

## Discovery Guide

# Simple Machines & A(maize)ing Grains

STEM FOR SCOUTS AT THE PLIMOTH GRIST MILL

### Be a citizen scientist at the Plimoth Grist Mill in the heart of Downtown Plymouth!

Scouts explore simple machines, experiment with water power, and discover the power of whole grains at a working reproduction of the first mill built in Plimoth Colony. Patches are available to purchase at the Plimoth Plantation Museum Shop.

## Goals for Scouts

**Explore** the science, engineering, math, and technology inside a working grist mill.

**Discover** the accomplishments of America's early engineers.

**Learn** about past peoples and cultures and compare their lives to ours today.

## Patch Program Requirements

To earn the Simple Machines & A(maize)ing Grains Patch, use this Discovery Guide to explore Plimoth Plantation's Plimoth Grist Mill as a troop and work together to solve problems and learn how millers turned water into energy to grind corn!

### BROWNIES

- Answer any **two** questions in each section of the Discovery Guide
- Choose one hands-on activity
- Mill Math Challenge is optional

### JUNIOR GIRL SCOUTS

- Answer any **three** questions in each section of the Discovery Guide
- Complete both hands-on activities
- Complete the Mill Math Challenges



PLIMOTH®





## Mills in the Community

### QUESTIONS

What does the word “grist” mean? How many other words for “grist” can you brainstorm?

How did the mill serve the community of Plymouth Colony? How does the mill still serve the community today?

Who was Sarah Jenney, and why was it unusual for her to be at the mill?

Do grist mills still exist today?

### HANDS-ON ACTIVITY: CAN YOU TIE A MILLER'S KNOT?

**Look for the knot tying exhibit on the lower floor of the mill. Practice tying a miller's knot. As a troop, can you figure out:**

Why were knots very important to farmers and millers?

Why is the miller's knot especially good for tying sacks of grain?

### MILL MATH CHALLENGE: HOW MUCH CORN?

It takes the miller 20 minutes to grind 50 pounds of corn. How many pounds of corn can the miller grind in one hour (60 minutes)? How many pounds can they grind in an 8 hour day?



## Wonders of Water Power!

### QUESTIONS

Where does the mill's energy or power come from? Is this green or renewable energy? Why or why not?

Look at the environment around the mill. Share or draw three observations about Town Brook and its ecosystem. Where does Town Brook start? Where is it going?

The weight of falling water makes the water wheel turn which drives the mill. What force in nature makes things fall down?

Watch the mill's water wheel turn. An object that is moving has kinetic energy. An object that is ready to move (but isn't moving) has potential energy. Does the water wheel have potential or kinetic energy?

### **MILL MATH CHALLENGE: CAN YOU FIGURE OUT HOW MUCH WATER IT TAKES TO TURN THE WATER WHEEL?**

1 gallon of water weighs 8.3 pounds (3.8 kilograms). Each water wheel compartment (called a bucket) holds about 20 gallons of water. How many pounds of water are in each bucket? How many kilograms? **Hint:** Multiple the number of gallons per bucket by the weight of 1 bucket.



## Mill Technology

### QUESTIONS

How many gears does the Plimoth Grist Mill have? What are they called?

Why does the mill need gears?

How do the gears help move or transmit energy from one part of the mill to another?

Can you find a way to get ground corn from the millstones (upstairs) to the flour bin in the gear room?

### MILL MATH CHALLENGE: CALCULATE THE GEAR RATIO

The large face gear has 66 cogs, while the smaller lantern gear has 13 rounds. For every 1 rotation of the face gear, how many times does the lantern gear go around? What is the gear ratio for the Plimoth Grist Mill? **Hint:** To calculate the gear ratio, divide the number of cogs in the larger gear by the number of rounds in the smaller gear.



## Grinding Corn

### QUESTIONS

According to Wampanoag tradition, what animal brought corn to the people, and where did it come from?

Squanto was a Wampanoag man who taught the Pilgrims how to plant corn. What did they use for fertilizer?

What did the word “corn” mean to the Pilgrims? Is it the same as the Wampanoag? How would you feel if you had to grow, cook, and eat unfamiliar foods?

What are some non-food products that are made from corn today?

### HANDS-ON ACTIVITY: COOKING WITH CORN

#### Nasaump

Nasaump is a traditional Wampanoag dish that is made from dried corn, local berries, and nuts. It is boiled in water until it thickens, and is similar to a porridge or oatmeal.

1 ½ cups cornmeal

1 cup strawberries, raspberries, blueberries or a combination of all three

½ crushed walnuts, hazelnuts, sunflower seeds or a combination of all three

1 quart water

maple syrup or sugar to taste (optional)

Combine cornmeal, berries, crushed nuts, and the optional sweetener in a pot of water and bring to a boil. Turn down the heat to medium and cook, stirring frequently, for 15 minutes.

**The finest grounds are called meal. The medium grounds are called grits. Both are used for cooking and baking.** Who (or what!) do you think gets to eat the biggest pieces that are left over?

**MILL MATH CHALLENGE: MORTAR AND PESTLE VS. MILL STONES**

The Wampanoag and Pilgrims could grind about 4 pounds of corn in 1 hour (60 minutes) using a mortar and pestle. How long would it take 1 person to grind 20 pounds of corn? How would your answer change if you had siblings or friends to help you?

**BONUS QUESTION!**

How many pounds of corn can the mill grind in 1 hour by using water power? Is it more or less than using a mortar and pestle?



## Congratulations!

You've completed the Simple Machines & A(maize)ing Grains Patch Program. You worked together to learn how water powered an important part of Plymouth's earliest communities and how people in the past used science and math to solve problems, just like we do today.

**Don't forget to bring your Discovery Guide to the Plimoth Plantation Museum Shop to purchase your patch.**

## Tie a Miller's Knot!

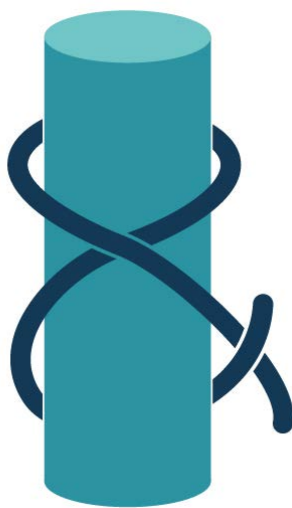
Knots were important for farmers and millers alike. If a sack of corn or meal wasn't tightly closed, valuable corn could be lost.

Millers were fined for failing to keep their product in good condition. In 1644, mill owner Sarah Jenney was made to promise to keep bags of corn from spilling and spoiling. Tying her sacks properly would help her to do this.

Find a piece of rope or even a shoelace, and try out this knot! You'll need something to tie the knot around. If you don't have a bag with a top you can close with the knot, try tying it around a railing.



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