**The Statistics and Probability Strand: Outcome SP7.2**

[Learning Space](#ls) [What Students Should…](#wss) [Key Questions](#kq) [Assessment](#assessment) [Instruction](#instruction)

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| **Outcome** | **Indicators** |
| SP7.2 Demonstrate an understanding of circle graphs.  [C, CN, PS, R, T, V]  *In support of the K-12 Mathematics goals of Spatial Sense, Number Sense, Logical Thinking and Mathematical Attitude..* | 1. Identify common attributes of circle graphs, such as:    * title, label, or legend    * the sum of the central angles is 360°    * the data is reported as a percent of the total and the sum of the percents is equal to 100%. 2. Create and label a circle graph, with and without technology, to display a set of data. 3. Find, describe and compare circle graphs in a variety of print and electronic media such as newspapers, magazines, and the Internet. 4. Translate percents displayed in a circle graph into quantities to solve a problem. 5. Interpret a circle graph to answer questions. 6. Identify the characteristics of a set of data that make it possible to create a circle graph. |
| **Learning Space** [**Top**](#top) | |
| Circle graphs are the last of the data displays that the students will learn about in K-9 mathematics. This outcome has very direct links to outcomes SS7.1 *Demonstrate an understanding of circles including circumference and central angles* and N7.3 *Expand and demonstrate an understanding of percents to include fractional percents between 1% and 100%* as well as to their study of angles and percent in grade 6.  Generally, students find circle graphs fairly straight forward, however; they sometimes become confused when asked to determine if a circle graph is appropriate for different sets of data. For example, some students will try to use a circle graph to display data from 30 different individuals. Although this can be done, having 30 slices of the pie, it is a difficult graph to create and a graph that does not provide a lot of visual insight into the data. Thus, it is very important for students to not only explore data that is well suited to circle graphs, but also to explore data that is not suited to circle graphs.  Students need to reflect upon how circle graphs compare to the other graphic displays that they have learned about: concrete graphs, pictographs, bar graphs, double bar graphs, and line graphs. It is important for students to understand that while line graphs are not good for representing qualitative data (such as favourite drink), circle graphs are quite effective.  It is important that the students’ study of circle graphs not get caught up in a study of ratio and proportion as circle graphs are merely one context for those concepts which are explore in depth in grade 8. Instead, the study of circle graphs should be closely tied to the students’ study of percents. | |

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| The data that the students use to explore and develop their understanding of circle graphs and the problems that the students solve using circle graphs can come from a wide variety of sources, including the media. However, it is important to make sure that the contexts of the data used are relevant and meaningful to the students. Other subject areas can become sources of data to be displayed. Social Studies might involve the students collecting data on various cultural, social, or economic situations. Similarly, Science, Health Education, and Physical Education can also be good sources of relevant and timely data. | | |
| **What Students Should…** [**Top**](#top) | | |
| **Know**   * The term circle graph (or pie chart). | **Understand**   * That certain types of data lend themselves better to certain types of data displays. * That circle graphs are best for categorized or grouped data rather than individual cases. * That the total percent represented by the sectors of a circle graph must be 100%. * That the number of degrees allocated to a category in a circle graph is proportional to the percentage of the data that it represents. | **Be Able to Do**   * Determine the angle to be used in representing a category of data that represents a certain percent of the data. * Construct a circle graph given the data. * Given a circle graph, answer problems regarding the number of responses in each category. |
| **Key Questions**[**Top**](#top) | | |
| * Are all data sets well represented by circle graphs? * What is the relationship between the percent of data in a category and the angle used to represent that category in a circle graph? * Why must the total percent indicated by a circle graph be 100? | | |

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| **Suggestions for Assessment:** [**Top**](#top) |
| **Big Idea:**  Proportional reasoning in circle graphs.  **Suggestions for assessment tasks:**   1. Have the individual students find a circle graph in a media source (newspaper, magazine, on the Internet) that is about a topic of interest to them. Have the students photocopy or clip out and save the circle graph (noting its reference) and write about what the graph tells them. When the students turn this in, the teacher can then create a problem for each student to solve during an interview. Problems can be varied depending on the level of understanding of the students. 2. Generate a set of data within the class, such as a secret vote on who will be school president next year or favourite style of shoe (runner, slip-on, flip-flop…). Have each of the students then create a circle graph based on the data collected and turn it in.   **What to look for:**   * See [*Proportional Reasoning in Circle Graphs Rubric*](file:///C:\Users\kw426\AppData\Local\Temp\Proportional%20Reasoning%20in%20Circle%20Graphs%20Rubric.doc)*.* |
| **Suggestions for Instruction:** [**Top**](#top) |
| **Big Idea:**  Proportional reasoning in circle graphs.  *It should be noted that although the big idea for this outcome is about Proportional Reasoning, students are not familiar with this terminology. They have experience solving problems involving percents, which ultimately is proportional reasoning, however; they have not encountered other contexts of proportional reasoning in their mathematics.*  **Suggestions for instructional activities**   1. Provide the students with a collection of circle graphs found in different media sources and in small groups ask the students to discuss the graphs and make a list of common characteristics both in terms of the format of the graphs and the type of data information represented. Have the groups share their ideas with the class, and generate a list of common characteristics for the class. 2. If the students have not already looked at circles and discovered the measure of the central angles in a circle totalling 360°, have the students use protractors to explore the sum of the central angles in the circle graph examples that have been given and discuss their results as a class. (This could also be done by copying the graphs onto overhead sheets and having individual students come up and use a transparent protractor to determine the individual angles. Thus, as a whole class they can reach the conclusion that the sum of the central angles in a circle is 360°). If the students have already explored this idea when studying circles, ask them to recall what they know about circles, and more specifically about angles in circles. Students might make connections with their understanding of what “doing a 360” means with respect to skateboarding, bike tricks, or spinning cars. 3. Using fraction circles (commercial or cut out), have the students determine the fraction of a whole circle represented by each different size of piece, as well as the percent of the entire circle and the degrees. Have the students discuss how the three values (the fraction, the percent and the degrees) are related to each other. Note: This relationship could also be explored outside the context of circle graphs when the students are learning about percents and fractions in outcome N7.3 *Expand and demonstrate an understanding of percents to include fractional percents between 1% and 100%*. 4. Provide the students with “fixed” data sets first – ones that involve percents that the students would have seen in their exploration of the fraction circles (50%, 25%, 20%, …) and then gradually move into other percents as they become more comfortable with the process involved in changing the percent into degrees. Vary the way students make the circle graphs – using fraction circles, using technology, and using a protractor. 5. As a homework assignment, give the students a circle graph and ask them a question such as “Based on this circle graph, if 1000 people were surveyed, how many of them would you expect to pick blue for their favourite house colour?”. Give the assignment a few days ahead of the day you will discuss it so that the students have time to think about the problem and try different types of solutions. Then, have the students share their ideas, strategies and reasoning. Discuss all ideas brought forward as a class and have the students draw conclusions about how they would solve such a problem. 6. Have the students go in pairs, with each partner receiving a different circle graph (these graphs could also be researched by the students). Have the students then create three or four questions about the information in the data graph and answer them. Next, have each student create a problem sheet for their partner using the circle graph and their questions. Encourage the students to write the questions out in order of increasing difficulty (they might even want to give each question a question mark rating from one question mark, ?, for easy to four question marks, ????, for the most difficult. The purpose of this ranking is not about whether they agree on the ranking of the difficulty of the question, but that they are thinking about different types of questions that could be asked). The partners then switch assignment sheets, do the questions, and then correct their partner’s answers using their own. If there are disagreements on the answer to a question, have the students consult a second pair of students. If there is still no agreement, bring the question forward to the entire class and discuss it. If the students each research to find their own circle graph, a booklet of the graphs and questions could be made up for students to refer to for extra practice. 7. Provide the students with a number of sets of data and ask them to consider whether or not the data would be well represented using a circle graph. Have the class discuss their ideas and reasoning. Have the students devise a list of criteria for selecting circle graphs to represent data. |