GRADE LEVEL:

Upper elementary

#### STANDARDS:

##### **Motions and Forces**

- The motion of an object can be described by its position, direction of motion, and speed.

#### PURPOSE:

Students will investigate and compare how objects of differing weight affect force, as related to distance traveled by the object.

#### LENGTH OF TIME:

60 minutes

#### MATERIALS:

Shot Put Challenge Student Sheet

Activity Materials

-See Student Sheet



#### **Fast Facts**

##### **Force:**

- 1) a push or a pull; force is the power to put something in motion.
- 2) Any influence that causes an object to undergo a change in speed, a change in direction, or a change in shape.

*Examples:* opening a door, kicking a soccer ball, pushing a skateboard or jumping in the air.

Force is measured in Newtons (named after Sir Isaac Newton)

A force is described in speed (magnitude) and direction of motion.

There are two types of force:

**Contact force:** is the result of physical contact between two objects. *Examples:* kicking a ball or hitting a homerun.

**Field force:** is a force between two objects that do not need to touch. *Examples:* gravitational pull or magnetic force. Sometimes more than one force is pulling or pushing on an object as in tug of war or pushing a box or a car.



**Note to Teacher:** Before class begins, find an open area to set up each of the four stations listed on the Shot Put Challenge Student Sheet. Using a piece of tape or other type of marker, indicate a starting line at each station.

### **WHOLE GROUP:**

1. Introduce the concept of force using the information in the Fast Facts.
2. Pass out the Shot Put Challenge Student Sheet and go over the directions and materials with the students. Demonstrate the activity including the proper shot-put technique.



**Note to Teacher:** Hold the object like a waiter holds a tray of plates over their shoulder with hand flat and at shoulder height. Extend your arm to push the object out in front as far as possible. To see a live demonstration of shot puts check out our YouTube Channel:  
<http://www.youtube.com/user/TWFoundation>

3. Break the students into small groups and assign them a station to start.

### **SMALL GROUP:**

4. Ask the groups to work through each station.
5. Discuss the results of the activity using the Discussion Questions on the Student Sheet.

### **FOLLOW-UP QUESTIONS:**

1. What is the definition of force and how is it measured?
2. In this activity, how was the concept of force applied?
3. Based on the initial position of the ball in your hand, how is force affected by the speed and direction of the ball after the shot-put?

### **EXTENSION ACTIVITY:**

1. Use different types of balls for the activity and follow the same instructions to complete the activity.
2. Allow students to use different techniques to throw the ball. Ask them to compare the results between the different techniques.

## **STUDENT SHEET: SHOT PUT CHALLENGE:**

### **INTRODUCTION:**

Throwing a shot put involves skill and technique to make it travel the farthest distance. But, is it just skill and technique? This activity will show you that other factors also affect distance traveled. Which ball do you think will travel farthest?

### **MATERIALS:**

- Cotton Balls
- Ping Pong Balls
- Paper Balls
- Golf Balls
- Meter Sticks
- Digital Scale

### **DIRECTIONS:**

*At each station:*

1. Weigh each type of ball (in grams) on a digital scale and record the weight before testing.
2. Stand behind the line at your first station.
3. Pick up a ball and shot put it as far as you can.

*Shot Put Technique: Hold the object like a waiter holds a tray of plates over their shoulder with hand flat and at shoulder height. Extend your arm to push the object out in front as far as possible.*



- a) For the low speed trial, apply minimal/little energy when you shot put the balls.
  - b) For the high speed trial, apply all your energy (use your legs) when you shot put the balls.
4. Using the meter stick, measure the distance thrown for each trial.
  5. Record results in the chart below.
  6. Answer discussion questions.

Ball Type	Weight (in grams)	Speed: Low Distance Travel (in feet)	Speed: High Distance Travel (in feet)
1. Cotton Ball			
2. Ping Pong Ball			
3. Paper Ball			
4. Golf Ball			

**DISCUSSION QUESTIONS:**

1. Which ball traveled the farthest distance? Which ball traveled the shortest distance?
2. What effected the distance of how far each ball traveled?
3. What is the relationship between the weight of the object and the distance it traveled? Based on your answer, what affects FORCE the most in this activity?
4. During the shot put trials, how did changing your energy affect the distance each ball traveled?