GRADE 2 MATHEMATICS

Statistics and Probability

Grade 2: Statistics (Data Analysis) (2.SP.1, 2.SP.2)

Enduring Understandings:

Data can be collected and organized in a variety of ways.
Data can be used to answer questions.

Essential Questions:

Why do we collect data?
How can data be collected and recorded?

Specific Learning Outcome(s):	Achievement Indicators:
2.SP.1 Gather and record data about self and others to answer questions. [C, CN, PS, V]	➛ Formulate a question that can be answered by gathering information about self and others. ➛ Organize data as it is collected using concrete objects, tallies, checkmarks, charts, or lists. ➛ Answer questions using collected data.
2.SP.2 Construct and interpret concrete graphs and pictographs to solve problems. [C, CN, PS, R, V]	➛ Determine the common attributes of concrete graphs by comparing a set of concrete graphs. ➛ Determine the common attributes of pictographs by comparing a set of pictographs. ➛ Answer questions pertaining to a concrete graph or pictograph. ➛ Create a concrete graph to display a set of data and draw conclusions. ➛ Create a pictograph to represent a set of data using one-to-one correspondence. ➛ Solve a problem by constructing and interpreting a concrete graph or pictograph.

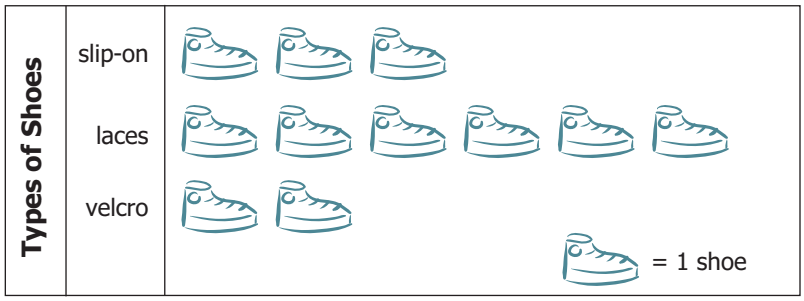
Prior Knowledge

Students may have had no formal instruction in statistics.

Background Information

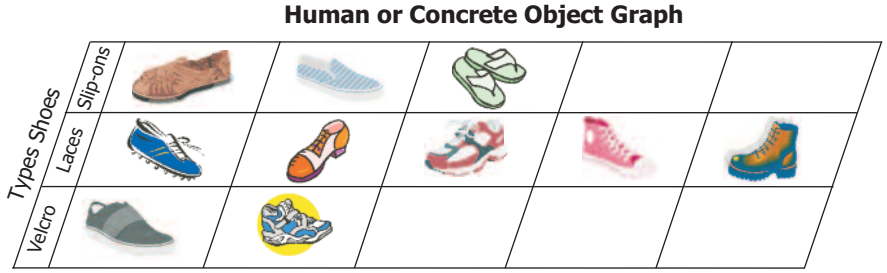
A **pictograph** uses uniform, representative pictures to depict quantities of objects or people. It is used when the data are discrete (non-continuous). The symbols used must be the same size and shape to avoid misleading the audience.

Example of a pictograph:



Pictographs need to have a title, labels, and pictures. Legends/keys are needed when the pictures or symbols are used to represent more than one quantity (many-to-one correspondence).

A **concrete graph** is made using the actual objects or people on a graphing mat.



Concrete graphs need to have a title and labels.

A **graphing mat** is made from thick plastic sheeting (the type that can be bought off the roll at a hardware store). One side has squares large enough for a person to stand on. These are made using masking tape. There is usually room for three columns and 10 rows. The second side has tile-sized squares again made with masking tape. There is usually room for five columns and at least 12 rows.

As children collect objects, they naturally sort, count, and compare. Sorting, counting, and comparing are the basis for understanding statistics. Children also naturally ask questions to gather information. Teachers can use classroom experiences as sources of information to capitalize on children's interests and to help them see that statistics are a part of everyday life. As well, data collection provides a way to connect mathematics to other subject areas. Good questions are an integral part of data collection. Students need practice formulating questions in more than one way. By examining the possible answers to a set of similar questions, students can determine which one will best provide the desired data.

Note: Surveys should be made manageable by obtaining information from a small population (e.g., no larger than a single class), and by limiting the number of categories to two or three.

Teachers need to model and develop the language of statistics in oral and written formats.

Mathematical Language

categories	match	least
label	more	concrete graph
title	less	pictograph
data	same amount as	compare
tallies	most	survey

Learning Experiences

Assessing Prior Knowledge

Present a question such as, "Do you have a pet at home?"

Ask students what answers are possible (yes or no). Ask for suggestions as to how you might gather the information. The suggestions they make should reflect their prior experience.

Complete the survey and discuss the results.

- **Formulate a question that can be answered by gathering information about self and others.**
- **Organize data as it is collected using concrete objects, tallies, checkmarks, charts, or lists.**
- **Answer questions using collected data.**

Suggestions for Instruction

- Read a book such as *The Best Vacation Ever* by Stuart J. Murphy or *Charlie's Checklist* by Rory S. Lerman. Both books have characters that formulate questions and gather data. Discuss the questions chosen and the methods used to gather and record the data.
- Model the formulation of questions, such as
  - "I wonder . . ."
  - "How can we find out?"
  - "Whom shall we ask?"
- Use everyday occurrences to formulate questions about the children's environment.

  Sample questions:
  - "How do you travel to school?"
  - "Which kind of pizza did you order?"
  - "Which author should we read this week?"
  - "How many times can you hop on one foot?"
  - "What is your favourite animal?"
- Model questions on the same topic in several ways and allow the group to choose the best question for its purpose. This is an important process of data collection that they will need to practise.

  Examples:
  - "How did you travel to school today?"
  - "Did you walk to school today?"
  - "How many children in our class used the school bus today?"

- Select a survey question that can be answered "yes" or "no." Model ways in which the data can be collected.

  Examples:

  - two different colours of unifix cubes (one for "yes" and the other for "no")
  - tallies
  - a class list and writing "yes" or "no" beside each person's name
  - checkmarks

  Have students answer questions about the data.

  Examples:

  - Which one has the most/least?
  - How many more? How many less?
  - How many people were surveyed altogether?

- Math Routine: Question of the Week

  Have pairs of students take turns formulating a survey question, collecting the data, representing it, and then presenting their findings to the class.

  This can be used as formative assessment.

Assessing Understanding

Students work in pairs. Have each group formulate a survey question, collect the data, and summarize the results by making statements about the data.

- **Determine the common attributes of concrete graphs and of pictographs by comparing a set of concrete graphs and a set of pictographs respectively.**
- **Answer questions pertaining to a concrete graph or pictograph.**
- **Create a concrete graph to display a set of data and draw conclusions.**
- **Create a pictograph to represent a set of data using one-to-one correspondence.**
- **Solve a problem by constructing and interpreting a concrete graph or pictograph.**

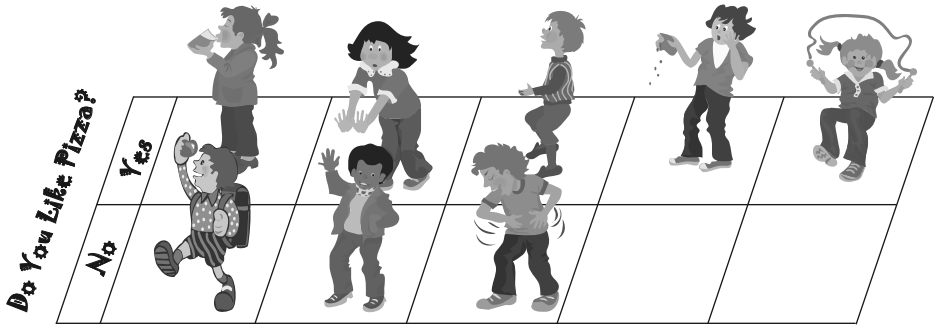
Suggestions for Instruction

- Model the construction of a concrete graph. Have students formulate a question and decide the answer choices. Make a label for each choice. Decide on a title for the graph and write it on a strip of paper. Place the labels at the bottom of each column of the graphing mat and the title at the top or on the side. Have students stand in the appropriate column. Students need to be shown how to line up on the graphing mat—start at the bottom, one person in each square, do not skip squares. Discuss the results. Demonstrate the use of one-to-one matching as a strategy for comparing the data. Have students hold hands with someone from the next column and count students without partners to determine the difference.

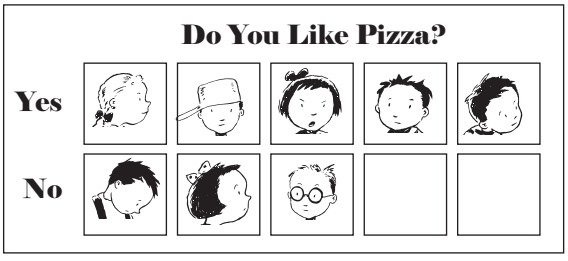
  Individual graphing mats can be made from checkered or striped vinyl.

  Note: Data can be transferred to the pictograph using a small grid and student pictures.

  Concrete Graph



  Pictograph



  Note: Although pictographs consist of uniform pictures, use student photographs on a similar background to make a class pictograph.

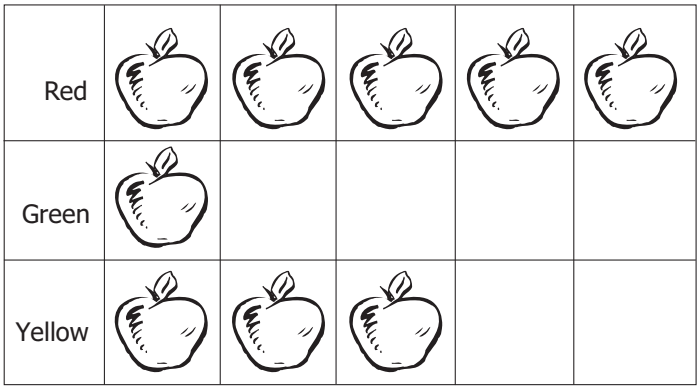
- Use coloured cubes, pasta, cereal, or candies, and a small graphing mat. From the collection of objects have students select one that represents their favourite colour. Make colour labels and a title for the graph. Have students place their object in the correct column on the graph. Change the concrete graph to a pictograph by having students substitute a coloured square or circle for the actual object. Discuss the similarities and differences between the two graph types.
- Have students create three different representations of the same set of data.

  Example:

  Glue coloured pasta on the first grid. On the second grid, draw and color pasta pieces to represent the same information that is on the first one. Lastly, represent the same data with tallies. Discuss how the three grids are the same and how they are different.
- Construct two different concrete graphs. Have students compare the graphs and identify the common attributes (title, labels).
- Construct two different pictographs. Have students compare the graphs and identify the common attributes (title, labels).
- In preparation for the interpretation of data, lead students to ask and answer questions about the information on graphs.

  Example:

Favourite Apple Colours



Sample questions:

- What does the pictograph show? How do you know?
- What does this tell about the colours of apples?
- Which do we like most? least?
- How many more are there of our most favourite colour than our least favourite colour?
- Which do we like more—yellow or green? How do you know?
- How many people were surveyed? How do you know?

- Provide meaningful opportunities for students to collect, represent, and interpret data.

  Examples:
  - vote on a class book to read
  - collect data on the number of sunny, cloudy, rainy, snowy days in a particular month
  - decide on a game to play for indoor recess

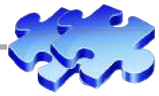
The science, social studies, and health curricula provide meaningful contexts for working with data.

Assessing Understanding

1. Show students a concrete graph or a pictograph. Have students describe, orally or in writing, what the graph is showing (interpret the data).
2. Give students a set of data.
   Example:

Do you have a cat?	
Yes	**No**
𝍸 |||	𝍸

   Have students construct a concrete graph or pictograph using the data.



Planning a Class Celebration

Context

Tell students that they are going to be planning a class celebration/special event. Have them brainstorm for things they would like to have at the celebration (food, games, beverage, music, movie, etc.).

Have students work in partners or small groups. Assign each group (or have groups select) a category from the brainstormed list. Have each group

- formulate a question
- determine the answer choices
- collect the data
- represent the data in graph form
- summarize the data in written form
- present the results to the class

NOTES