

Team Members: _____

Part 1: Meet your Manipulative!

1. Separate the following number pieces out from the rest: 1, 1, 2, 3, 8, and 13.
2. Take one sheet of paper and divide it into four pieces by folding it in half, then folding it in half again, and then unfolding and tearing along the creases.
3. Place the pieces in a row, in number order, with *one* square between the 3 and the eight, and *three* squares after the 13.

It should look like this: → 1 1 2 3 □ 8 13 □ □ □

Set the remaining piece aside. Do you see a pattern? What numbers are missing? Write them in the empty spaces above.

Part 2: The Golden Spiral, a.k.a. ...

1. What is the Golden Spiral?

2. What does the Manipulative have to do with the Golden Spiral?

3. What are some other names for the Golden Spiral?

Part 3: Spirals At Large

1. Name the spirals shown on the back of your Manipulative.

2. Name some spirals NOT shown on the back of your Manipulative.

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Part 1: The Golden Mean

1. What is the *Golden Mean*, and what does it have to do with the *Golden Spiral*?

2. What is a *ratio*, and how does it differ from a *proportion*?

3. What is the *metric system*, and where do we use it?

Part 2: Grow (and Measure) Your Own Rectangle

Using the pieces of your spiral puzzle, build a rectangle one piece at a time, beginning with a "1".

- Add pieces in order of size, from least to greatest.
- At each Interval (each time you add a piece), measure the length (L) and width (W) of your rectangle in centimeters (abbreviated "cm").
- Record the length as the longer side, and the width as the shorter side, in the table in Part 3.
- Intervals 1 and 2 have been filled in for you.
- Draw your completed rectangle (7 pieces) on the back of this Work Sheet.

Part 3: Using the Facts to Predict the Future

Following the example for Interval 1, calculate the ratio as a fraction, then as a decimal. Be sure to carry the decimal out 3 places, rounding if necessary. When you're finished, use the answers you found to predict the length, width, and ratios for Intervals 8, 9, and 10. Fill in your predictions under the table.

Interval	Length	Width	Ratio L/W	Ratio to 3rd Decimal
1	1	1	1/1 = 1	1.000
2	2	1		
3				
4				
5				
6				
7				
8				
9				
10				

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Part 1: A Picture Is Worth a Thousand Words

1. What experimental data do you have from Activity 2?

2. What are the main parts of a graph?

3. What is an interval scale and when is it useful?

Part 2: Fill In the Blank

Use your graph paper to construct a graph for your experimental data. The calculated ratio from Activity 2 will be the y-axis. The Interval will be the x-axis. Choose a scale that lets you plot your data points as accurately as possible, and be sure to label both axes.

Do you notice any trends in your data?

Part 3: Making an Educated Guess

a) Using a pencil, connect your data points from left to right. What shape do you get? [Note: Check to make sure you have the right shape before moving on to Part (b).]

b) Using a different color than the one you used in (a), connect all the minimum points. Now choose a third color, and connect all the maximum points. What do you notice?

c) What do you think the next point on the graph will be? What does this have to do with the Golden Mean?

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Part 1: The American scale is English...

1. What is the customary *English scale*, and where do we use it?

2. What is the difference between a mixed fraction and an improper fraction?

3. Name two places we use *fractions*, and two where we use *decimals*.

1 _____ 2 _____ 1 _____ 2 _____

Part 2: Inch by Inch

Using the pieces of your spiral puzzle build a rectangle one piece at a time, beginning with a "1".

- Add pieces in order of size from least to greatest.
- At each Interval (each time you add the next largest piece), measure the length (L) and width (W) of your rectangle to the nearest 16th of an inch.
- Record the length as the longer side, and the width as the shorter side, in the table in Part 3.

Part 3: Fractions (It Takes All Kinds)

In order to form the ratio, you will have to a) convert mixed fractions to improper fractions then b) simplify the ratio by dividing the length by the width to get a single fraction.

The single fraction goes in the Ratio column in the table below.

After you get the ratio, divide one more time to get the decimal form. You can use the back of this worksheet for scratch paper.

Interval	Length	Width	Ratio (L/W)	Ratio to 3 rd Decimal
1				
2				
3				
4				
5				
6				
7				

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Part 1: Getting Scientific

- 1. What is the Scientific Method and why is it important?

- 2. What is the difference between a variable and a control?

- 3. How do you come up with a hypothesis? What do you do when you have one?

Part 2: English vs. Metric

- 1. Did you get the same results for Activity 2 and Activity 4? If not, why do you think that is?

- 2. Should you have gotten the same results for both Activities? Why?

- 3. What are the variables in Activity 2 and 4? What is the control?

Part 3: Conduct an Experiment

- a) Come up with a hypothesis about which scale (English or Metric) is most accurate and which scale is more appropriate?

- b) Design an experiment to test your hypothesis. Try it out, and write down your method and results.

- c) Based on your results, which scale should be used for scientific experiments? Why?

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Part 1: Highly Analytical Moment

1. What is a histogram?

2. Name and define 3 ways you can average data.

3. Why do we analyze results?

Part 2: A Team Effort

a) Use the master table from the entire class's results for Activity 2 to fill in the maximum and minimum values for each interval in table 1 below. Subtract the Minimum from the Maximum to get the Spread.

Table 1: Class Data from Activity 2

Interval	1	2	3	4	5	6	7
Maximum							
Minimum							
Spread							

- b) Average (find the mean of) the spread values. _____
- c) Using graph paper, create a histogram with *quantity* on the y-axis and *ranges in value* on the x-axis.
- d) Repeat the directions in (a) and (b) to find the maximum, minimum, spread, and average spread for Activity 4. Use Table 2, on page 2, for your data.
- e) Using graph paper, create a histogram with *quantity* on the y-axis and *ranges in value* on the x-axis.

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Table 2: Class Data from Activity 4

Interval	1	2	3	4	5	6	7
Maximum							
Minimum							
Spread							

The average spread for Activity 4 is: _____.

Part 3: Coming to A Conclusion

a) Do your results support your hypothesis in Activity 5? Explain.

b) Why is finding the variability important?

c) Why use a histogram instead of a line graph?
