



# Shrinking and Growing



In her adventures in Wonderland, Alice shrinks and grows many different times. In this activity, after tracing a 5-inch tall character from the story onto #6 plastic, children predict what might happen when the plastic is heated in the oven.

Comparisons of measurements before and measurements after shrinking will help children begin to think about mathematical properties such as proportion and scale.

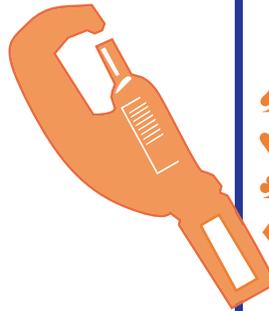
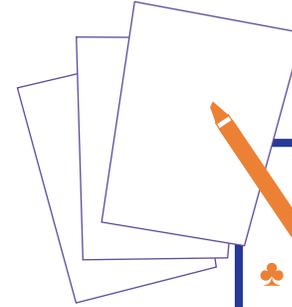
## To Get Ready:

Creation of a chart with spaces for predictions and actual measurements might be helpful to the students as they record their results. You might also want to preheat the toaster oven before you start the activity.



## To Start, Ask:

*What do you think might happen to a piece of plastic placed in the toaster oven for 30 seconds at 325 degrees?*



## What you'll need: (for each student)

- ♣ #6 recyclable plastic (approx. 5 inches square)
- ♦ pre-printed illustrations of Alice, the White Rabbit, and the Mouse included on the last page of this activity
- ♠ permanent markers
- ♥ scissors
- ♣ ruler
- ♦ calipers to measure the thickness of the plastic

## (for the class)

- ♣ paper
- ♦ pencils
- ♠ toaster oven
- ♥ oven mitts
- ♣ baking sheet
- ♦ aluminum foil
- ♠ spatula / tongs



## Try It!:

- ♣ Draw or trace an image onto a piece of #6 plastic. It's fun to trace characters from the *Alice's Adventures in Wonderland* story. You can color them in also!
- ♦ Cut out your drawing, and measure and record the dimensions (height, width, thickness) of your character. Trace your character on your paper as well. How much do you think your character will change when you put it in the oven? Make a measurement prediction and write it on your piece of paper.
- ♠ Place your plastic character on a baking sheet lined with aluminum foil (make sure the pieces aren't touching!) and heat it at 325 degrees for approximately 30 seconds.
- ♥ Watch it as it cooks. What do you notice? Use an oven mitt to remove the baking sheet and a spatula to place the plastic pieces on a Formica, wood, or metal surface to cool for a minute.
- ♣ Measure your drawing again. What has changed? What has stayed the same? What other things do you notice about the plastic? Trace the smaller character on your paper next to your drawing of your original character. How are they different?



## Questions to think about and ask:

- How do the measurements of the big Alice (or other characters) relate to the measurements of the smaller Alice?
- Why do you think the plastic shrinks?
- How does the thickness of the plastic change after heating?
- Do you notice anything about the lines that you traced? Are they the same or different?



## Assess What Happened (Students reflect):

Invite students to write a paragraph about how their lives would be different if they shrunk to be the size of a caterpillar. What would they think about people? What things would seem tall to them?



## Connect it to Standards:

Content Standard B (Physical Science) Grades K-4: "Objects have many observable properties, including size, weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers." (National Research Council Science Education Standards)

## Connect it to the Story!

When Alice finds herself in the hall of locked doors, she wanders about until she finds a key that unlocks a tiny fifteen-inch door. She looks through the door, but realizes that she is too large to go through the door to the beautiful garden beyond. Fortunately, she finds a drink that helps her shrink to become ten inches high. However, once she has shrunk, she realizes that the key to unlock the door is now on a table that she is too short to reach. Alice wishes that she could grow tall again in order to reach the key. You too must solve the challenge of reaching to skyscraper heights.



## Career Corner:

**Materials Chemists** are scientists who study all different kinds of materials, like plastics, rubber, wood, and cement. In their work, they compare materials, take measurements, and notice the ways that they respond to heat, cold, pressure, and other chemicals. If you like to work with lots of different materials, you might enjoy a career as a materials chemist.

