

Study Group Homework
Due October 6
Section 1.3 Patterns

1. Read section 1.3 on Patterns in the green book. Figure out a way for your group to read the section together, being sure to spend some time working on the investigations, answering questions at the pencil icons, and working to understand the text. You can individually write in your notebooks at the stopping points and then talk together or you can talk first and then write in your notebooks.

Recognize that different people in your group might need different things – some people might need some individual time to think, while others might want to jump into a discussion. Be honest about your preferences and respectful of others'. Try to come up with a process that works reasonably well for everyone. Remember that the goal here is depth not speed – catching on quickly is not the same as understanding deeply ... so, if you're starting to feel resentful that some group members are "holding you back," change your focus from finishing quickly to listening to your classmates and trying to understand their confusion, observations, etc. and seeing what you can learn from them. You can list these observations in your notebook too.

In your reading pay particular attention to **connections** and to **reasoning**. Can you connect material in the chapter to other problems we've done in class? When the author talks about the patterns, sometimes he uses sound reasoning to explain why a pattern continues and sometimes he just implies that it does. For each pattern, decide whether or not the author has justified that it will continue, and be sure to write these observations in your notebook (in a way that they will make sense to you in a month).

2. Do problems 22 and 23 on page 29. Note that for problem 22 there are answers in the back of the book, but these problems can have multiple solutions, as long as you can justify a particular pattern. See if you can find alternate answers to some of the patterns and justify them. For part a, supply reasons why the next in the sequence could be a square or a triangle, which do you find most convincing?

For problem 23, first find a numerical pattern. Note that there is a beautiful visual way of looking at this pattern. Here's a hint: start with a square array of dots, with one removed. Divide it into equal sections that somehow correspond to a number pattern you've seen before.

3. Now choose one or more of the following to work on. Pick whatever seems most interesting to you; if different people in the group want to start in different places, that's fine.

- Explore some number patterns in problems 24-27.
- Try the 4's problem (number 29). This is a famous, fun puzzle. You can try to go beyond making the numbers 1-10; it's amazing how many are possible.

- Look for more patterns in Pascal's Triangle (see problem 1 of exploration 1.1. in the red book).
- Explore Fibonacci numbers (problem 38). See if you can make connections with the Cuisinaire Rod problems from last week.
- Fill in the chart below with data from the Cuisinaire Rods problem, and then try to connect to material in this chapter (for example, the third row is 1 2 1 because for a length 3 train, there is one way to make it with 1 rod (light green), two ways to make it with 2 rods (white-red or red-white), and one way to make it with 3 rods (all white)). Have you seen this table before? What is the connection?

Number of Ways to Make Cuisinaire Rod Trains
(sorted by length and number of rods in the train)

Length of Train	<u>Number of Rods in Train</u>									
	1	2	3	4	5	6	7	8	9	10
1	1									
2	1	1								
3	1	2	1							
4										
5										
6										
7										
8										
9										
10										

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