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Halving
Grades 3-5

Introduction
One misconception students often have when learning about fractions is that to half something you must cut it into only two pieces of the same shape. This task develops the idea of different ways of creating half of a whole. It allows students to be artistic and create interesting patterns of their own. It also allows students to describe and justify their thinking. In this task students are asked to consider ways to prove that a square is split in half and also to think of other ways to split a square in half and convince others that it is split in half.

Video
Strategies for Learning Mathematics, https://youcubed.org/weeks/week-3-grade-3-5/

Agenda for the activity

Activity	Time	Description	Materials
Mindset Message	5 min	Play the mindset video, ***Strategies for Learning Mathematics,*** *https://youcubed.org/weeks/week-3-grade-3-5/*	• Mindset Video day 1, ***Strategies for Learning Mathematics***
Exploring Halves	15 min	Introduce the idea of one-half. • Show students one example and discuss as a class how they could convince someone that the square has been split in half. • Hand out squares and have students work in partners to convince each other that each shows halves; cut them out and discuss each one at a time.	• Halving Handouts • Scissors • Glue • White paper • Colored pens/ pencils
Sharing Strategies	10 min	• Invite students to share different strategies for how they proved that the square was split in half. • Invite students share ideas about what needs to be true in order for a shape to be split in half.	

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Making your Own Halves	10 min	• Give students squares and allow them to design their own halves. • After they complete their design they switch squares with their neighbor and decide if they agree that the square has been split in half.	• Origami paper or patty paper • Colored pens/ pencils
Debrief Mindset Message	5 min	Strategies for Learning Mathematics: Ask students to reflect on all the Strategies for Learning Mathematics from the video: 1) Draw it out, 2) Teamwork, 3) Experiment, 4) Look for different resources, 5) Start with a smaller case. Highlight some moments when you saw individuals and groups using these strategies or ask students to share when they used the strategy or saw someone else use the strategy.	

Activity

This problem is a great way to get students thinking about fractions and what it means to have half of something. Students often see half cut only in a certain ways. This allows students to see that a whole can be split in half in many different ways. Allow students to discuss their thinking and explain how they are seeing the problems.

Begin class by asking students how they know when something is split in half. What do halves look like? What needs to be true for something to be split in half? Show them one of the shapes from the Halving Handout. Tell them it shows halves. Their task is to describe how they know that the square has been split in half. They should convince themselves and someone else that they know there are two halves. Once they have discussed with their partner, they can use color-coding, pictures, words and diagrams to show off what they find. They should think about what needs to be true in order for a square to be split in half.

Having students work with a partner, give each pair of students a copy of all the squares that are split in half. Have them work through the different squares one at a time: cutting out the square and then convincing each other that each is ½ in whatever way they chose. They can record their thinking on their blank piece of paper, using color-coding, words, visuals and other ways to show why the

shape shows halves. They should be able to convince themselves and a neighbor. As students work, have students consider the following questions- What does it mean to split a shape in half? What needs to be true in order for them to be halves?

Invite students to share with the class their strategy for convincing others that the square has been made into halves. Pick students with different strategies from each other to show their approach to the class. Have students ask questions if they are not convinced. Have students share their ideas about what it means to split a shape in half and what needs to be true in order for someone to know they are halves. Record their ideas on the board.

Following your whole class conversation, give each individual student a square and colored pens and have them create a design that splits the square in half. Have students exchange their design with their neighbor. Their neighbor must decide if they agree that the design splits the square in half. Encourage students to use color coding to prove that they have split the square in half. They can then talk through if they agree that the square has been split in half.

Consider having a few students share their designs with the class or have students do a gallery walk around the room where they look at the different ways the students split their squares in half.

Extensions

- Have students make a design that is ¼ of the square. Have them convince their neighbor that they have covered one quarter of the square.

Materials

- Halving Handouts
- Scissors
- Glue
- White paper
- Colored pens/pencils
- Origami paper or patty paper

Adapted from http://nrich.maths.org/1788

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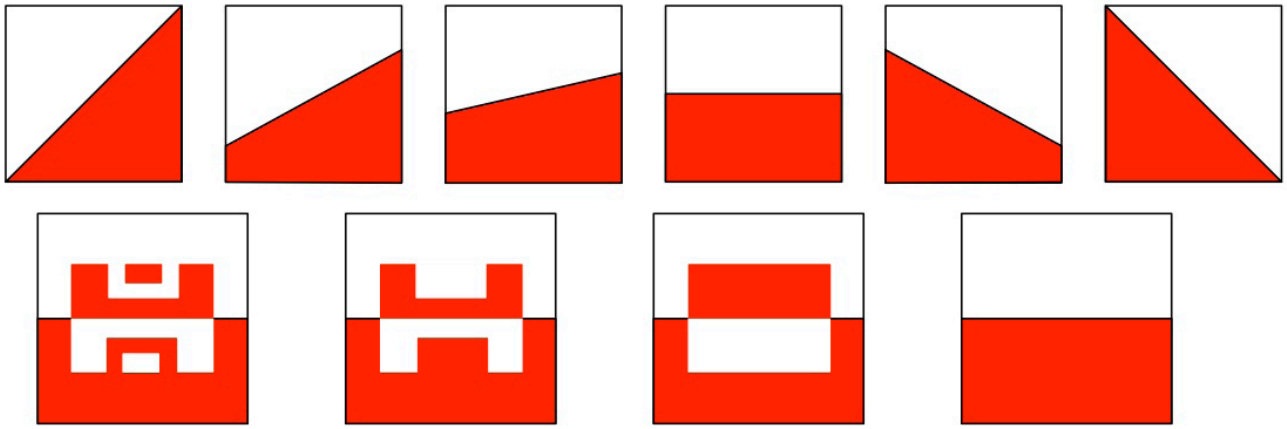
Handout



Each of these images shows squares split in half. How can you check that each is correct? How can you convince someone that each is split in half? (Use the additional Halving Handout.) What does it mean to split a square in half? What needs to be true in order for it to be half?

Think of another way to split a square into two halves. Make your own design that splits a square in half.

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Handout