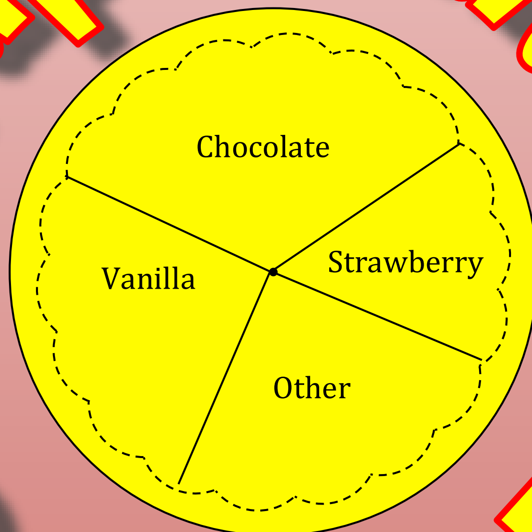
Paper Plate Pie Charts



By Brad Fulton
Educator of the Year, 2005
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Educator of the Year

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Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

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♦ 2005 California League of Middle Schools Educator of the Year
♦ California Math Council and NCTM national featured presenter
♦ Lead trainer for summer teacher training institutes
♦ Trainer/consultant for district, county, regional, and national workshops

Author and co-author of mathematics curriculum

♦ Simply Great Math Activities series: six books covering all major strands
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References available upon request

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Brad

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Paper Plate Pie Charts
It's As Easy As Pie!

Required Materials:

☒ Paper plates or copies of the included masters

Optional Materials:

☐ Coloring crayons, markers, or pencils

☐ Calculators

Overview:

Students enjoy studying data, especially when they gather the data themselves. They tend to like making graphs of various types, but they often need a lot of practice in what is most important: *understanding* the data. This activity allows students to analyze data and draw conclusions about data without spending inordinate amounts of time creating the graphs. Students will be able to quickly create accurate pie charts that can be used for critical thinking activities. Two versions are explained, one which will work for any sample size, and a second simpler method that does not require rigorous calculations to determine the degree measures. This second option will work best for younger students.

Procedure:

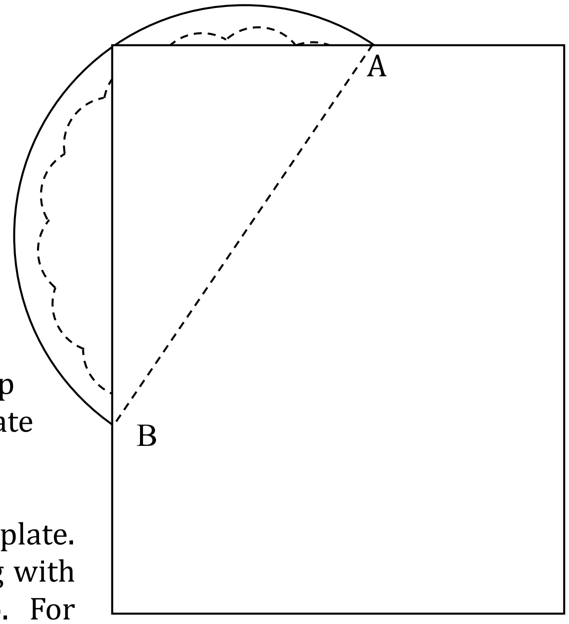
1 Begin by asking the students to generate some data. Since they are making a pie graph, the data should be of the type in which it is helpful to compare parts to wholes. Lists of favorites, such as favorite foods, teams, sports, or pastimes are examples. For this description, we will pretend that a class of 24 students has been surveyed about their favorite flavors of ice cream with the top three responses shown here:

Chocolate:	8
Vanilla:	6
Strawberry:	4
Other:	6

2 Now the students need to convert these to degrees. Though there are numerous ways to do this, an easy and efficient method is to multiply the number respondents in the subsets by 360 and divide by the total surveyed. For example, the 8 respondents who chose chocolate are multiplied by 360 and divided by 24 to get 120°. This results in 90° for vanilla, 60° for strawberry, and 90° for other.

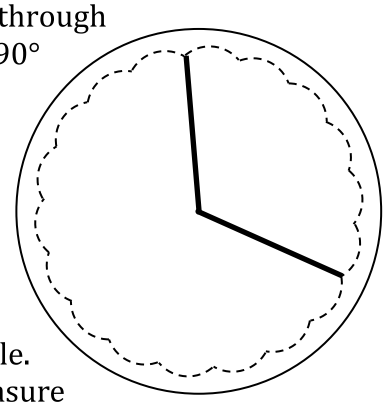
$$\frac{8}{24}\times 360° = 120°$$

3 Now students will make a pie graph of their data on a paper or Styrofoam plate. Notice that these plates have fluted edges for strength and design. Depending on size and brand, many plates have 18 or 24 scallops in the edge. Let's assume we are using an 18-flute plate as in the activity master. Since the 18 flutes make up the entire 360° of the circular plate, each scallop must be 360÷18=20°. It is easy to make accurate estimations of the regions we need to graph.



4 The students will need to find the center of the plate. This can be done quite simply by either judging with the eye or by balancing the plate on a fingertip. For more accuracy, one creative method is to place a sheet of paper so that one corner touches the edge as shown. By connecting the points A and B where the paper intersects the edge of the plate, a diameter of the circle is created. All diameters pass through the center of a circle. Doing this once more from a different location results in two diameters that intersect at the circle's center.

5 Now have them draw a line from the center to one of the points on the scalloped edge. The 120° section for chocolate will extend from this line through six 20° scallops. A second line should be drawn there. The 90° vanilla section extends through 4½ scallops. The 60° strawberry section requires three scallops and the 90° section for other flavors uses the remaining 4½ scallops.



6 **An even simpler way** to make these pie charts is to tell the students to limit their surveys so that the number of respondents matches the number of flutes on the plate. If their plate has 18 scallops, then the student should survey 18 people. That way each scallop represents one respondent. Angle measure will not be necessary, yet the data is still represented accurately and reliable conclusions can be inferred from the pie chart.

7 Although this is a simple graph, some very good questions can be asked about it. Here are some examples:

How much more popular is chocolate compared to strawberry? (Two times)

How does the number of people who prefer chocolate compare to the combined total for vanilla and strawberry? (More total people like vanilla and strawberry.)

What percent of people prefer vanilla? (25%)

How does the way a question is phrased affect the results of the survey? For example, we could ask, "What is your favorite flavor of ice cream?" as opposed to, "Which of these is your favorite flavor: chocolate, fish, rutabaga, or dirt?"

8 You may want the students to graph the data on a plate that does not have 18 scallops just to compare the results. It is also a great idea to have them graph the results on a different *size* plate that has 18 scallops. This helps students see what it is they are measuring when they measure degrees. Many students are of the mistaken impression that the area of the wedge is important. They believe that 20° on a smaller plate represents a lesser amount than 20° on a larger plate. This helps them see that what they are measuring is the degree of rotation about the center of the circle. The radius of the circle is immaterial.

> **Good Tip!**
>
> Buy different sizes and brands of plates. Some will have 18 flutes, some will have 24, and others may have more or less. Have students work with a variety of styles to gain a better sense of angles and their measures.

9 Three sample plate templates are included. Each scallop of the 18-fluted model represents 20° (360°÷18=20°). Similarly, each scallop of the 20-fluted master is equal to 18°, and the 24-fluted master has 15° scallops. Each template has the center marked accurately. A third template for advanced students offers a circle marked in 5° increments.

10 The data chart at the bottom of the master can be used to tally the results as students take their surveys as shown here.

Strawberry ~~||||~~ |

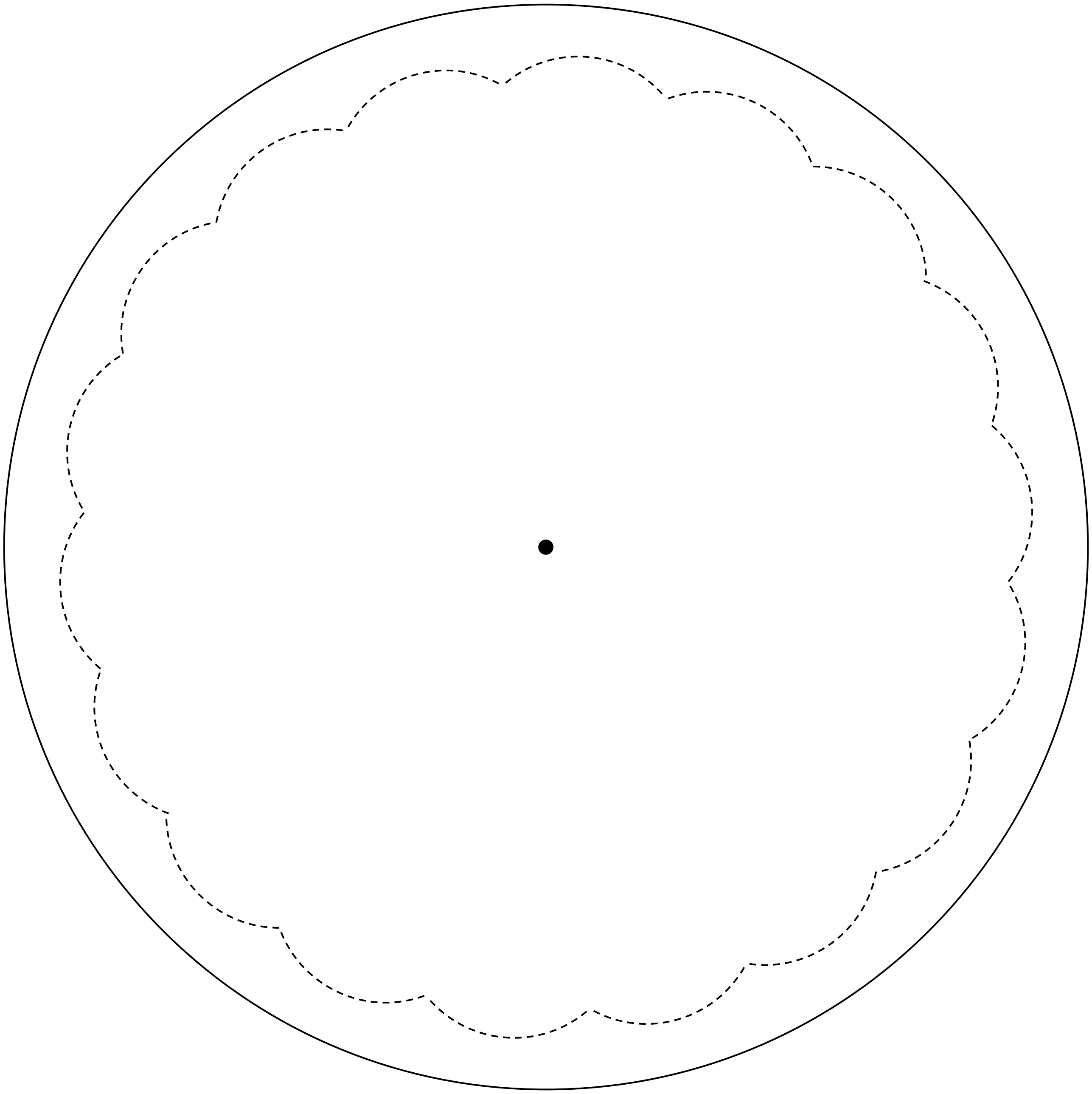
Chocolate ~~||||~~ ~~||||~~ ||

11 Older students can use protractors to check for accuracy if you wish, but this skill is not required for this activity.

12 Students can color and label their pie charts when they finish.

18 points

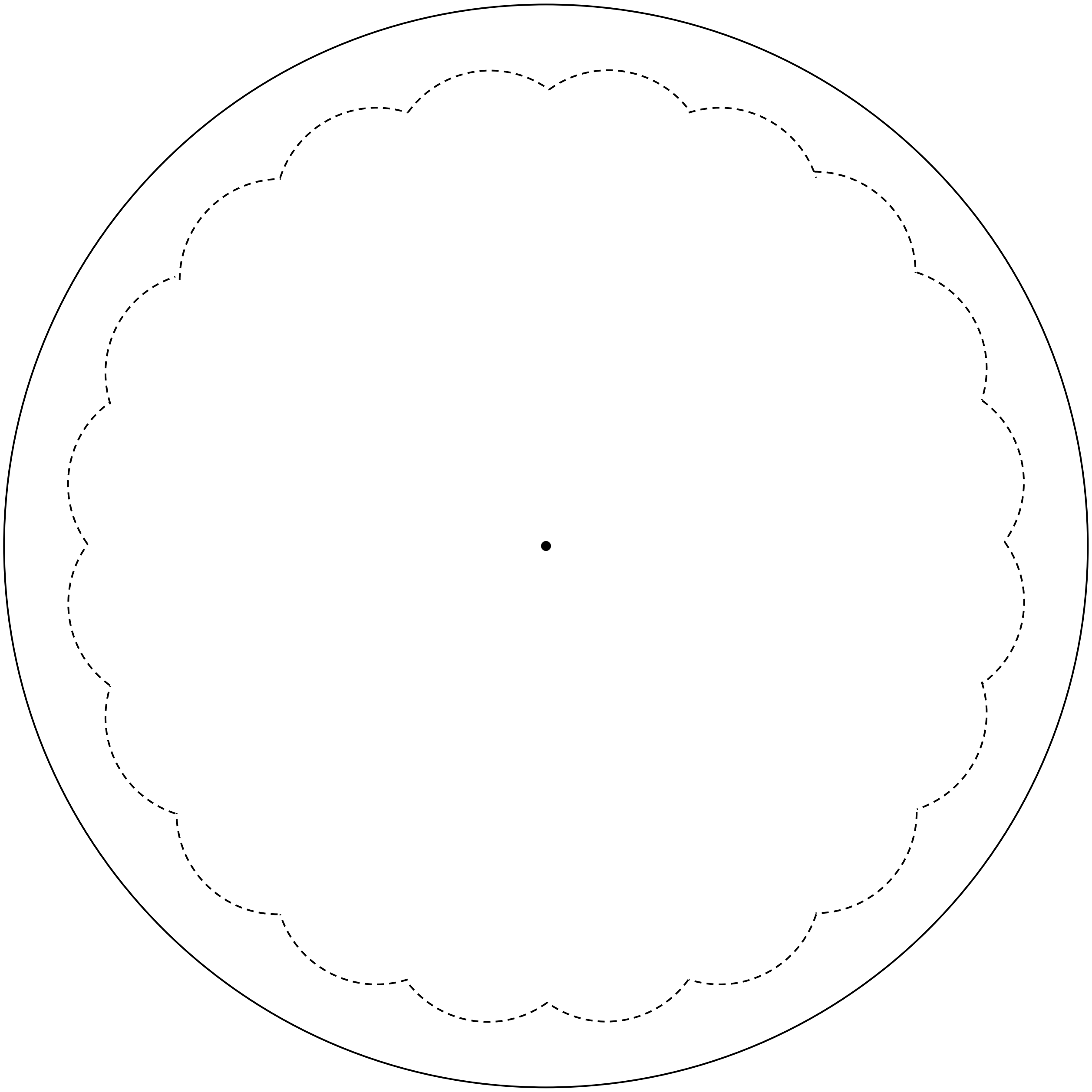
Name______________________________



Data Table

20 points

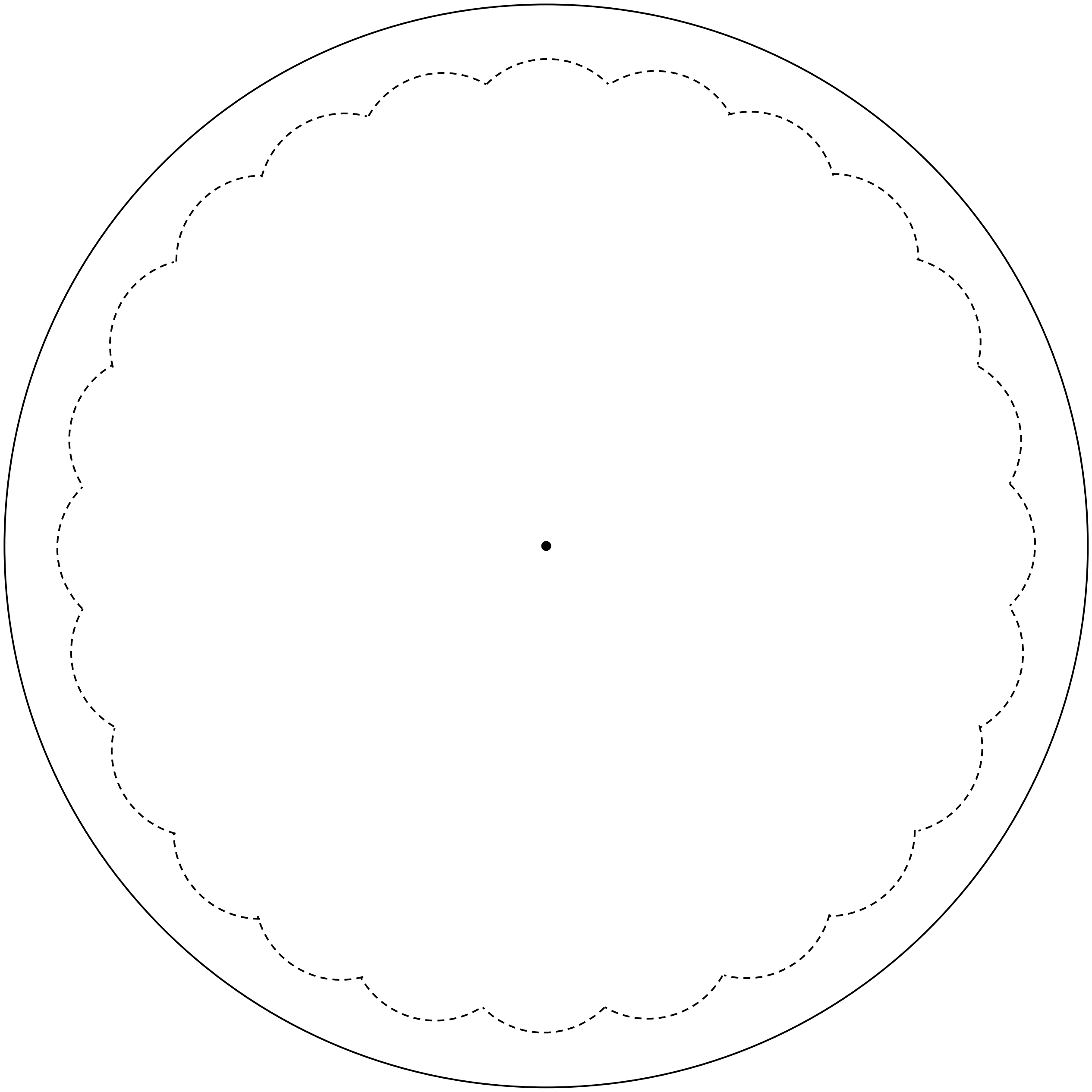
Name______________________________



Data Table

24 points

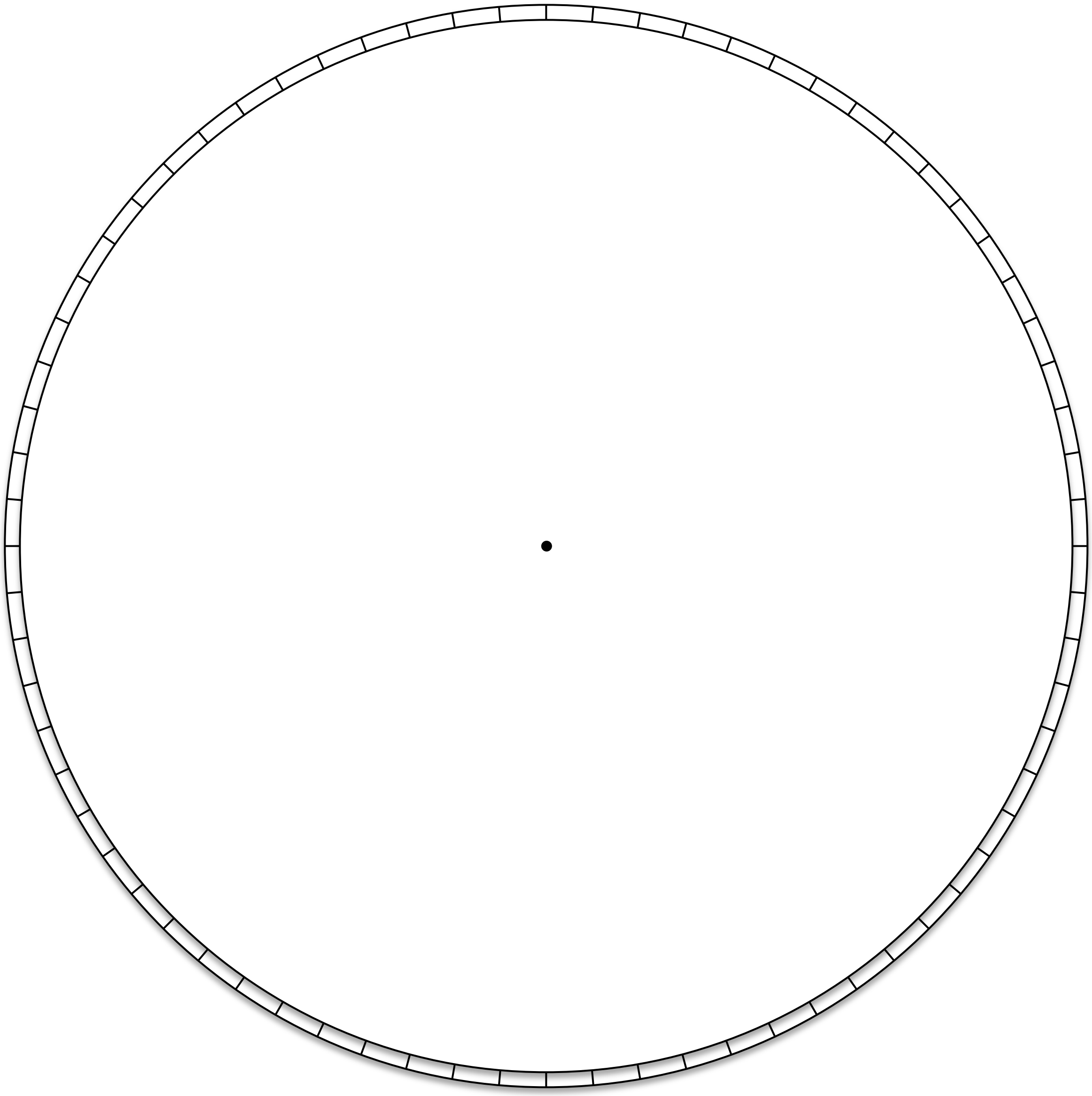
Name______________________________



Data Table

5° segments

Name______________________________



Data Table

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- *Developing Number Sense*

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

Brad