Lesson
1-12A
Action Fractions
Math+CT

Brownie Bites (Unplugged)

Math Connections: **Children review equal shares by dividing a brownie into four equal shares, and reinforce the idea that shares can be equal in size, even if they are different shapes.**

CS Connections: **Children explore the importance of precise instructions, which computers require to operate properly.**

▶ Before You Begin

For the Math Message: Decide how to manage the paper cookie cutting. You may wish to have children work in pairs. Gather enough copies of the cookie, pairs of scissors, and tape to distribute to the pairs. Some children may wish to use a ruler and pencil when deciding how to share the cookie.
For the Brownie Sharing: Prepare a rectangular play dough brownie (or other food) in a covered jar (or other container) and a knife with which you can cut the brownie.

▶ Vocabulary

code • coding • decompose • precise

Common Core State Standards

- Develop understanding of fractions as numbers.

Computational Thinking

- **SEQUENCE:** Precise instructions are more likely to produce the intended outcome than general ones.
- **DECOMPOSITION:** Complex problems can be broken into smaller parts.

1 Warm Up 5–10 min

	Materials	
Giving Directions Children think about giving directions to a computer.	*Make My Design* Activity Card (optional)	
"I Can ..." Statements Children read the explicit Math and CS goals.		

2 Focus 40–50 min

Math Message: Sharing a Cookie Children solve a problem about equal parts.	*Cookie* (2–3 copies per partnership); scissors; tape (optional)	3.NF.1, 3.G.2 SMP2, SMP4
Sharing Brownies Children create precise instructions to divide a brownie into equal shares.	play dough; jar; knife	

"I Can ..." statements

- *I can share a whole into equal parts (in multiple ways).*
- *I can collaborate with a partner to solve problems.*
- *I can name equal parts using fractions language.*
- *I can give directions that a partner can follow.*
- *I can decompose/break down a task into smaller steps.*

Anticipated Barriers

- Children may struggle with non-standard partitioning.
- Children may have misconceptions about partitioning wholes. For example, parts are not overlapping.
- Children may have challenges with division of the whole into equivalent parts.

Student Options

Consider these options for adapting the lesson to your students' preferences:

- Children may be given the option to partition the play dough into parts themselves.

Make My Design

"I Can ..." statements

- *I can share a whole into equal parts (in multiple ways).*
- *I can collaborate with a partner to solve problems.*
- *I can name equal parts using fractions language.*
- *I can give directions that a partner can follow.*
- *I can **decompose**/break down a task into smaller steps.*

1 Warm Up 5–10 min

Giving Directions

Remind children of doing activities, such as *Make My Design*, where they had to get a partner to re-create an out-of-sight design using only verbal directions. Ask the class to share what they found to be the most fun or challenging aspect of giving directions to their partners.

Tell children that **coding** is a way of giving instructions to a computer. The actual instructions are called **code**. Explain that sometimes people think of computers as very smart, but what they do is very simple: they follow instructions in order, exactly as they are written. It is humans – computer programmers – who have to think about how to give directions with enough precision and detail to have computers complete their goal. Explain that today children will practice giving directions to get you to complete a simple goal. You will be acting like a computer – you will only follow the instructions exactly, without assuming any information that might seem obvious.

I Can ...

Display the "I Can ..." statements and explain that these statements express the goals for today's lesson. Carefully read these statements and ask children to use their thumbs to show how true they feel each statement is for them (thumbs up for yes, thumbs down for no, thumbs sideways for maybe). Explain that during the wrap up for the lesson, you will look at the "I Can ..." statements again, and see how children's opinions about the statements have changed. Explain that the statements can also give children clues about what to expect in each lesson.

2 Focus 45–50 min

Math Message: Sharing a Cookie

WHOLE CLASS | SMALL GROUP | **PARTNER** | **INDEPENDENT**

Share one cookie equally among 4 people. Use your scissors to cut the cookie into the pieces that each person gets. What is another way to divide the cookie so everyone gets equal shares? Cut up another cookie to show this way.

To practice dividing a whole into equal shares, have children to work independently or in pairs to share a large rectangular cookie fairly among 4 people. Encourage them to talk to a partner about how they know that the shares are equal. Provide partnerships with multiple copies of the cookie and a pair of scissors. After children cut their cookie into four shares, you may wish to offer children tape to reassemble the pieces into the original rectangle.

Sharing Brownies

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

Math Message Follow-Up Explain to children that you want to share a brownie (or whatever food item you choose) equally between four friends. Tell children that they can use their shared cookies to think about how they might want the brownie shares to look. Show children the play dough "brownie" inside a container (preferably a jar or another container with a screw-top lid) and a knife which you can use to cut the brownie.

Ask: *If you were to ask a human to cut the "brownie" in this jar into four equal shares, what steps would you tell them to take?* Write down the verbs children use in their answers. Likely, you will have about two or three steps: Open the jar, take out the brownie, cut it into four equal pieces.

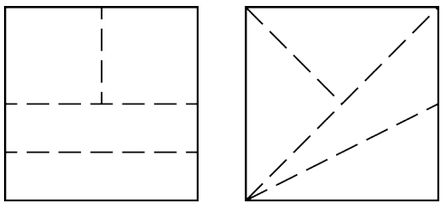
Now ask: *Pretend I'm a computer and tell me what to do to divide this brownie into four equal shares. What should I do first?* Answers vary. As children suggest steps, follow them, interpreting their instructions very narrowly. Assign one child to be the "recorder" who will write down all the verbs of the steps as they are executed. Make sure you do not fill in steps that they haven't specified. For actions that can be done multiple ways (such as "open" - see the second bullet below), intentionally choose a simple interpretation of that word, rather than the more complex interpretation they likely intended. *For example:*

- If children tell you to "take the brownie out of the jar" before telling you to open it, attempt to stick your hand through the glass of the jar to pull it out.
- If children tell you to "open the jar," attempt to pull the lid off the jar, rather than screwing it off. Listen for phrases such as "grab the lid and twist your hand" to complete this step.
- If children suggest you cut the brownie without first asking you to pick up the knife, divide it with your hands in a very messy way. (If the brownie is no longer whole after any failed step, simply re-form the play dough and continue.)
- If children suggest cutting the food in four pieces, make the pieces very obviously different sizes. Listen for them to instruct you to cut the brownie into 4 pieces that are equal sizes.
- If children suggest cutting the food into fourths, or in half and then in half again, make four equal-sized pieces of different shapes. (See margin for possible ways to do this.)

If children get frustrated, remind them that computers are more likely to be able to follow directions the way they intend if they break down, or **decompose**, the task into smaller, simpler steps. Encourage them to think about how a single step such as "open the jar" can be broken into smaller, more specific steps.

Continue attempting to follow children's instructions until the instructions are detailed enough to allow you to fairly share the brownie.

Equal-Sized Pieces of Different Shapes



Wrap Up

WHOLE CLASS | SMALL GROUP | PARTNER | INDEPENDENT

Once the class has successfully worked together to achieve the goal of sharing the brownie, remind them that when you were pretending to be a computer, you needed very **precise** instructions. Ask: *What do you think precise means?* Sample answer: It means being very specific and detailed. It means not skipping any steps, no matter how small.

If you ended up with 4 equal-size pieces of brownie that were different shapes, ask: *Is this what you expected the four equal pieces you asked for to look like? How could you have used more precise words to make me cut the brownie into the shapes you want?* Answers vary.

End the activity by having children re-read the verbs they used to instruct the "computer" from the list created by the "recorder." Compare the list to the verbs they needed to instruct a human from the beginning of the lesson. Help them see how instructions for even a simple activity may need to be broken down into smaller, more precise steps when no assumptions are made.

Now "I Can ..." Review today's "I Can ..." statements and ask children to use their thumbs to show how true they now feel each statement is for them (thumbs up for yes, thumbs down for no, thumbs sideways for maybe). Note that some children may have started with thumbs down, but are now all the way or halfway up. Assure children that they will see some of the same "I Can ..." statements in future lessons, to build more confidence about them.

NOTE This activity can be done again on other occasions, using other goals. Children may even enjoy pairing up and taking turns instructing and being the "computer" once they become used to interpreting instructions without any inferences.

"I Can ..." statements

- *I can share a whole into equal parts (in multiple ways).*
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- *I can give directions that a partner can follow.*
- *I can decompose/break down a task into smaller steps.*