

**OHIO ACADEMIC
CONTENT STANDARDS**

- **Interpreting Graphs (Grade 1)** Y2003.CMA.S05.GPK-02.BC.L01.I04
Read and interpret charts, picture graphs and bar graphs as sources of information to identify main ideas, draw conclusions, and make predictions.
- **Probability (Grade 1)** Y2003.CMA.S05.GPK-02.BD.L01.I08
Describe the likelihood of simple events as possible/impossible and more likely/less likely.
- **Sorting Data (Grade 1)** Y2003.CMA.S05.GPK-02.BB.L01.I01
Identify multiple categories for sorting data.
- **Graph Categories (Grade 1)** Y2003.CMA.S05.GPK-02.BB.L01.I07
Answer questions about the number of objects represented in a picture graph, bar graph or table graph.
- **Tally Marks (Grade 1)** Y2003.CMA.S05.GPK-02.BB.L01.I02
Collect and organize data into charts using tally marks.
- **Picture Graphs (Grade 1)** Y2003.CMA.S05.GPK-02.BC.L01.I03
Display data in picture graphs with units of 1 and bar graphs with intervals of 1.
- **Attributes (Grade 1)** Y2003.CMA.S04.GPK-02.BA.L01.I01
Sort, classify and order objects by two or more attributes, such as color and shape, and explain how objects were sorted.
- **Fractions (Grade 1)** Y2003.CMA.S01.GPK-02.BC.L01.I09
Represent commonly used fractions using words and physical models for halves, thirds and fourths.

DATA ANALYSIS

FOCUS

- ◆ Analysis of displays of data.

VIDEO “The Best Day!”

Ohio Academic Content Standards

- Interpreting Graphs (Math Grade 1)
Y2003.CMA.S05.GPK-02.BC.L01.I04
- Probability (Math Grade 1)
Y2003.CMA.S05.GPK-02.BD.L01.I08
- Interpreting Graphs (Math Grade 2)
Y2003.CMA.S05.GPK-02.BC.L02.I02
- Bar Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BD.L03.I03

Seth is working on a multimedia presentation about the rainforest to play during the group’s bake sale.

When Alex brings in a poster to publicize the sale, the MathTek kids find they need to use some problem-solving techniques to decide on the best day to hold the sale. A look at several types of data provided by Ms. Davis helps them decide what information they need. The group decides to make a bar graph using the number of people who used the library every day for one month. The group makes four separate graphs, one graph for each week. The interpretation of their graphs, as well as a discussion and investigation of chances and probability, helps the group choose what they predict will be the busiest day at the library to ensure the success of their bake sale.

VOCABULARY

- ◆ *Bar Graph.* A graph in which the length of a bar (rectangle) is used to represent a numerical amount.
- ◆ *Circle Graph.* A graph showing the relationship of all the parts of a whole. Generally, percentages are used to divide the area proportionally. Circle graphs are also called a pie graph or pie chart.
- ◆ *Line Graph.* A method of displaying

data utilizing line segments drawn between various data points. A line graph is suitable for continuous data and to show changes over time.

- ◆ *Pictograph.* A type of graph which uses symbols to represent a quantity of objects or persons. The value of each symbol is shown in a key which appears on the graph.

JOURNAL TOPICS

1. Tell about something that will definitely happen. Explain. (See Extension 3–Probability for example.)
2. Tell about something that might happen. Explain.
3. Tell about something that definitely will not happen. Explain.

EXTENSIONS

I. GRAPHING

Ohio Academic Content Standards

- Sorting Data (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I01
- Organizing Data (Math Grade 2)
Y2003.CMA.S05.GPK-02.BA.L02.I01
- Picture Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BD.L03.I02
- Types of Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BC.L03.I06

Materials Needed: Teddy Grahams, M&Ms, Candy Graph (Appendix 7A), glue, crayons, magazines, newspapers

- ◆ To introduce simple graphs, divide the class into groups and give half of the groups a plastic sandwich bag containing a number of three kinds of Teddy Grahams and a piece of tagboard. The other groups get a small bag of M&Ms and a Candy Graph (Appendix 7A). Ask each group to sort their bears or candy by color. The Teddy Grahams should be glued to the tagboard in rows according to color. The M&Ms are counted and one

DATA ANALYSIS

box on the graph is colored for each candy.

- ◆ When the graphs are finished, display them and discuss the similarities and differences of the two kinds of graphs. The Teddy Graham graphs are “pictographs” which show us pictures (objects) to represent the numerical results. The candy graphs are “bar graphs” which have colored bars that show us the numerical results.
- ◆ Ask questions of groups about their graphs, such as “Which kind did you have the most (least) of?” or “How many more of one color than another did you have?”
- ◆ Have each group write a conclusion about their graph. Display each group’s graph along with their written conclusion. Make a collection of graphs found in magazines, newspapers, etc. Show examples of other kinds of charts and tables that easily show us numerical information.
- ◆ As a class, make a new graph each week. Topics could include Favorite TV Show, Eye Color, Favorite Insect, etc.

*The questions presented in the MathTek CD activity “Interpreting Graphs” offer further practice in analyzing information presented in many different kinds of graphs.

2. CIRCLE GRAPHS, FRACTIONS AND EQUIVALENCY

Ohio Academic Content Standards

- Interpreting Graphs (Math Grade 1)
Y2003.CMA.S05.GPK-02.BC.L01.I04
- Fractions (Math Grade 1)
Y2003.CMA.S01.GPK-02.BC.L01.I09
- Fractions (Math Grade 2)
Y2003.CMA.S01.GPK-02.BC.L02.I05
- Interpreting Graphs (Math Grade 2)
Y2003.CMA.S05.GPK-02.BC.L02.I02
- Data (Math Grade 2)
Y2003.CMA.S05.GPK-02.BA.L02.I06

- Types of Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BC.L03.I06
- Fractions (Math Grade 3)
Y2003.CMA.S01.G03-04.BD.L03.I06

Materials Needed: Circle patterns, crayons or markers

- ◆ Divide the class into groups of four and give each group a large circle pattern or “pizza.” Tell them that they get to create a pizza with a slice for each of them. Each person’s slice will have their favorite pizza topping. The pizza that they will be making will be a simple circle graph or “pie chart.” They first will need to divide the “pizza” into equal portions for each of them. This exercise will also show and discuss fractions. Each member will decorate his or her portion to represent his or her favorite topping. If two students prefer the same topping, half of the pizza will have that topping. Give the groups an opportunity to discuss among themselves what portion of their pizza is covered by each topping. Groups can share their results and conclusions with the rest of the class.
- ◆ Groups of six or eight with Level 2 and 3 students offer further opportunities to explore the concept of fractions and equivalency. For example, if four students in a group of eight like pepperoni the best, then $\frac{4}{8}$ or $\frac{1}{2}$ of the pizza will have pepperoni.

3. PROBABILITY

Ohio Academic Content Standards

- Probability (Math Grade 1)
Y2003.CMA.S05.GPK-02.BD.L01.I08
- Probability (Math Grade 2)
Y2003.CMA.S05.GPK-02.BD.L02.I07
- Probability (Math Grade 3)
Y2003.CMA.S05.G03-04.BF.L03.I09
- Probability (Math Grade 3)
Y2003.CMA.S05.G03-04.BG.L03.I10

- Venn Diagrams (Grade 1)
Y2003.CER.S03.GPK-03.BD.L01.I07
Create and use graphic organizers, such as Venn diagrams or webs, with teacher assistance, to demonstrate comprehension.

- Fractions (Grade 2)
Y2003.CMA.S01.GPK-02.BC.L02.I05
Represent commonly used fractions using words and physical models for halves, thirds, fourths, sixths and eighths.

- Organizing Data (Grade 2)
Y2003.CMA.S05.GPK-02.BA.L02.I01
Pose questions, use observations, interviews and surveys to collect data, and organize data in charts, picture graphs and bar graphs.

- Interpreting Graphs (Grade 2) Y2003.CMA.S05.GPK-02.BC.L02.I02
Read, interpret and make comparisons and predictions from data represented in charts, line plots, picture graphs and bar graphs.

- Data (Grade 2) Y2003.CMA.S05.GPK-02.BA.L02.I06
Recognize that data may vary from one population to another.

- Probability (Grade 2)
Y2003.CMA.S05.GPK-02.BD.L02.I07
List some of the possible outcomes of a simple experiment, and predict whether given outcomes are more, less or equally likely to occur.

- Organizing Data (Grade 2) Y2003.CMA.S05.GPK-02.BA.L02.I01
Pose questions, use observations, interviews and surveys to collect data, and organize data in charts, picture graphs and bar graphs.

• **Fractions (Grade 3)**
Y2003.CMA.S01.G03-04.BD.
L03.I06

Compare and order commonly used fractions and mixed numbers using number lines, models (such as fraction circles or bars), and points of reference (such as more or less than).

• **Bar Graphs (Grade 3)**
Y2003.CMA.S05.G03-04.BD.
L03.I03

Read, interpret and construct bar graphs with intervals greater than one.

• **Picture Graphs (Grade 3)**
Y2003.CMA.S05.G03-04.BD.
L03.I02

Draw and interpret picture graphs in which a symbol or picture represents more than one object.

• **Types of Graphs (Grade 3)**
Y2003.CMA.S05.G03-04.BC.
L03.I06

Translate information freely among charts, tables, line plots, picture graphs and bar graphs.

• **Probability (Grade 3)**
Y2003.CMA.S05.G03-04.BF.
L03.I09

Conduct a simple experiment or simulation of a simple event, record the results in a chart, table or graph, and use the results to draw conclusions about the likelihood of possible outcomes.

• **Probability (Grade 3)**
Y2003.CMA.S05.G03-04.BG.
L03.I10

Use physical models, pictures, diagrams and lists to solve problems involving possible arrangements or combinations of two to four objects.

• **Match Data (Grade 3)**
Y2003.CMA.S05.G03-04.BB.
L03.I05

Match a set of data with a graphical representation of the data.

DATA ANALYSIS

Materials Needed: Colored cube blocks or counters, paper bags, Cube Recording Sheets (Appendix 7B)

- ◆ Perform a simple probability experiment to demonstrate the concept of “chances.” Divide the class into groups. Tell the class that you are going to put two red cubes in a paper bag, shake the bag, and take one out. Ask them to work as a team and predict what color cube you will take out. Ask for responses and explanations for the responses. Explain that there are times when we can predict for certain what will happen.
- ◆ Exchange one red cube for a blue cube and ask groups to predict what color you will pull out this time. Discuss responses and reasons for responses. Explain that there are times when we can predict what “might” happen but we will not know for sure.
- ◆ Using the same red and blue cube, ask groups to put their heads together and decide what chance there is that you will pull out a green cube and why. Explain that there are times when we can predict that something will definitely not happen.
- ◆ Give each group three cubes (red, blue, and green), a paper bag, and a Cube Recording Sheet (Appendix 7B). Ask them to work as a team and predict what will happen if they draw a cube 12 times, replacing the cube each time. After they have written their prediction, have them record the results, forming a bar graph in the process. Ask if what happened was what they thought would happen. If they predicted that they would pull out each color the same number of times but did not, explain that this is an example of the theory that what we expect to happen does not always happen.

- ◆ Combine group recorded results into one graph and see how this compares to the individual results, and if it is any closer to the expected results. Ask the students to draw a conclusion.
- ◆ Level 2 and 3 students can begin to associate fractions and percentages with probability. For example, if one red and one blue cube are used, the probability of drawing one color is $\frac{1}{2}$ or 50%.
*“Chances Are” on the MathTek CD provides the opportunity to choose circumstances and make predictions about probability.

4. CIRCLE GRAPHS (PIE CHARTS)

Ohio Academic Content Standards

- Graph Categories (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I07
- Types of Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BC.L03.I06

Materials Needed: Graph paper, scissors, tape, rulers, crayons, pencils

- ◆ Level 2 and 3 students can begin to work with circle graphs (pie charts). Once data has been gathered and compiled into a bar graph, cut bars into strips and tape together to form one long strip. Cut lines in between boxes about $\frac{3}{4}$ of the way through (see diagram Bar Graph to Circle Graph, Appendix 7C). Lay strip down and form a circle with it. Trace a circle inside the strip and mark the circle section so they are the same length as the different colored bar sections. From the center of the circle, use a ruler to draw radii to the ends of the bar segments. Color the circle sections so they match the bar section colors.
- ◆ Level 3 students can begin to work with percentages by using a number that is a factor of 100 for their bar graph. For example: 10, 20, 25, or 50

entries on the bar graph are easy to convert to a circle graph and interpret percentages.

- ◆ Another idea for Level 3 students is to have them string ten each of ten colors of beads (100 total) on a wire and then form the wire into a circle. Each color section represents 10% of the circle, each bead represents 1%. This circle can be laid on any circle graph and, by counting the beads each section covers, students percentages can easily compute.

5. SORTING VENN DIAGRAMS

Ohio Academic Content Standards

- Attributes (Math Grade 1)
Y2003.CMA.S04.GPK-02.BA.L01.I01
- Sorting Data (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I01
- Venn Diagrams (Math Grade 1)
Y2003.CER.S03.GPK-03.BD.L01.I07
- Pattern Predictions (Math Grade 3)
Y2003.CMA.S04.G03-04.BB.L03.I03

Materials Needed: Objects for sorting, large loops of yarn or string, large sheets of paper

- ◆ Begin a practice of sorting activities by giving each group a collection of objects to sort, such as leaves, buttons, attribute blocks, etc. Have each group share the way they sorted their objects and keep a class list of different ideas. This activity will reinforce the idea that objects can usually be sorted more than one way. Have each group make a graph of one way they sorted their collection. Level 1 students can make a picture or bar graph. Level 2 or 3 students could decide themselves the best way to display the results of their sorting.
- ◆ Introduce Venn diagrams as a logical way of sorting and classifying. Begin by sorting the class into two groups. Use two very large loops of yarn or string laid out on the floor to sort the class.

For example, ask all students wearing blue to step into one circle, all students wearing white step into the other. Probably at least one student will be confused where to go since they are wearing both blue and white. Discuss the fact that they should be in both circles. Ask for suggestions. If students have no suggestions, show how the two circles can be overlapped so that students wearing both colors can stand in each circle at the same time. Explain that this is another way to sort things when there is an intersection or place where objects share both traits.

- ◆ Ask students to sort their collections using traits that would require a Venn diagram. Give them large sheets of paper on which to draw two large intersecting circles. They might come up with some ideas like “leaves that are brown and leaves that have stems” or “attribute blocks that are red and attribute blocks that are circles.” Again, have groups share their ideas and keep a class list. Shared ideas generate more ideas.
- ◆ For Level 2 and 3 students, demonstrate some other ways to use Venn diagrams, such as three circles that intersect various ways, or a circle within a circle (see Venn Diagrams–Appendix 7D).
*The MathTek CD activity “Simple Sorting” provides practice in categorizing and using attributes to sort objects.

6. KEEPING RECORDS

Ohio Academic Content Standards

- Tally Marks (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I02
- Interpreting Graphs (Math Grade 1)
Y2003.CMA.S05.GPK-02.BC.L01.I04
- Interpreting Graphs (Math Grade 2)
Y2003.CMA.S05.GPK-02.BC.L02.I02
- Types of Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BC.L03.I06

- Organizing Data (Grade 3)
Y2003.CMA.S05.G03-04.BA.L03.I01

Collect and organize data from an experiment, such as recording and classifying observations or measurements, in response to a question posed.

- Pattern Predictions (Grade 3)
Y2003.CMA.S04.G03-04.BB.L03.I03

Use patterns to make predictions, identify relationships, and solve problems.

- Interpreting Graphs (Grade 3)
Y2003.CMA.S05.G03-04.BD.L03.I02

Draw and interpret picture graphs in which a symbol or picture represents more than one object.

DATA ANALYSIS

Technology Used: Imagination Express: Rainforest, The Graph Club

- ◆ Have students create their own multimedia presentation about the rainforest by utilizing the program Imagination Express: Rainforest (Edmark). Students can create pictures which can be animated and enter their own text to accompany their own story.
- ◆ The Graph Club (Tom Snyder) can be utilized once again to organize and display information collected by students. Different kinds of graphs (bar, circle, line) can be used to demonstrate means of displaying information.

7. MATHTEK CD ACTIVITIES

Interpreting Graphs

Ohio Academic Content Standards

- Interpreting Graphs (Math Grade 1)
Y2003.CMA.S05.GPK-02.BC.L01.I04
- Graph Categories (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I07
- Interpreting Graphs (Math Grade 2)
Y2003.CMA.S05.GPK-02.BC.L02.I02
- Interpreting Graphs (Math Grade 3)
Y2003.CMA.S05.G03-04.BD.L03.I02

At each of three levels, four graphs are presented for interpretation. Four questions are asked about each graph. At Level 1, tallies and pictographs are presented. At Level 2, a pictograph with units of more than one, bar graphs, and a picture map are presented. At Level 3, a coordinate grid, circle and line graphs, and a picture map are presented.

Graph It!

Ohio Academic Content Standards

- Picture Graphs (Math Grade 1)
Y2003.CMA.S05.GPK-02.BC.L01.I03
- Graph Categories (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I07

- Interpreting Graphs (Math Grade 2)
Y2003.CMA.S05.GPK-02.BC.L02.I02
- Match Data (Math Grade 3)
Y2003.CMA.S05.G03-04.BB.L03.I05

Types of graphs presented for interpretation in “Interpreting Graphs” are used in this activity with an added step. Three levels, each containing three graphs, are to be completed by inserting information provided in story-problem form. Once the graph is correctly completed, questions for interpretation are presented.

Simple Sorting

Ohio Academic Content Standards

- Sorting Data (Math Grade 1)
Y2003.CMA.S05.GPK-02.BB.L01.I01
- Attributes (Math Grade 1)
Y2003.CMA.S04.GPK-02.BA.L01.I01
- Organizing Data (Math Grade 2)
Y2003.CMA.S05.GPK-02.BA.L02.I01
- Organizing Data (Math Grade 3)
Y2003.CMA.S05.G03-04.BA.L03.I01

This activity offers two levels of sorting. There are eight variations at each level. Students are asked to sort six items into two categories. Categories include patterns, geometric properties, number concepts, money, and some science-related categories.

Chances Are

Ohio Academic Content Standards

- Probability (Math Grade 1)
Y2003.CMA.S05.GPK-02.BD.L01.I08
- Probability (Math Grade 2)
Y2003.CMA.S05.GPK-02.BD.L02.I07
- Probability (Math Grade 3)
Y2003.CMA.S05.G03-04.BF.L03.I09
- Probability (Math Grade 3)
Y2003.CMA.S05.G03-04.BG.L03.I10

In this activity, students can practice prediction and analyze probability. Four spinners and four choices of number of spins are presented for each selection. A prediction of results is required before running the test.

Results can be printed for further analysis and explanation of results.

8. ADDITIONAL RESOURCES

- ◆ *What's the Point?*
<http://www.funbrain.com>
- ◆ *Bug Bar Graph*
<http://pbskids.org/cyberchase/games/bargraphs/bargraphs.html>
- ◆ *Counting Objects*
http://www.harcourtschool.com/activity/counting_objects/
- ◆ *Coin Flipping Page*
<http://shazam.econ.ubc.ca/flip/index.html>
- ◆ *ReviseWise: Train Race*
<http://www.bbc.co.uk/education/mathsf/shockwave/games/train.html>
- ◆ *ReviseWise: Weather Today*
http://www.bbc.co.uk/schools/revisewise/maths/data/12_act.shtml
- ◆ *ReviseWise: Fish Tank*
<http://www.bbc.co.uk/education/mathsf/shockwave/games/fish.html>

Candy Graph

Name _____

	10								
9									
8									
7									
6									
5									
4									
3									
2									
1									
		brown	orange	yellow	red	green	tan		

Cube Recording Sheet

16	
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	
1	

red

16	
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	
1	

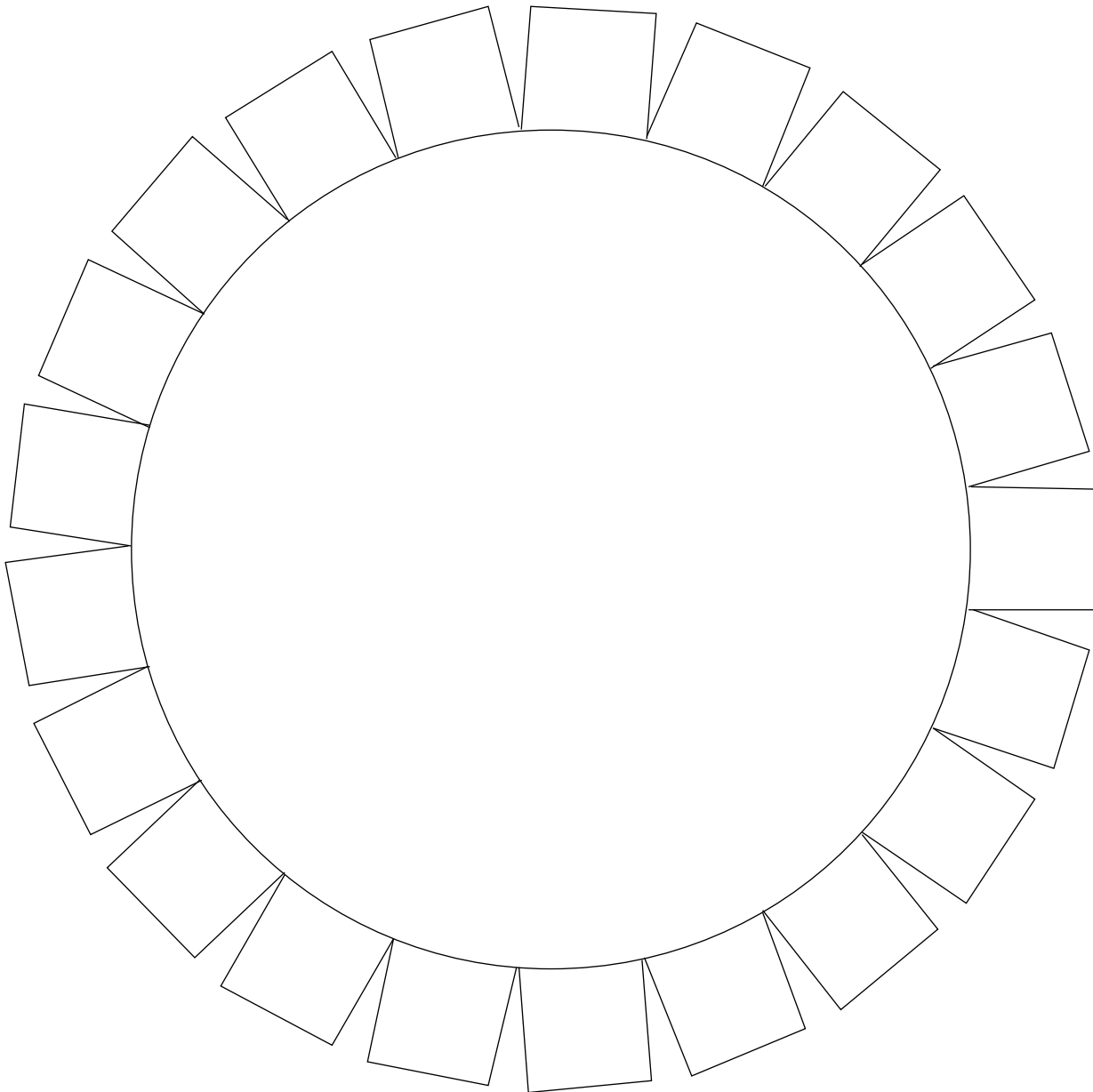
blue

16	
15	
14	
13	
12	
11	
10	
9	
8	
7	
6	
5	
4	
3	
2	
1	

green

Bar Graph to Circle Graph

(21 Entries)



Venn Diagrams

