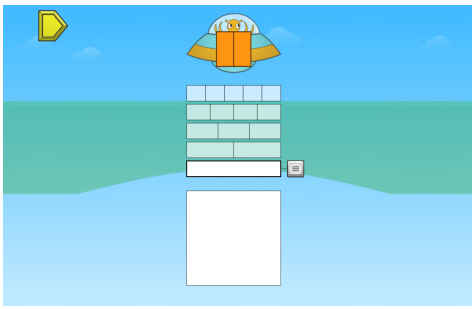
Puzzle Talk Facilitation Guide

This is a guide to provide support for facilitating student thinking as teachers engage students in academic discourse around math concepts and strategies using ST Math puzzles. This talk can be done over multiple days. ***Pre-work can be given to encourage students to think about the concept prior to the Puzzle Talk.*** *Read the Puzzle Talks Overview to learn more.*

Grade Level: First
Objective: Equal Shares and Partitioning
Game: Alien Bridge



Teacher Prep

Description

- **Purpose:** Focus on combining shaded parts of two equivalent wholes together with guiding questions for each step in the Problem Solving Process.
- **Materials Needed:** Provide students with whiteboards and markers.
- **Puzzle Location:** Grade 1 > Equal Shares and Partitioning > Alien Bridge > Level 1
- **Duration:** Multiple days
- **Time:** May vary 10 - 20 minutes each session

Look Fors

How does the student:

- determine how many partitions to divide the shape into?
- understand the need for the partitions to have an equal area?
- use the language of fourths and halves?
- understand that the more pieces you partition a shape into, the smaller those pieces become.

Puzzle Progression

Puzzles include a whole block that students partition to match the alien ship. As students progress through the levels, they choose between shapes in halves or in fourths, then find the equivalent fraction. Finally, students will need to add fractional parts to find equivalent fractions.

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Facilitation Suggestions (This is what a student-led discussion might look like.)

This would occur over multiple days

Notice and Wonder

- Display the first puzzle from Level 1.
- Ask students, "What do you notice? What do you wonder about this puzzle?"
- Allow a few students to share their thinking with the whole class.

Predict and Justify

- Ask students to think individually about how they could solve the puzzle, then turn and share with a partner before sharing as a class.
- Students should provide mathematical reasoning for the idea they want to try. They can use math tools to demonstrate their thinking.
- As students share their strategies, list these ideas for the class to consider.

Test and Observe

- Select one of their solutions to try.
- Solve the puzzle and have students describe what happened.
- You can use the puzzle controls by double-clicking on the screen to pause the puzzle while students check if their answer matches the puzzle on the screen. Discuss how this might provide evidence for why the solution will work - or not work.

Analyze and Learn

- Ask students how what happened compared to what they thought would happen. What did they learn?
- Ask students, "What do you notice about the size of the pieces when we cut or partition the shape?" (Highlight that the pieces are equivalent - or the same size.)
- Show another puzzle from Level 1. Ask questions like:
  - "How did you know which cutting strip to select?"
  - "How did you determine how many partitions to select?"
  - "What do you notice about the size of the pieces we make when we cut, or partition, the shape?"
  - Is there more than one way to solve this puzzle?
- You can use the puzzle controls to replay and examine what happens in the puzzle.
  - If the puzzle was correct, discuss why the strategy used was successful.
  - If the puzzle was incorrect, analyze what happened and consider how to adjust the strategy to try again.
- Repeat with other puzzles from Level 1.

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Connect and Extend

Levels 2-3

- Display a puzzle in Level 2.
- Ask students, “What do you notice? How is this puzzle different from the puzzles we just solved?”
- Level 2 has students choose a square that has already been partitioned.
- Have students share their thinking. Ask students questions like:
  - “What is different about this puzzle from the ones we’ve already done?”
  - “What happens to the size of the pieces when we have more pieces?”
  - “What happens to the size of the pieces when we go from halves to fourths? Why do the pieces get smaller?”
  - You can use the puzzle controls to replay and examine what happens in the puzzle.
    - If the puzzle was correct, discuss why the strategy used was successful.
    - If the puzzle was incorrect, analyze what happened and consider how to adjust the strategy to try again.
- Continue with puzzles from Levels 2 and 3.
  - “How did you know you had made something that was the same as what was in the spaceship?”
  - “Why are fourths smaller than halves?”

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Additional Ideas for Connecting and Extending this Puzzle

Vocabulary Card Sort

- Give pairs of students the vocabulary card sort.
- Have them sort and discuss how they sorted the cards.
- Discuss how multiple cards can represent the same fraction.

Vocabulary Puzzle Match

- Give each pair of students a set of the vocabulary cards.
- Display the first puzzle in Level 2. Ask students to work together to find two different cards that could represent the fraction shown in the spaceship.
- Discuss answers as a class.
- Repeat with the remaining puzzles in Level 2.

Create a Fraction

- Laminate the Fraction Work Mat (or put it in a page protector). Give each student a mat and a dry erase marker.
- Tell students that you are going to give directions and they need to follow those directions.
- Ask students to follow directions such as: Partition your shapes into halves. Shade in one half in each shape. How many total halves did you color?
- Partition your squares into fourths. Make your fourths look different in each square.
- Partition one square into halves. Partition the other square into fourths. Shade in one half and one fourth. Which is bigger? Why?; Partition one of the squares into fourths.
- Shade in four of the fourths. Is this the same as the whole square? Why?

Support students who may not understand that "halves" or "fourths" relates to the number of equal pieces a shape is partitioned into.

- Give students a set of the vocabulary cards and four blank notecards. Ask students to start by pulling out the cards that say "halves" and "fourths" and placing them in front of them. Then ask students to put the other cards with words to the side. Ask students to sort the rest of the cards into two groups: halves or fourths. Ask students to make a column of all of the halves cards under the word "halves" and all of the fourths cards under the word "fourths". Talk as a group about what all of the halves have in common. Explain to students that because they all have two equal pieces, each of those pictures represent halves. Have students write the number 2 on one of their notecards and place it into the column under halves. Then look at all of the cards under the word "fourths" and talk again about what they all have in common. Explain to students that because they all

have four equal pieces, each of those pictures represent fourths. Have students write the number 4 on one of their notecards and place it into the column under fourths. Finally, ask students to draw and partition a shape that shows halves and fourths and add the card to the correct column.

Support students who may not understand that halves must be 2 equal pieces and fourths must be 4 equal pieces, not just shapes broken up into 2 or 4 pieces.

- Ask students if they've ever had to share something with someone (like a big brother or sister) and they didn't feel like it was a "fair share". Ask them why it wasn't "fair". Explain that in order to be called "halves" or "fourths", the pieces have to be fair shares- the same sized pieces. Cut apart the "Halves or Halves NOT" cards. Display one card at a time. Have students look at each card and call out "Halves!" or "Halves-NOT!" depending on what they see on the cards. Give each student a whiteboard and a marker. Ask students to draw their own example of halves and halves NOT. Share and discuss students' examples as a class.

Vocabulary Cards

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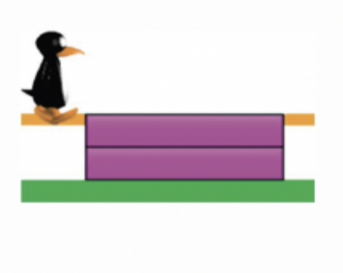
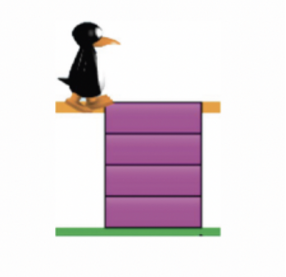
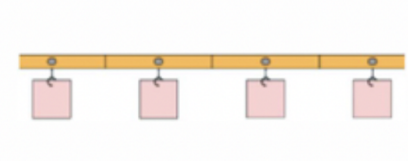
half of	**fourth of**	
halves	**quarters**	
fourths	**quarter of**	
		
		**Vocabulary Card Sort** 1st grade Equal Shares and Partitioning: Alien Bridge

Puzzle Talk Pre-Work

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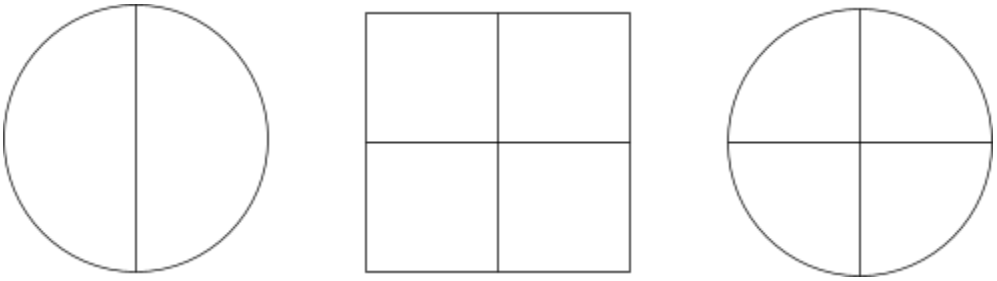
Equal Shares and Partitioning: Alien Bridge

Name: _____ Date: _____

Shade in one part of these shapes. Write how much of each shape is shaded.



_____ _____ _____

Circle the pizza that could be shared equally with 4 friends.

Draw a rectangle. Shade a half blue and a quarter red.

Fraction Work Mat