Understanding Fractions With Cookie Cutters

by EdgertonCenter

UNDERSTANDING FRACTIONS WITH COOKIE CUTTERS

MATH, GRADES 3-5

Lesson Overview:

In this lesson, students will learn about fractions by creating cookie cutters in Tinkercad, 3D printing them, then using the cutters with Play-Doh or modeling clay to create and compare different fractional amounts.

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Essential Question:

How can students visualize and compare fractional amounts using physical shapes?

Skills Taught:

- 3D modeling with Tinkercad
- Understanding fractional denominators
- Division
- Compare/contrast

Time Required: 2 - 3 Hours

Materials Needed:

- Tinkercad
- Play-Doh or modeling clay
- 3D printer and filament

Step 1: Define

Context:

Fractions can be a difficult concept to teach to students who have until now only dealt with whole numbers. This lesson aims to teach students how to understand fractions through the concept of splitting something equal sized into a different number of parts. Plus, teaching with Tinkercad and cookies is just plain fun!

Challenges:

Challenge 1: Compare fractions. What's greater - ¾ or ? or 2/7?

Students create cookie cutters to split cookies into a specified number of parts. Collect the number of slices of each denomination, roll them into a ball, and compare the volume or weight to find out which fraction is greater

Challenge 2: You have lots of friends, but only one cookie! How can you design a cookie cutter so that you and every friend gets to have the same amount of cookie?

Split students into groups equal to the denominator of the fraction. The cookie can be any shape and size. Have each student design a cookie cutter that will slice the cookie into even fractions: one part for everyone in that group.

Example: create a circular 3 in. diameter cookies split between four, five, and six students to demonstrate the fractions ¼, , and .

Student Products and Learning Goals:

- Students will create 3D printed cookie cutters in a variety of denominations.
- Use the cookie cutters to make quantities of modeling clay that can be compared and contrasted.

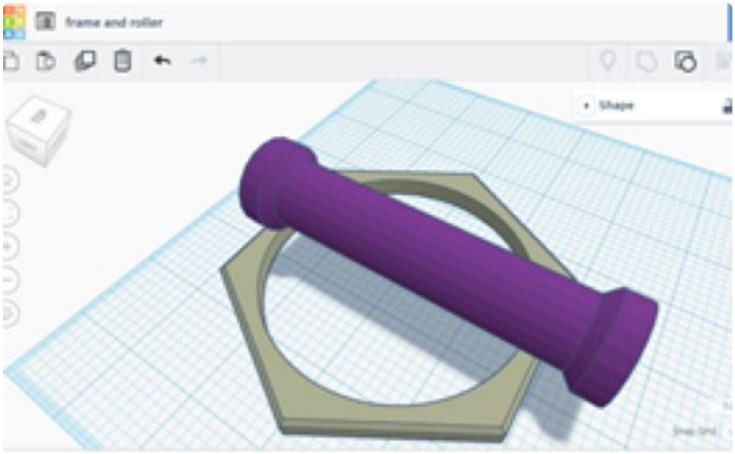
Step 2: Introduce the Content

The teacher can present fractions in a traditional lesson or use this activity as an introduction.

Define and introduce terminology and writing conventions such as "one half = ½", three fourths = ¾ ", "two sevenths = 2/7".

Step 3: Prepare the Clay Forming Pieces

For the fraction comparison exercise to work well you will need a way to make a flat sheet of clay/ “cookie dough”. You can use the frame and roller designs provided and 3D print them. Roll clay within the frame in three different directions to make a uniform sheet of clay. Find the shapes at this link https://www.tinkercad.com/things/0BxtAVXLBjK.



Step 4: Create Cookie Cutters

Summary of the Steps demonstrated in the video:

1. Make the outside of the Cookie Cutter:

- Give students the dimensions for the cookie and help them model the outside portion of the cookie cutter. This can serve as the students' introduction to Tinkercad. Alternatively, the teacher can present a separate lesson on Tinkercad. Drag a cylinder onto the workplane. Dimension it to 3 3/4 inches in diameter. Drag the height down to 1/8th of an inch. This will be the lip of the cookie cutter.
- Drag another cylinder onto the workplane. Give it a 3 in. diameter and a in height.
- Align the two shapes and group.

2. Divide the Cookie Cutter into Fractions:

- In this step, students will begin applying their new knowledge of fractions! They can create the rest of the cookie cutter by using the pie chart shape.
- To find the pie chart shape, go to the right sidebar, click the dropdown menu, and click on "all" underneath "shape generators." Find a create a pie chart.
- Make the pie chart ½ in height and give it a diameter of 2.75 in. Align with the cutter.
- This is where fractions come in! The pie chart panel looks like this:
- The numbers entered under "Data" are the relative sizes of the slices of the chart. They must be at least 10. To keep things simple for students just discovering fractions, it is suggested that they enter 10 for each even slice of their cookie cutter. For example, a student challenged to share their cookie with 4 students would enter "10,10,10,10" without spaces. This should help students learn that four even fourths make a whole!
- Click the pie chart again and turn it into a whole. Group everything. The cookie cutter is now complete!

https://youtu.be/b8MFRiJwGYU

Step 5: Cookie Creation and Student Conversations

Activity 1:

Comparing and contrasting. Students work in groups of different sizes. Each gets a cookie slice and rolls it up into a ball. Ask the student to compare their cookie dough with that of a student from a different group. Can they guess how many students were in that group by comparing the balls of cookie dough?

Activity 2:

Adding fractions. See if the students can come up with combinations of fractions that add up to the same sum, such as + = ¼, + = ½, or ½ + = .

https://youtu.be/Favdk1n0owA

Step 6: Resources

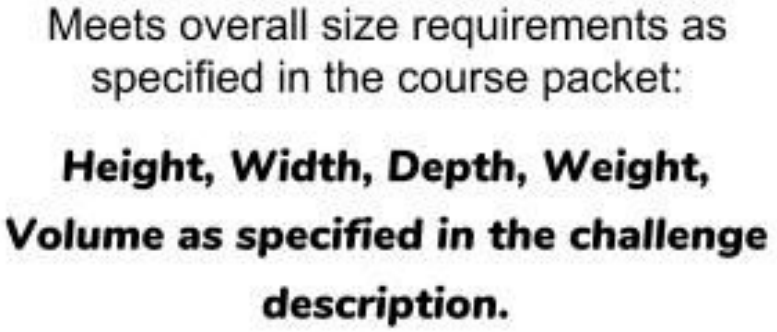
“THING” Checklist:

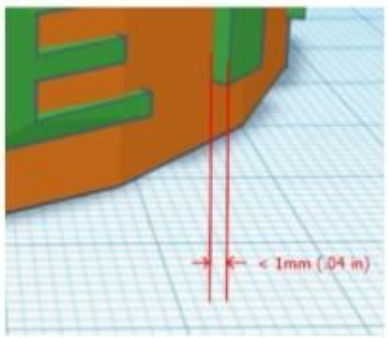
To ensure you get a quality 3D print, go through the list before tinkering and printing. **(See images above)**

We hope you had fun designing and sharing your Cookie Cutters. What did you make? What materials did you use? We want to see! If you did this in a K-12 classroom, what subject was it in?
Send us an email or leave us a comment so we can see what you're making.

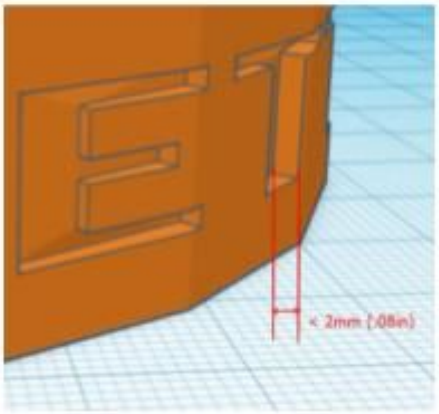
Visit our website k12maker.mit.edu to get resources for K-12 teachers:

- Maker skills workshops for K-12 educators - Spring, Summer, and Fall
- Lists of Tools and Materials and illustrated charts to print and post
- Supervision and safety guidelines for shop administrators
- Training guides for common tools (including student checklists and refresher guides)
- Our Maker Methodology for designing Maker Projects for core curriculum, including sample projects

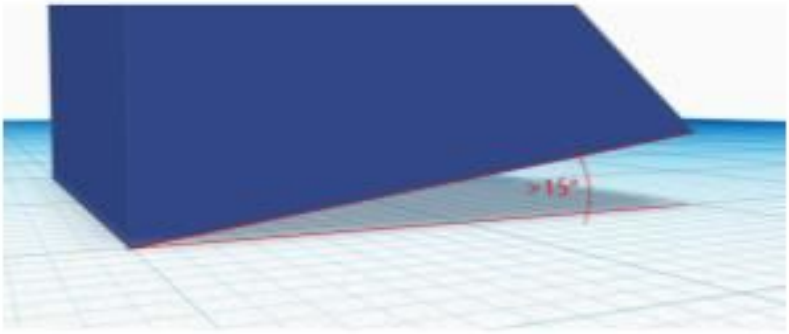




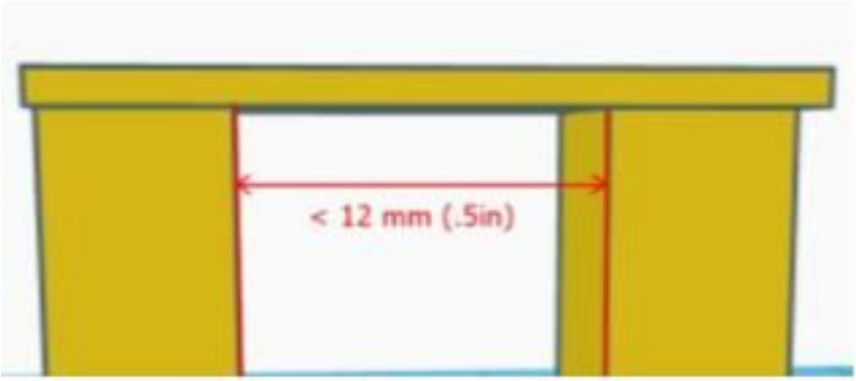
Embossed features stick out no more than 1 mm (.04 in).



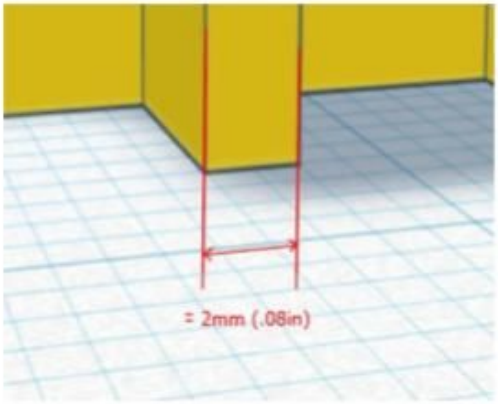
Engraved features go in no more than 2 mm (.08 in).



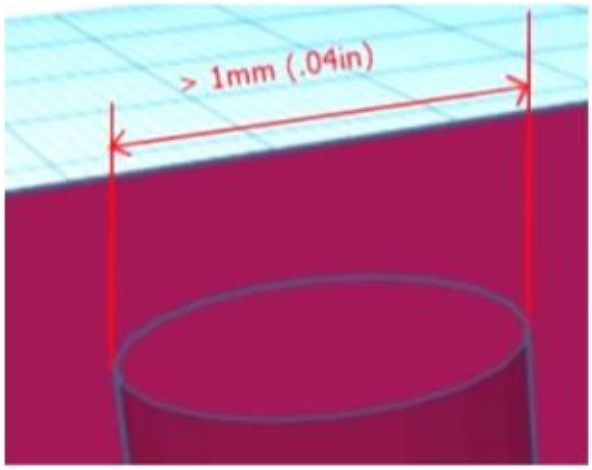
Unsupported features (overhangs) are angled up at least 15º (more is better).



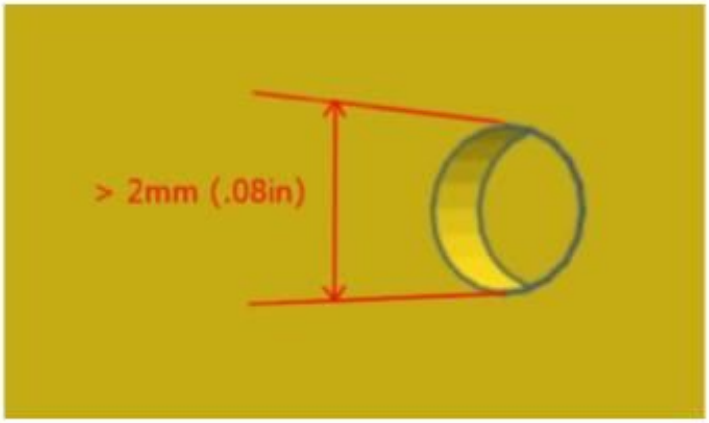
Bridge features have an unsupported span no greater than 12 mm (.5 in).



Wall thicknesses are typically 2 mm (.08 in).



Thin features such as details, are no smaller than 1 mm (.08 inch).



Round holes can be at any angle and are greater than 2 mm (.08 in)

Clever way to make play-doh educational.