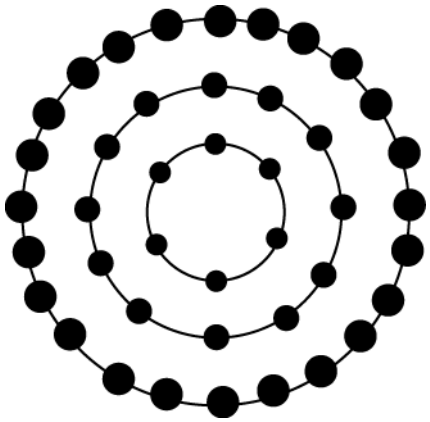
Inductive Reasoning Exercise NAMES:

Turn in one paper per group but be sure all members of the group have seen the final answers. Circle your name if the paper that gets turned in is your copy.

This problem set is taken from the magazine *Mathematics Teacher*, November 2004, Mathematical Lens.

1. To the right is a picture of a chandelier with three rows of lights. Count the number of lights in each ring and record your numbers below.



Ring	Number of lights
1 (inner)	
2	
3	

2. Describe **at least two different** patterns that you find in the number of lights.

3. How many lights would you expect to see in the fourth ring of this chandelier? Explain how you got your answer. Use whichever pattern from exercise #2 you like.

4. Suppose the manufacturer of this chandelier simply doubled the number of lights in a ring to determine the number of lights to be used in the next ring. Would it be possible to make a chandelier that uses a total of 99 lights? Explain.

5. How does inductive reasoning play a role in your conclusion for problem #3? In other words, reflect on how inductive reasoning is defined and how you used it.

The following are selected questions from the book *Mathematics: A human endeavor* by Jacobs (Set II of the 1.3 exercise set). Information and questions in square brackets have been added by me; please answer all questions.

In 1772, the German astronomer Johann Elert Bode used inductive reasoning to find a pattern in the distances of the planets from the sun. At that time, only six planets were known. The actual relative distances of the planets to the sun and his pattern are shown [in the table below].

Planet	**Actual distance ***	**Bode's pattern**
Mercury	4	0 + 4 = 4
Venus	7	3 + 4 = 7
Earth	10	6 + 4 = 10
Mars	15	12 + 4 = 16
Jupiter	52	48 + 4 = 52
Saturn	96	96 + 4 = 100

* The distances are based on taking the distance from the earth to the sun to be 10 units. [All other distances are relative to that.]

Notice there is a pretty good match between the [actual distances and the numbers in Bode's pattern].

6. What equation do you think belongs between Bode's equations for Mars and Jupiter? [Explain.]

7. What equation do you think belongs after Bode's equation for Saturn?

In 1781, William Herschel discovered Uranus, the next planet beyond Saturn. Because its distance of 192 units comes remarkably close to the number predicted by [the equation from exercise #7], astronomers came to the conclusion that the ["missing"] equation between Bode's equations for Mars and Jupiter also must mean something.

8. What do you suppose they thought it meant?

In 1801, the asteroid Ceres was discovered at a distance of 28 units from the sun. [Spooooky!]