

Date: _____

Your Name: _____

Name(s) of Partner(s): _____



**NEW ENGLAND
COMMON ASSESSMENT PROGRAM**

Released Science Inquiry Task

Force of Friction

2015

Grade 8

Inquiry Booklet

Science

Directions:

In this task, you will read a story about two students who investigate the force of friction acting on a wooden block. You and a partner will conduct the same scientific investigation about friction as the students in the story. You will measure the effects of the type of surface, mass, and surface area on the force of friction.

The following Word Bank defines the terms that you will need to understand throughout this investigation.

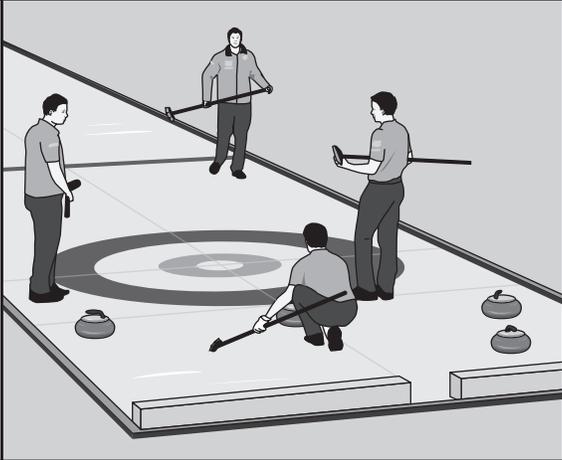
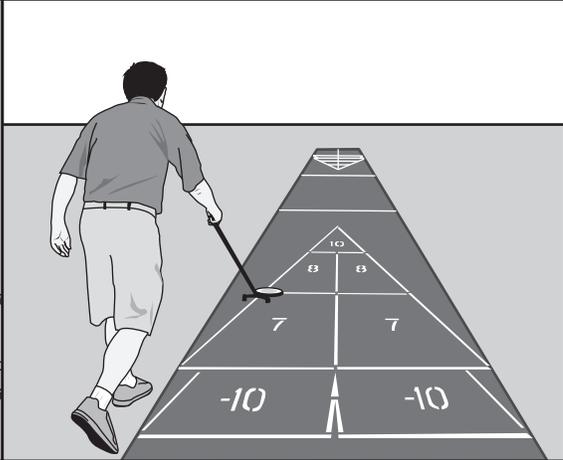
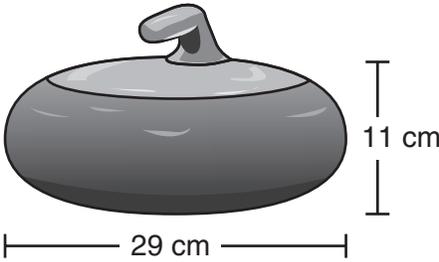
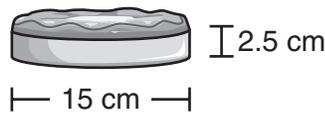
Word Bank

Applied force	an action that could cause an object to move, such as a push or a pull
Average (mean)	a typical number for a data set; a value that is found by dividing the sum of a set of terms by the number of terms Example: The average of 5, 5, and 8 is $\frac{(5 + 5 + 8)}{3} = 6$.
Curling	a sport in which players slide special stones across a sheet of ice toward a target area
Force of friction	when an object is pushed or pulled, the resistance that opposes the movement of that object
Shuffleboard	a game in which players use broom-shaped paddles to push weighted disks, sending them gliding down a long and narrow court toward a target area
Surface area (of a flat surface)	a number that describes the space inside a flat, or two-dimensional, surface Example: The area of a rectangle = length \times width: Area = 5 cm \times 6 cm = 30 cm ² .
Texture	the feel or appearance of a surface Example: A surface can be rough or smooth.
Trial	each time you repeat the same step of an investigation

Force of Friction

Kayla and Mason are watching a curling game, which is played on ice, on television. Kayla says this sport reminds her of the game shuffleboard, which is usually played on a wooden surface (similar to a basketball court). Mason remembers playing shuffleboard once, and he tells Kayla that there are differences between the two games. They research each sport, and they find out that the playing surfaces, the playing pieces themselves, and the size and mass of the playing pieces are very different. They made the chart below to show these differences.

A Comparison of Curling and Shuffleboard

Sport	Curling	Shuffleboard
Playing Area		
Playing Piece	<p style="text-align: center;">Curling stone</p> 	<p style="text-align: center;">Weighted disk</p> 
Playing Surface	<p style="text-align: center;">Ice</p>	<p style="text-align: center;">Wooden floor</p>
Mass of Playing Piece	<p style="text-align: center;">17–20 kg</p>	<p style="text-align: center;">0.45 kg</p>

Kayla and Mason wonder why the playing pieces are so different. They decide to ask their science teacher, Mr. Gregson, about them the next day. Mr. Gregson suggests that Kayla and Mason do some investigations to find out more, and he asks them to focus on the following research question:

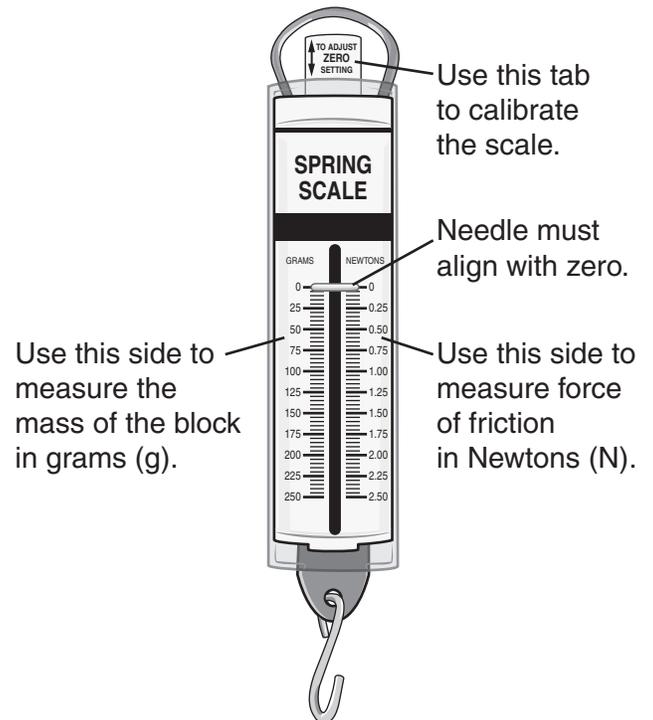
How does the texture of the surface affect the amount of force needed to slide an object across it?

You will answer the same research question.

Materials for the investigation:

- 1 piece of wax paper (about 28 cm long)
- 1 piece of sandpaper (about 28 cm long)
- 1 paper towel (about 28 cm long)
- 1 Newton (N) spring scale
- 1 wooden block with an eye screw on the end
- 6 labels

Newton (N) Spring Scale



How to Calibrate and Use the Newton Spring Scale

- To measure the force of friction in Newtons, read the Newton side of the scale using the numbers on the right, as shown in the diagram. To measure the mass of the block (g), read the numbers on the left, as shown.
- The spring scale may need to be calibrated before each step of your investigation. Please check your spring scale to ensure the needle begins at zero. To adjust if necessary, hold the scale upright and use the metal tab above the scale to move the faceplate either up or down until the needle aligns with the zero setting.

Making a Prediction

In this investigation, you will be pulling a wooden block across three different surfaces. Use the information from the story and what you already know about the properties of different surfaces to make a prediction **on your own** about the students' research question:

Research Question:

How does the texture of the surface affect the amount of force needed to slide an object across it?

Write your prediction.

Explain the reasoning for your prediction.



Organizing and Presenting Your Data

Before beginning the task, you must decide how you will organize your data. Read the directions under “Conducting Your Investigation” on page 6 and then, in the box on this page, design a data table that has all the rows and columns you need to collect the data as you follow the steps. Be sure to give your table a title and **include a column for the average**.

Do not use the materials for this investigation until after you have created the data table.

Data Table 1:

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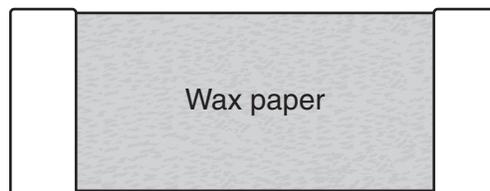
Conducting Your Investigation

You and your partner will measure the mass of the wooden block and then pull the block across three different surfaces.

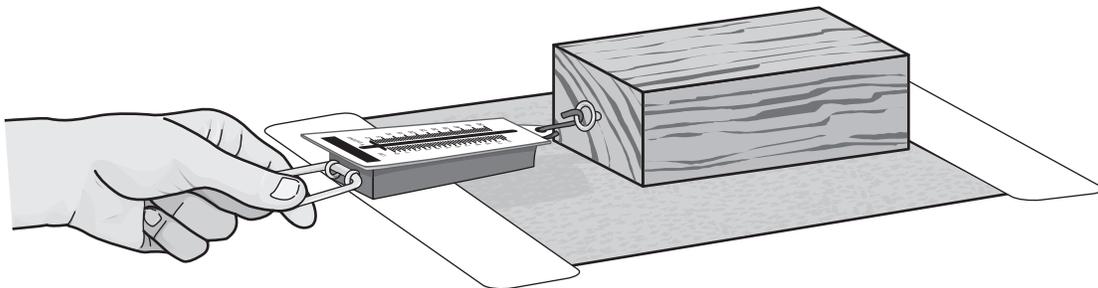
1. Measure the mass of the wooden block by hanging it on the spring scale from the eye screw. Record this value in the box below.

Mass of wooden block: _____ g

2. Use labels to attach the ends of the piece of wax paper to the table, as shown below.



3. Place the block on its largest side, and attach the hook of the spring scale to the block.
4. Place the block at one end of the wax paper, as shown in the diagram below. The block should not be on the label.



While holding the other end of the spring scale, gently pull the spring scale horizontally across the wax paper surface until the block begins to move. **As soon as the block begins to move, stop pulling and record the force shown in Newtons** on the spring scale in the table you created (Data Table 1) for **Trial 1**. Note: You may use your finger to hold the surfaces in place if the labels move.

5. Repeat steps 3 and 4 for **Trial 2** and **Trial 3**.
6. Repeat steps 2–5 with the sandpaper and the paper towel. Record your results in Data Table 1.

Reminder:

After completing the investigation and all the sections of Data Table 1, follow your teacher's instructions for cleaning up the workspace.

