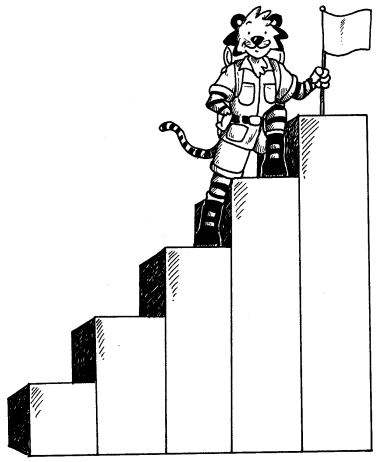
Using Cuisenaire® Rods



Geometry & Measurement

Table of Contents

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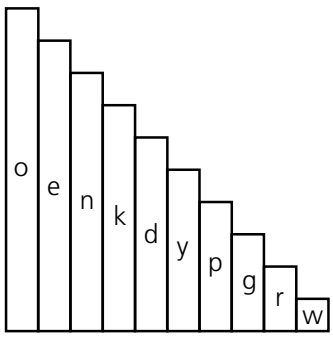
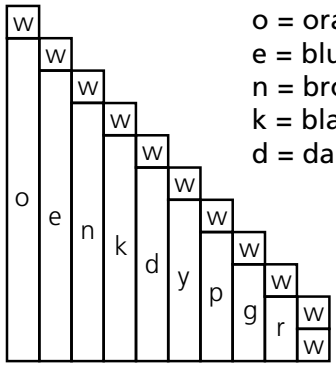
LER 7530 — Geometry & Measurement — Grades 3-6

Exploring with Cuisenaire® Rods

A versatile collection of 10 colored rectangular rods, Cuisenaire® Rods are used to develop a variety of math skills. Each rod's color corresponds to a different length. The shortest rod, the white, is 1 centimeter long; the longest, the orange, is 10 centimeters long. When the rods are arranged in order of length into a pattern commonly called a "staircase," each rod differs from the next by 1 centimeter. This allows you to assign a value to one rod and then assign values to the other rods based on the relationships between the rods. One set contains 74 rods, distributed in the quantities shown below. The 10 colors are referred to as follows:





o = orange (4)
e = blue (4)
n = brown (4)
k = black (4)
d = dark green (4)
y = yellow (4)
p = purple (6)
g = light green (10)
r = red (12)
w = white (22)

Using letters to represent the rods exposes students to the kind of symbolic thinking they will use later in algebra.

With Cuisenaire Rods, students can explore spatial relationships by making flat designs on a table or by stacking them to make three-dimensional designs. They soon discover how some combinations of rods are equal in length to other, single rods. This understanding provides a context for investigating symmetry.

Older students may focus on comparing the lengths of the rods and recording the results on grid paper. This helps them visualize the inherent "structure" of a design and gives them practice using grade-appropriate arithmetic and geometric vocabulary. Though students need to explore freely, some may appreciate specific challenges, such as being asked to make designs that show fractional equivalence between two groups of rods.

Working with Cuisenaire Rods

Cuisenaire Rods provide a basic model for the numbers 1 to 10. The white rod can stand for 1, and the red rod can stand for 2, because the red rod is the same length as a "train" of two white rods. The rods from light green through orange are assigned values from 3 through 10, respectively.

The orange and white rods provide a model for place value. A "train" of 4 orange rods ("tens") and 3 white rods ("ones") is 43 white rods long.

Using the Activities

Strands and Skills

		Cover the Camel	You'll Be "Floored"!	An Amusing Adventure	Getting Triangular	Mirror, Mirror	Can You Build It?
Problem Solving		●	●	●	●	●	●
Reasoning & Proof		●	●	●	●	●	●
Communication		●	●	●	●	●	●
Connections		●	●	●	●	●	●
Representation		●	●	●	●	●	●
Number & Operations	Counting	●	●				
	Comparing		●				
	Equivalence		●				
	Estimation			●			
Algebra	Patterns				●		
Geometry	Properties of Geometric Figures				●	●	●
	Area & Perimeter	●	●				
	Measurement	●	●	●			
	Spatial Visualization	●	●	●	●	●	●
	Symmetry					●	

Are You Using *the Super Source*®?

If you are currently using *the Super Source*®, available from ETA/Cuisenaire®, with your Cuisenaire® Rods, you can use the activities in *Using Cuisenaire® Rods: Geometry & Measurement* for additional practice. This chart correlates the activities in both books:

Using Cuisenaire Rods	*the Super Source*
Cover the Camel	Cover the Giraffe, Book K–2
You'll Be "Floored"!	Tiling with Rods, Book 3–4
An Amusing Adventure	Tour of the Islands, Book 3–4
Getting Triangular	Making Triangles, Book 5–6
Mirror, Mirror	Place the Mirror, Book 5–6
Can You Build It?	Building to Spec, Book 3–4

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An Amusing Adventure

Numbers • Measurement

Estimation • Mental Math

Getting Started

Supplies

- ☑ Cuisenaire® Rods, 1 set per group
- ☑ *Amusement Park Map* to be taped together, 1 per group, pages 26–29
- ☑ Crayons
- ☑ 1 centimeter ruler, for "Student Starters"

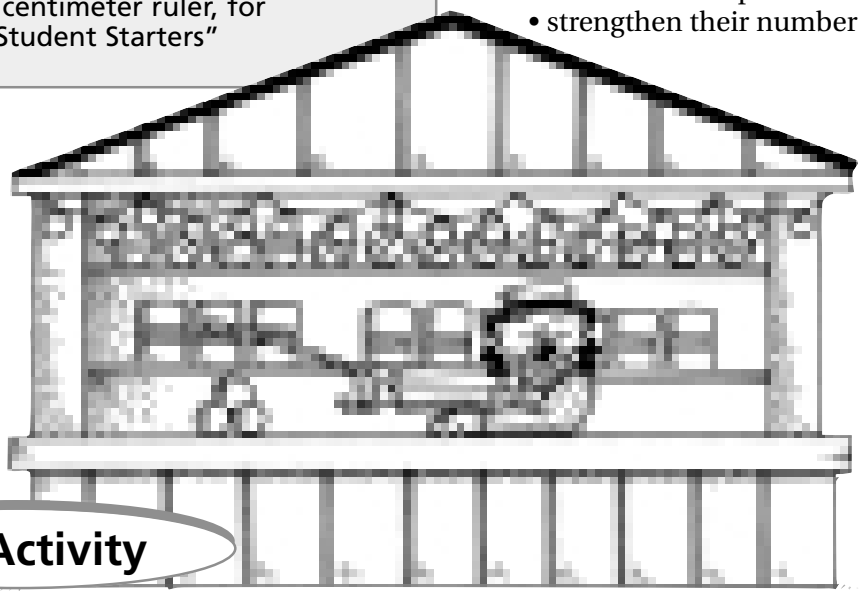
A Look Ahead

In this game for two to four players, students estimate distances on a map in terms of centimeters or as a combination of various Cuisenaire Rods. They then check their estimates by making rod trains on the map.

Learning Objectives

In this activity, students have the opportunity to:

- estimate and measure with centimeters
- do mental computation
- strengthen their number sense



The Activity

Student Starters

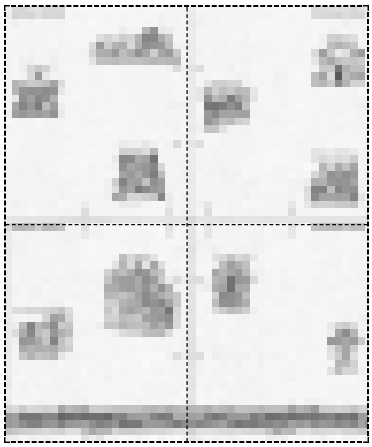
Explain to students that Cuisenaire Rods can be used to measure distances in terms of centimeters. Hold a white rod against a centimeter ruler to show that the white rod is one centimeter long. Ask students to determine the lengths of the other rods in centimeters.

- Challenge pairs of students to each place their two index fingers 9 centimeters apart on a desktop. Have them check their estimates with a blue rod.
- Ask students: "Which rods can you use to check longer distances, such as 20 centimeters?" Accept any reasonable answers, such as using a two-car orange train or two blue rods plus a red rod.
- Have students use their index fingers on the desktop to estimate distances between 1 and 30 centimeters and check their estimates with rods.
- Explain the rules for this game, *An Amusing Adventure*, as described in the "Independent Exploration." Show how to attach the four parts of the map to make up the gameboard. Then select a student to play part of a sample game with you.

Independent Exploration

Play An Amusing Adventure!

1. This is a game for two to four players. The object is to be the first to land on each of the rides on the map, and then return to the Arcade.
2. You will be playing on a map that shows the Arcade and 10 amusement park attractions. Each player must choose a different-colored crayon to record his or her plays. Decide who goes first.
3. The first player draws an X anywhere on the Arcade to mark a starting point and decides which attraction to visit first.
4. That player announces an estimate of the distance from the starting point to the ride. Then, starting at the X, the player places a train of rods equal to his or her estimate in the direction of the first ride, and marks where the train ends. If the train reaches the ride, on the next turn the player can proceed in the same way to any other ride from the ride he or she is visiting. If the train does not reach the ride, the player must "wait in line" and try to reach the ride from this location on his or her next turn.



5. Taking turns, each player chooses a different starting point at the Arcade, marks it with an X, and follows the same procedure to go from ride to ride in any order. Track who visits which ride first on a piece of paper
6. When players have visited all of the rides, they use the same procedure to return to their starting point at the Arcade from the last ride. The player who returns to the starting point first is the winner.
7. Play the game several times. Visit the rides in a different order each time.

Beyond the Activity

Discussion Points

Invite students to talk about their games and describe their thoughts during the game. Use prompts, such as these, to promote class discussion:

- Did you get better at estimating as you played? Explain.
- Was it easier to accurately estimate short distances or long distances? Why?
- What tips could you give classmates who want to improve their estimating?
- Which is the most efficient route? That is, which route allows you to visit all six rides and return to the Arcade in the shortest number of centimeters?

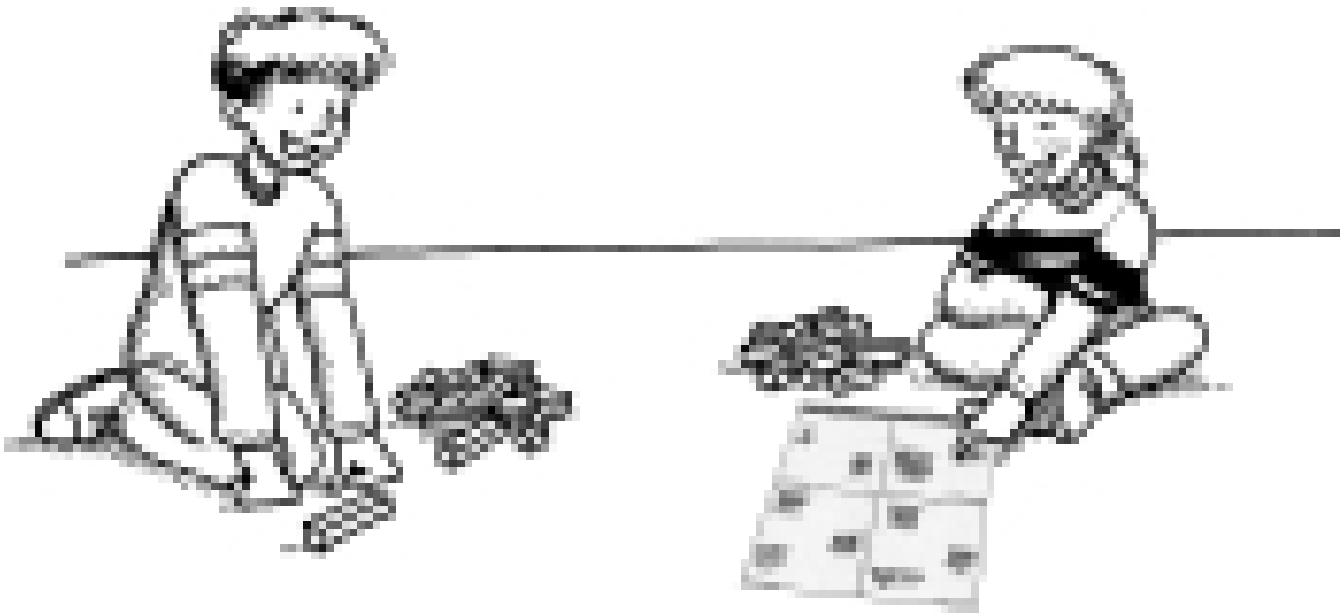
Extensions

1. Have students design their own *Amusing Adventure* gameboard maps with a playground or schoolyard theme, and play the game again on their maps.
2. Have students keep a running total of the number of centimeters they "travel" in their tour. The winner might then be the player who takes either the longest or shortest tour.
3. Have students play the game again. This time, players must find the shortest distance in centimeters from the Arcade and back, visiting all the rides except the two roller coasters at the park.

Teaching Notes

Mathematics in Action

An Amusing Adventure is an engaging way to practice estimation skills and develop better number sense. Many students' estimation skills improve noticeably while playing this game. These students form a mental image of one of the Cuisenaire® Rods, such as the orange, and then use it as a benchmark for making their estimates. Students visualize reaching the desired goal using the chosen rod, thereby improving their estimation skills. Some students report that they used the measurements they made earlier in the game to help them estimate new distances. For example, if they found that the distance from the Arcade to the carousel is 28 centimeters and the distance to the balloons from the carousel looks about half as far, they may estimate that the second distance would measure 28 - 14, or 14 centimeters.



Students report that shorter rather than longer distances are easier to estimate. For example, they might try to estimate a longer distance by mentally making a train of orange rods, and then make a mistake in their visualization of the length of the orange rod. The mistake then becomes compounded. Shorter distances, however, require that students visualize the lengths of only one or two rods, so potential mistakes tend to be minimized.

After making an estimate, students need to figure out a train of rods with a length that equals that estimate. Many students will use multiplication, thinking, "I have estimated 20 centimeters, which could be 4 times 5, or 4 yellow rods." Others will think in terms of place value: "I have estimated 23 centimeters, which would be 2 orange (10-centimeter) rods and 3 white (1-centimeter) rods."

Teaching Notes

Still other students will pick up a combination of rods that add up to the given number: "I have estimated 17 centimeters, which could be a blue (9) plus a brown (8)." Sometimes students use subtraction as well, reasoning, "I have estimated 39 centimeters, which is almost 40, so if I put down 4 orange rods and then count back one white rod, it will be the same as 39."

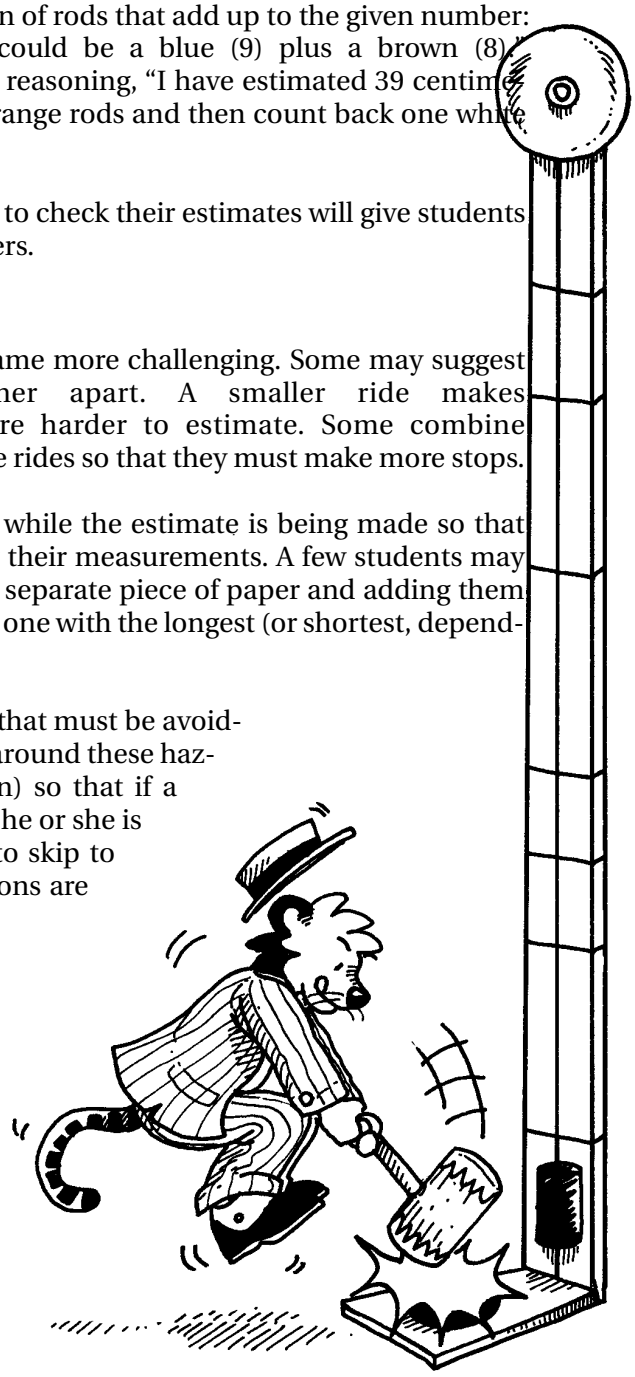
Observing how their teammates use the rods to check their estimates will give students different strategies for thinking about numbers.

New Challenges

Students enjoy devising ways to make the game more challenging. Some may suggest making the rides smaller and farther apart. A smaller ride makes a smaller target, and longer distances are harder to estimate. Some combine the idea of smaller rides with the idea of more rides so that they must make more stops.

Some students may suggest hiding the rods while the estimate is being made so that players do not have a visual way of checking their measurements. A few students may suggest keeping track of their estimates on a separate piece of paper and adding them to find the total distance of the trip. Then, the one with the longest (or shortest, depending on their pre-game agreement) trip wins.

Some will add details, such as snack booths, that must be avoided, challenging players to route their travels around these hazards. Still others add rewards (like a balloon) so that if a player lands exactly on one of these rewards, he or she is rewarded with an extra turn or the chance to skip to the next ride without estimating. The variations are limited only by the creativity of the students.

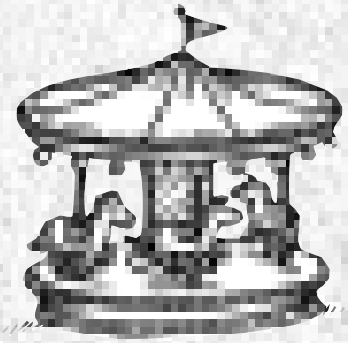


Amusement Park Map

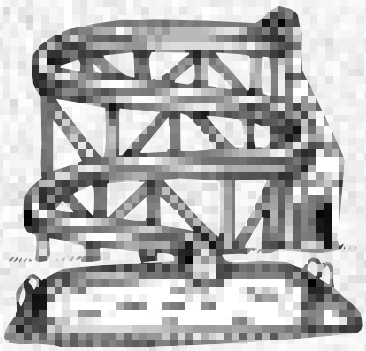
(Northwest Section)

Train Ride

Carousel



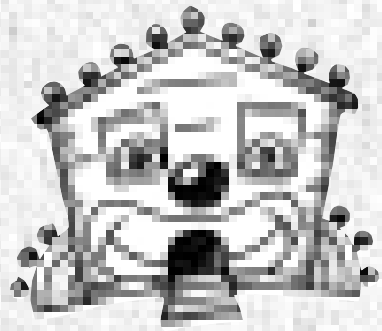
Splash Slide



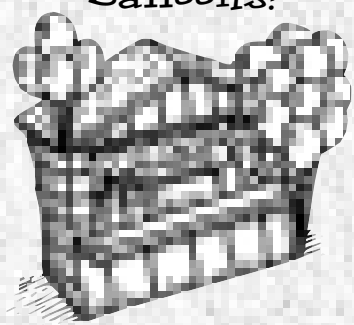
Amusement Park Map

(Northeast Section)

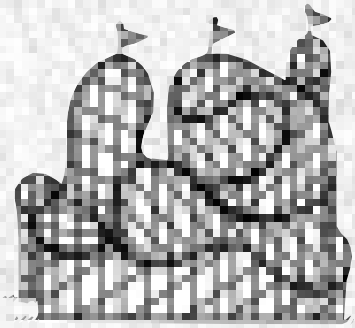
Funhouse



Balloons!

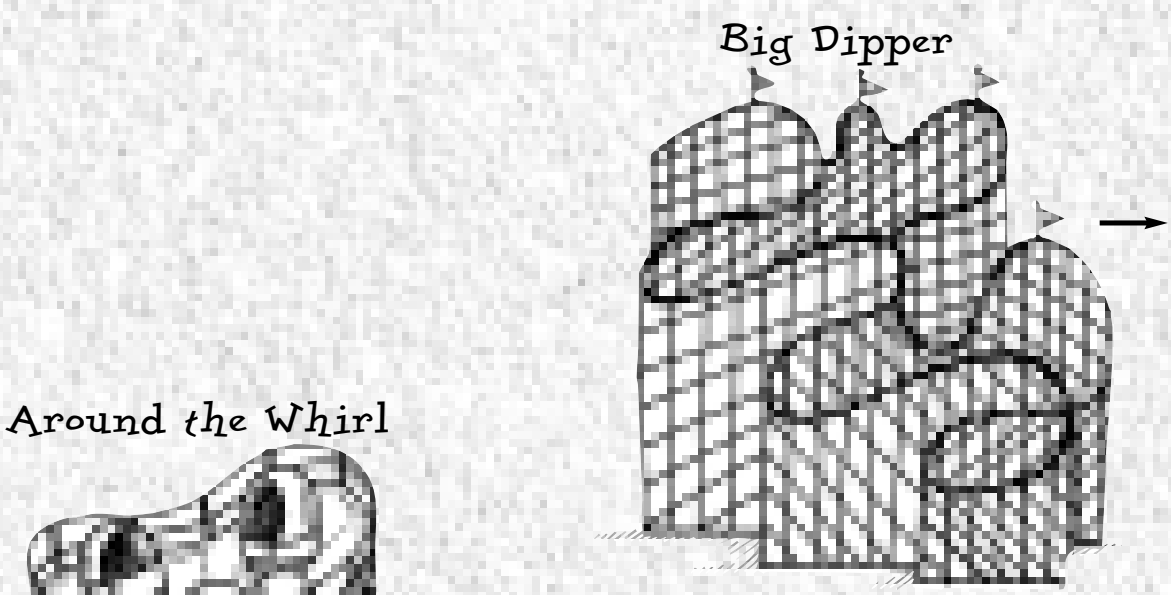


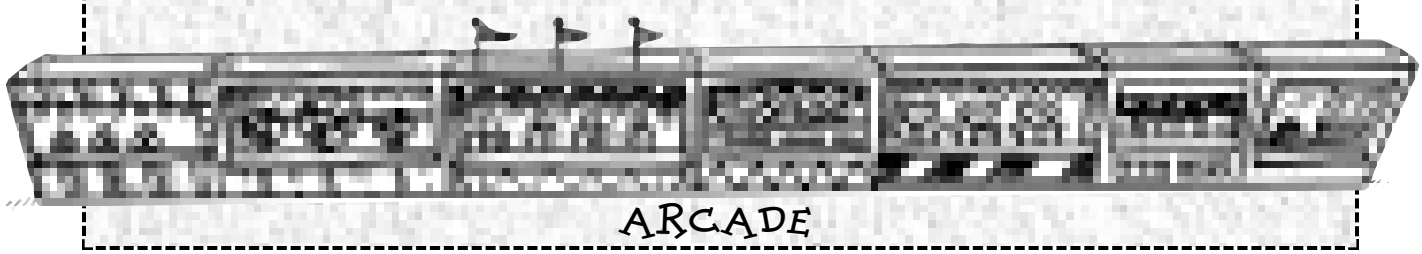
Rock & Roller



Amusement Park Map

(Southwest Section)

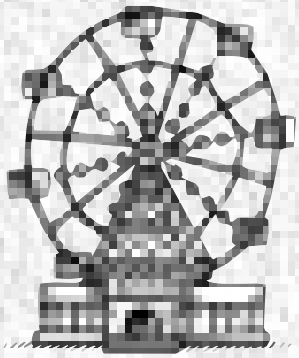




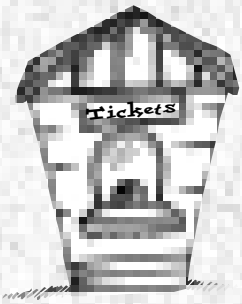
Amusement Park Map

(Southeast Section)

Ferris Wheel



Tickets



ARCADE