

# RAFT IDEAS

**Topics:** Ratio, Proportion,  
Properties of Matter

## Materials List

- ✓ Shrink Plastic sheets or (clean) food trays made from polystyrene (#6 plastic)
- ✓ Rulers (metric)
- ✓ Permanent markers
- ✓ Data table (on page 2)
- ✓ Scissors
- ✓ Wood blocks
- ✓ Toaster oven or regular oven
- ✓ Tongs or spatula

This activity can be used to teach:

CO Science Standard 1:  
Physical Science

- Matter and Molecules  
Grades: 3, 5, 6, HS

CO Math Standard 2:  
Patterns, Functions and Algebraic Structures

- Percentages
- Quantitative Observations

Grades: 7, 8, HS

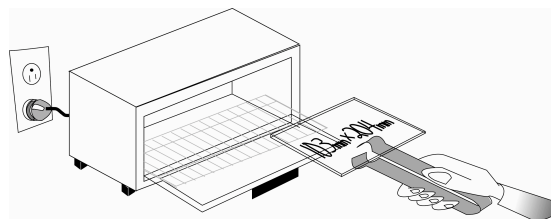
CO Math Standard 1:  
Number Sense, Properties and Operations  
Grades: 3, 4, 5, 6



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# Shrinking Math

The Art of Shrink Plastic with an Academic Twist

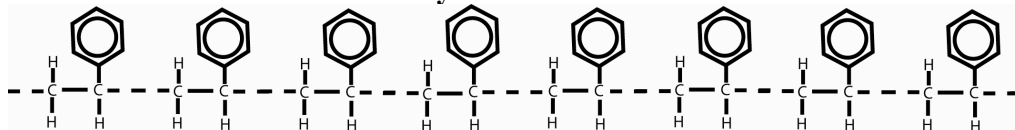


Students can use shrink plastic to create beautiful works of art as well as learn math and science concepts/skills, such as precise measurement & the properties of polymers.

## To Do and Notice - Caution: Heating process should be closely supervised or preformed by an adult. Heat in a well ventilated area!

1. Distribute shrink plastic pieces, copies of data table, rulers, and scissors.
2. Instruct students to cut out four rectangles of varying sizes from their plastic.
3. Students should carefully measure the rectangles and record dimensions in the data table. Using permanent markers, students should also write the measured dimensions on each plastic rectangle. (HINT: measurement for this activity is much easier if the students use metric units.)
4. Shrink the plastic pieces by placing them in a toaster oven at 120°C - 135°C (250°F - 275°F) for ~1 minute, or until plastic is flat. **DO NOT USE A HIGHER TEMPERATURE!** Remove from oven and place between wooden blocks to cool.
5. After the plastic cools, have students measure the “after shrinking” dimensions and record the data in the table.
6. Students should complete the data table and calculate the average percentage of shrinkage for this type of plastic.

## The Content Behind the Activity



Shrink plastic (recycle #6) is made of polystyrene, a transparent, rigid, and brittle organic polymer. Polystyrene’s properties make the plastic a choice material for disposable food trays and foam packing material. Polystyrene polymers are stretched during processing and solidify in this stressed state. Heating allows the molecules to return to their smaller, non-stressed state. Note that matter and mass are maintained even though the two dimensions (length and width) of the plastic rectangles decrease. During the shrinking process, the thickness and the density of the plastic both increase.

Divide the “after shrinking dimension” by the “before shrinking dimension” and multiply the result by 100, to find the percentage by which the plastic shrinks. In most cases, the shrink rate is less than 50%. Shrinkage rate for length and width may differ.

## Taking it Further

- Does the volume of the plastic change? (Students can measure all three dimensions.)
- Have students predict the “after shrinking” dimensions of figures drawn onto the shrink plastic with permanent marker. Are their predictions correct?

**Web Resources** (Visit [www.raft.net/more](http://www.raft.net/more) for how-to videos and more ideas!)

For background information on plastics and lesson plans for teaching about plastics, visit: <http://www.handsonplastics.com/>

## Shrinking Math Data Table

Rectangle	Before Shrinking		After Shrinking		E. Width Shrinkage ("C" / "A")	F. Height Shrinkage ("D" / "B")
	A. Width	B. Height	C. Width	D. Height		
1						
2						
3						
4						

Average Width Shrinkage  
 Average of Column E = \_\_\_\_\_  
 Multiply x 100 to get % = \_\_\_\_\_

Average Height Shrinkage  
 Average of Column F = \_\_\_\_\_  
 Multiply x 100 to get % = \_\_\_\_\_

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Average Width Shrinkage  
 Average of Column E = \_\_\_\_\_  
 Multiply x 100 to get % = \_\_\_\_\_

Average Height Shrinkage  
 Average of Column F = \_\_\_\_\_  
 Multiply x 100 to get % = \_\_\_\_\_