

# Problem of the Month

## Rod Trains



### Level A:

You have 10 different rods, each a different color and a different length.

If you use just the red rods and put them together in a train (one next to each other), what other length rods could you make? List the other rods by color. Explain why only some rods work.

If the light green rod is 3 units long, determine the length of each of the rods.

Explain the method you used to figure the lengths out.

Organize the rods in order from smallest to largest and draw each of them. Write the length next to each of your drawings.

## Level B:

A rod train can be made with different size rods. A rod train with a red rod first and a purple rod second is different than a purple rod first and a red rod second. Which color rod is the same length as a red rod next to a purple rod? What is the length of that rod?

How long is the brown rod?

Suppose you put two smaller rods together to make a rod train the same length as the brown rod. How many different ways (order matters) can you put two rods together and make it the same length as the brown?

Explain how you figured it out.

Write an addition number sentence for each of the combinations that you found.

What do you notice from the number sentences? Explain.

## Level C:

Rod Trains can be just one rod, several rods of equal size, or several rods of differing sizes. The order of the rods matter making rod trains unique from one another. For example a rod train made up of a red on the left side then a purple on the right is a different rod train than one that has a purple on the left side and a red on the right.

Consider the yellow rod. Determine all the different combinations of rods that can be arranged such that you have a rod train that is equal to the length of the yellow rod.

How many possible rod trains are equal in length to a yellow rod?  
Explain your solution and the method you used to figure it out.

How do you know you have all the combinations?

## **Level D:**

The longest rod you have is the orange rod, 10 centimeters in length.

Determine the number of rod trains that make up each of the ten rods.

Illustrate or list the ten rods and all the rod trains that have equal length to that rod.

Explain your method for finding each set of rod trains.

How do you know you have them all?

What patterns or relationships do you see in the list of the sets of rod trains?

## Level E:

Suppose you have a rod of every natural number length.

Determine the number of rod train combinations needed for a train of length  $n$ . Justify mathematically how you got your answer.

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# Rod Trains



### Primary Version Level A

**Materials:** A set of rods (1-10) for each pair. Paper and pencil to write or draw. Color crayons, markers or pencils.

**Discussion on the rug:** (Teacher gives students several rods)  
“Here are some rods. What do you notice about them? What else do you notice about them?” (Teacher continues to ask children to notice that they are different colors and different lengths. Teacher encourages the students to play with them and make different things.)

**In small groups:** (Each group has a set of rods)  
(Teacher asks the following questions. Only go on to the next question if student have success)

1. “How many rods do you have? How can you check to know for sure?”

(Continue until you think students understand that you have ten. If ten is too many, you might use less, such as six.)

2. “Put the rods in order of smallest to biggest.”

(At the end of the investigation have students either draw a picture to represent their solution)

3. “If this is a size 1 rod, how big are the others? Can you give each a name?” (Have students write a number next to each rod drawn)

4. “If you put red rods together, what other color rods can you make? Explain.”

# Cuisenaire Rods

