# Statistics and Probability Strand: Outcome SP4.1

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

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| **Outcome** | **Indicators** |
| SP4.1. Demonstrate an understanding of many-to-one correspondence by* comparing correspondences on graphs
* justifying the use of many-to-one intervals and correspondences
* interpreting data shown using a many-to-one correspondence
* creating bar graphs and pictographs using many-to-one correspondence.

[C, R, T, V]*In support of the K-12 Mathematics goals of Spatial Sense, Number Sense, Logical Thinking and Mathematical Attitude.* | 1. Compare graphs in which different correspondences are used and explain why the correspondence was used.
2. Compare graphs in which the same data have been displayed using one-to-one and many-to-one correspondences, and explain how they are the same and different.
3. Explain why many-to-one correspondence is sometimes used rather than one-to-one correspondence.
4. Find examples of graphs in which many-to-one correspondence is used in print and electronic media, such as newspapers, magazines, and the Internet, and describe the correspondence used.
5. Select a many-to-one correspondence for displaying a set of data in a graph and justify the choice.
6. Create and label (with categories, title, and legend) a pictograph to display a set of data using many-to-one correspondence, and justify the choice of correspondence used.
7. Create and label (with axes and title) a bar graph to display a set of data using many-to-one correspondence, and justify the choice of interval used.
8. Answer a question using a graph in which data are displayed using many-to-one correspondence.
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| **Learning Space:** [**Top**](#top) |
| Although it has not been referred to in such terms, the students’ exploration of place value has been one based upon pre-defined many-to-one correspondences: ten units correspond to one ten, ten tens correspond to one hundred, and so on. When working with data prior to grade 4, the students have studied concrete graphs, pictographs and bar graphs as methods of displaying data in which a one-to-one correspondence was used. In grade four, the students are continuing to look at displaying data with pictographs and bar graphs, but this time using a many-to-one correspondence.It is important for the students to realize the practicality of using a many-to-one correspondence. This can be done by giving the students large sets of data that have values that are greatly dispersed. Students need to understand that in using a many-to-one correspondence, some detail of the data is lost (individual values are no longer captured), however; each piece of data still has the same overall presence within the data.  |
| Data sources for the students’ study of statistical display and analysis in grade four should be relevant to the students’ interests and experiences. Populations sizes from the students’ study of Saskatchewan in social studies, daily caloric intake from health education, number of steps taken daily from physical education, and population sizes of plants and animals from science can serve as some sources of data that can also provide enough dispersion in the data to make many-to-one correspondence convenient as well as giving the students continuing experiences with whole numbers less than 10 000. Students may also be given decimal data to use in a data display.  |
| **What Students Should…** [**Top**](#top) |
| **Know*** the terms “one-to-one correspondence” and “many-to-one correspondence”
* the components of pictographs and bar graphs
 | **Understand*** the differences and similarities between graphs (pictographs and bar graphs) done with one-to-one correspondence and those done with many-to-one correspondence.
* reasoning for using either one-to-one correspondence or many-to-one correspondence.
* what the intervals in a many-to-one correspondence represent.
* how interpretation of graphs (pictographs and bar graphs) can be affected by the correspondence used in the graph.
* context and future applications can determine the correspondence used.
 | **Be Able to Do*** read and interpret graphs (pictographs and bar graphs) using many-to-one correspondence.
* create graphs (pictographs and bar graphs) using a many-to-one correspondence.
* select an appropriate interval for a many-to-one correspondence for a given set of data.
* identify errors in graphs (pictographs and bar graphs) of data that involve a many-to-one correspondence.
* change a data display from one-to-one correspondence to one with a many-to-one correspondence.
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| **Key Questions:** [**Top**](#top) |
| * Why might a many-to-one correspondence be used to graph collected data?
* How are data displays that use a one-to-one correspondence different from data displays that use a many-to-one correspondence?
* What does the graph tell you?
* What interval for a many-to-one correspondence would you use to display this data and why?
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| **Suggestions for assessment:** [**Top**](#top) |
| **Big Idea:**Many-to-one correspondences in data displays.**Suggestions for assessment tasks:**1. Provide the students with a set of graphs that include pictographs and bar graphs with either many-to-one or one-to-one correspondences. Include in the set graphs that represent the data in different ways. Ask the students to group together those graphs that represent the same data.
2. Provide the students two graphs and ask them to determine, with justification, whether the graphs could represent the same data.
3. Provide the students with a graph that uses a one-to-one correspondence and the context for the data in the graph. Ask the students to construct a graph using a many-to-one correspondence and to justify the choice of interval. Ask the students two questions to be answered using the new graph. One question should be such that it can’t be answered based on the new graph’s correspondence. For example, if the intervals are 5, then the question: “How many students read 22 books last year” cannot be answered using the graph with the many-to-one correspondence.

**What to look for:**See [*Data Analysis* Rubric](file:///C%3A%5CUsers%5Cru593%5CAppData%5CLocal%5CTemp%5CData%20Analysis%20Rubric.doc). |
| **Suggestions for instruction:** [**Top**](#top) |
| **Big Idea:**Many-to-one correspondences in data displays.**Suggestions for instructional activities:**1. In advance of beginning their study of this outcome, ask the students to start collecting examples of bar graphs and pictographs. Also collect some on your own, making sure that you have examples of both one-to-one and many-to-one correspondences being used in the graphs. Have the students turn in the graphs, print-outs of the graphs, or copies of the graphs. Copy the graphs on overheads, scan them into electronic files, or enlarge them on the photocopier – depending upon the technology available for your use in the classroom.

Select 10-12 examples and non-examples of bar graphs and pictographs that use many-to-one correspondences that you can use in a concept attainment activity as described below. Tell the students that in the next whole class activity they will be looking for patterns in a particular characteristic of pictographs and bar graphs. (Do not mention the terms “many-to-one correspondence”, “one-to-one correspondence” or “interval”). With categories of YES and NO on a t-chart, place one example of a graph with a many-to-one correspondence in the YES column and a non-example in the NO column. Tell the students that they are to think about, without saying out loud, why they think each graph has been put in the particular columns. It is important to select the order of the graphs carefully. Look for other relationships and patterns that the students might see – number of times a particular frequency occurs, overall shape of the graph, context, size of numbers and gradually provide them with examples or non-examples that might be misleading what they focus on. In most concept attainment activities, two or three sets of non-examples and examples are needed, but gauge this by the responses of your students – it may take more. Gradually start showing the students a new graph and ask them, by show of hands to say whether they believe it is an example or non-example. At first, look for answers that are very close to consensus or else put it into an “Not sure” column or area that can be returned to at a later date. Even if the student’s decision is incorrect, put it in the column they are indicating. Even at this time ask the students to not discuss their thinking or ideas. If the students place a graph in the wrong column, you can later tell the students you want to put up a graph that is specifically either a yes or no (make it one that will contradict what they did before), or if you are running out of examples suggest that you would like to switch one that they have placed previously. Invite the students to suggest placement of the “Not sure” graphs as you move through more examples and start inviting students, either in the majority or the minority, to share their reasoning. Challenge the other students to find counter-examples to the reasoning, or if there aren’t any, place a new example up that will counter their theory. Once the students have narrowed the focus and are able to describe many-to-one correspondence in their own words, introduce the term to them and tell them this is the characteristic the class was working towards.Have the students discuss what makes a graph have a many-to-one correspondence or one-to-one correspondence. Introduce the term “interval” as a way of describing the numerical divisions in a many-to-one correspondence. Ask the students to make their own “notes” about what many-to-one correspondence means.1. From the remaining examples that the students turned in, provide pairs of students a set of graphs that contain pictographs and bar graphs with both many-to-one and one-to-one correspondence and ask the students to sort the graphs to show the type of graphs and also the type of correspondences. Some students might use a Carroll diagram, others a Venn diagram, and others just four piles. Have different pairs share their sorting with the class and explain their strategies. If the students consistently use only one method of representing their sorting, ask them to try showing it in another way. It is important that students be flexible in their representation strategies.
2. Give the students another (or use the same) set of pictographs and bar graphs, and in pairs, ask them to use those examples to come up with reasons why many-to-one and one-to-one correspondences might be used. Have the pairs get into small groups, up to six students, and share the reasons that they came up with. End the activity with a class discussion in which the students share and clarify the reasons that they have come up with. Also have the class discuss the advantages and disadvantages that they think each type of correspondence has.
3. Have the students collect a set of data based on their learnings from another subject area, or related to a personal interest. Tell the students they must collect data they would want to use a many-to-one correspondence for. When the data has been collected ask the students to create a graph of the data using a many-to-one correspondence. Along with the graph, ask the students to provide an explanation of why the particular correspondence they chose was appropriate. Also ask the students to draw one conclusion based upon their graphs.
4. Provide the students with data involving tenths and hundredths and ask them to create a graph to display the data. Have the students compare their graphs and also discuss any challenges they had in working with decimal numbers.
5. In pairs, provide the students with a graph that was created with a one-to-one correspondence. The students’ task is to determine the original data set and also create a new graph that is created using a many-to-one correspondence.
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