

Math 130
Fall 04

Study Group Homework: Cuisinaire Rod Trains

Barring technical difficulties, in class we will watch a video from the *SuperSource* CD-ROM that came with your book. The videos on this CD-ROM are organized by they type of manipulative used in the activity, and this is the only video listed under Cuisinaire Rods. You can borrow Cuisinaire Rods from the Resource Center and there is also an online version of them available at <http://arcytech.org/java/> (Chose “Integer Bars.”). You can also use graph paper and colored pencils.

The colors of the Cuisinaire Rods are as follows:

Length (centimeters)	Color	Length (centimeters)	Color
1	White	6	Dark Green
2	Red	7	Black
3	Light Green	8	Brown
4	Purple	9	Blue
5	Yellow	10	Orange

In the video, the class together finds that there are four “Rod Trains” of length 3 centimeters: Light Green, Red-White, White-White-White, and White-Red, and then the children work individually and in groups to find trains of length 4 and 5. Note that the Red-White train is considered different from the White-Red train, and for most of this problem, trains that contain the same rods in different orders will be considered different.

For this activity, you will explore the same problem as the children, but in more depth and at a more adult level. Focus especially on the following:

- Getting organized
- Looking for patterns
- Justifying why your patterns will continue
- Asking (and answering!) new questions about the problem

Here are some questions to explore:

1. How many rod trains are there of length 4? How can you be sure you’ve found them all? Can you use the results of smaller cases to help you get organized and to help justify your reasoning? Don’t ignore very small cases – solve the problem for rods of length 1 and 2 also, and see if you can use these results to strengthen your reasoning.
2. Can you find any patterns in the number of trains? Can you predict how many trains of length 5 there will be? Test your prediction.

3. How many trains do you think there will be of length 6? Of length 10? Of length 20? Of length n ? Justify your reasoning (although, past a certain point, it's too much work to try to build them all).
4. Now explore some patterns contained within this problem. Feel free to select from the list below or to ask your own questions (and try to answer them!). You don't have to do these in order, and you won't have time to do them all. Perhaps you've already started working on some of these problems in your previous work.
 - Explore the number of trains of each length made with exactly two rods. Look for patterns. Can you predict how many trains of length 20 can be made from exactly two rods? Of length n ? Justify your reasoning.
 - Explore the number of trains of each length made with exactly three rods.
 - Continue the above, generalize.
 - Explore the number of trains of each length made with only White and Red Rods.
 - Explore some other problems like the one above.
 - Explore the number of trains of any length, made from exactly two rods.
 - Explore the number of trains of any length, made from exactly three rods.
 - Continue the above, generalize.
 - Suppose we consider trains that have the same rods to be the same, no matter the order of the rods (e.g. Red-White is the same as White-Red). How many trains of each length are there now?

Note that many of these patterns work well on a spreadsheet. We will explore using spreadsheets to describe them next class, but feel free to refer to the introductory handout on spreadsheets to try using them in study group (or feel free to wait).

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