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Flexible Number Trains
Day 3

Introduction

In this activity we focus on numbers that can be created by repeated addition, summing the same number again and again to achieve the result. In this activity students build flexible number trains out of Cuisenaire rods which promotes embodied cognition because of the movement of rods while the different ways of seeing a similar length supports further development of the Approximate Number System (ANS) that we use for estimating quantities. We love this task since it provides the opportunity to create an equivalent length in different ways. It is important for students to experience the different ways a number can be made by combining other smaller numbers.

Agenda

Activity	Time	Description/Prompt	Materials
Mindset Message	10 min	Share the messages from the mindset video, ***Speed is not Important***, https://www.youcubed.org/weeks/week-4-grade-1-2/	
Play with Cuisenaire Rods	5 min	• Give students time to play with the Cuisenaire rods. • Invite students to share what they build, notice, and anything they are wondering about.	• Cuisenaire rods
Discuss	10 min	• Build a train using three different colored rods. • Ask students to build a train just like yours. A train with length 8 is a good choice since there are 4 ways to build it using the same colored rods. • Build a second train of the same length next to the first using only the white unit rods. Ask the students what they notice about the two trains. • Ask students to build the same length train using a different color rod. • Record the different ways they build equivalent trains on the recording sheet • Write colored coded number sentences for each train students find.	• Flexible Number Trains recording sheet • Cuisenaire rods • Colored pencils or markers • Ruler

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Explore Flexible Number Trains	15 min	• Ask students to choose 3 or 4 different colored rods to make their own train. • Ask students to build and record all of the different equivalent trains they can make using the same colored rods.	• Flexible Number Trains recording sheet • Cuisenaire rods • Colored pencils or markers • Ruler
Discuss Flexible Number Trains	10 min	• Display the trains students have made. • As a class, discuss any patterns or other things they notice about their trains.	
Debrief Mindset Message	5 min	Ask students to reflect on the idea discussed in the video that math is NOT about speed. What is important in math is to think carefully, deeply, and to make connections.	

Activity

Watch the mindset video before class. See if there are any clips from the video you want to share with your class. At the beginning of class share the mindset messages from the video with your students.

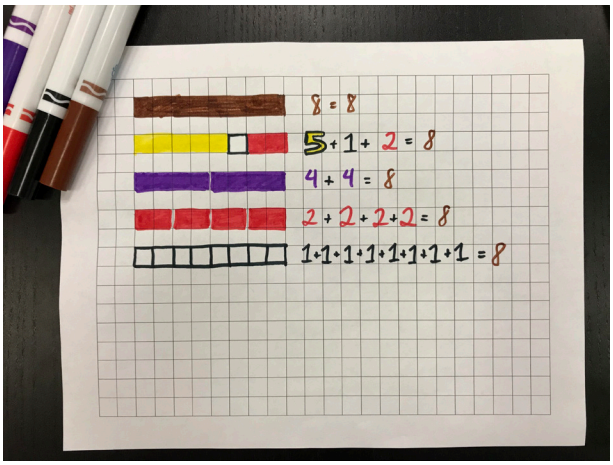
Pass out Cuisenaire rods. Have students play and explore with the rods. Giving students time to play with the rods before taking on the task allows them time to get familiar with the materials.

Invite students to share what they have made with the people sitting at their table. Ask students to share what they noticed about the Cuisenaire rods. Ask them if they have any questions about the rods.

Introduce the activity, Flexible Number Trains. Choose three or four different rods and build a train. We recommend you use a flexible number length for your train. For example, a train of length 8 made from 4 different colored rods can be built in 4 different ways using rods of the same color. You may want to use a ruler to show how you can keep them in line. Have students build a train that is just like yours. Create a second train parallel to your first only using the white unit cubes. Ask students to share something they notice about the two trains with a partner. Ask students to share what they discussed.

Tell students they are going to investigate more about these Flexible Number Trains by choosing three or four different colored rods and building their own Number Train. They will then build as many different trains as they can, that are equal to their first, and are built using only one color of rod. As students explore and make mistakes praise their work. If you see a time where they need more instruction interrupt their work and ask them to share their thinking. Facilitating a discussion before anyone has finished the task is a good way to build a maths learning community. If students are struggling and making mistakes don't miss the opportunity to let them know that making mistakes and struggling is the best time for brain growth in mathematics.

Tell students to record their trains on the grid paper. Their trains should accurately show the length of each rod making up the train. Ask them to include a number sentence that represents each of their trains. They should use color to connect each entry in their number sentence to the colored rod in their picture of the number train.



While students are building new trains watch and listen to how they are checking that their new trains are the same length as their first. Some students may create trains to match their original train with different colored rods. Remind them that those are equivalent trains and today you are focusing on equivalent trains that are built with the same colored rods.

After students have built and recorded some flexible number trains bring them together for a discussion. Invite students to share their trains and the work they have done to record their findings. Since students were asked to choose three to four different colored rods to make their train, the smallest train that is possible has a length of 6. You may choose to organize the trains they have produced in order from least to greatest. Then students can be asked to consider the class data and what they can conclude from their work. They may choose to build more trains so they have a complete sequence of train lengths. There are many patterns to discuss. This is a

good time to introduce the word conjecture. Mathematicians study patterns and make conjectures. A conjecture is an idea based on a pattern you have noticed that you would like to prove. It is similar to a hypothesis in science. One example of a conjecture that students may make is that all of the even number train lengths can be made with the red, 2 unit, rods. Mathematicians work to prove their conjectures and your young mathematicians may want to continue their work and try to prove theirs.

Extensions

- What if the train is made up of 8 light green rods, how many trains of equivalent length can you make with one color?
- Which train lengths have the least number of equivalent rod trains made with the same colored rods?
- Which train lengths have the greatest number of equivalent rod trains made with the same colored rods?

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Flexible Number Trains Recording Sheet