STATISTICS AND PROBABILITY
GRADE 3

Western and Northern Canadian Protocol (WNCP) Edition

hands-on mathematics

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Contents

Introduction

The Statistics and Probability module explores the collection, organization, and interpretation of data. Ultimately, the goal of this module is for students to see relationships between statistics and probability and other strands of the mathematics curriculum.

Lessons in this module focus on students' abilities to respond to information they have collected, present it in a variety of ways, and draw conclusions from it. Students use a variety of strategies to collect and organize the data; then they observe it, measure it, experiment with it, and interpret it, as well as use it to draw conclusions and extend the information.

Students also compare and evaluate different methods of gathering data and develop skills in reading information in one format and transferring it to another. They also learn how to conduct probability experiments and draw conclusions about fairness from these experiments.

As with any mathematics topic, it is important for students to understand how data collection and probability fit into the world around them. Accordingly, students are introduced to key probability terms such as *likely, unlikely, always*, and *never*, and they use these terms in relation to weather forecasting as well as activities in their daily lives. Students are also given opportunities to collect information from online resources and to use technology to help them create data-management tools.

Most of the lessons in this module involve several steps and should be completed over the course of several days. Lessons provide opportunities for students of all ability levels to participate and to be challenged.

Mathematics Vocabulary

Continue to use your classroom mathematics word wall for displaying new vocabulary as it is introduced. Throughout this module, teachers should use, and encourage students to use, vocabulary such as: *data, information, survey, tally, chart, Venn diagram, Carroll diagram, pictograph, bar graph, line plot, hypothesis, probability, certain, likely, unlikely, always, never*, and *chance*.

1 Literature Connections

Background Information for Teachers

This lesson explores information collection focusing specifically on use of the survey. Although the lesson would be suitable at any time of year, it fits particularly well with *I Love to Read Month* in February, because students collect information about literature.

Materials

- overhead transparency of Activity Sheet A (2.1.1)
- overhead projector
- chart paper
- markers
- class list
- Internet access
- graph paper
- coloured pencils or markers
- books by several of students' favourite authors
- sticky notes

Activity: Part One

Begin the activity by discussing some of students' favourite authors. Ask:

- Who can name a favourite author?
- What kinds of stories does _____ (the author) write?
- What makes _____'s writing so appealing?
- What is an example of a book _____ wrote?

Repeat this line of questioning several times to elicit a list of students' favourite authors and books. Record their responses on chart paper.

Explain to students that they will now survey their classmates about one literature-related topic and then display their results on a bar graph. Brainstorm a list of topics about which students could collect and graph information, and record these topics on chart paper. Some examples include:

- most popular author
- most interesting book
- favourite literary genre (fantasy/fairytale, mystery, and so on)
- best bookstore
- funniest story character
- meanest story villain
- strangest fairytale character
- most admirable story hero

Have each student choose one of the ideas about which to survey his/her classmates. Ask:

- What question could you ask to find the information you are looking for?
- How can you make sure you ask each student in the class your question?

If students do not come up with the idea of using a class list, suggest that this would be a valuable tool to ensure that they have surveyed all their classmates. Depending on students' experience conducting surveys, you may also wish to review this process with them.

Display the overhead transparency of Activity Sheet A (2.1.1) on the overhead. Tell students they must determine what question they will ask their classmates as well as four or five possible choices for answers.

Note: Discuss how students can ensure that most of their surveyed classmates will be represented in the possible answer choices. For example, students can include "other" as one of their answer choices.

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Distribute Activity Sheet A (2.1.1), and have students record their questions and answers and then conduct their surveys. Consider also distributing a copy of the class list to help students ensure they have surveyed all their classmates.

Activity Sheet A

Directions to students

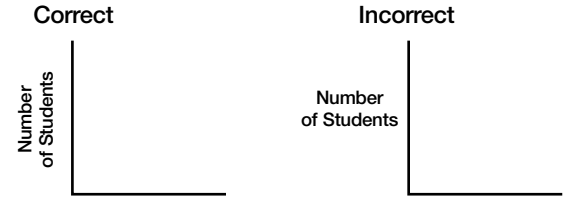
Record your question about which you will survey your classmates. Record four or five possible choices for answers. Ask each student in the class your question, and record their answers (2.1.1).

To review how to create a bar graph with the information they have collected, have students visit the "Create a Graph" link of the National Center for Education Statistics Students' Classroom website at http://www.nces.ed.gov/nceskids/graphing.

Note: Depending on students' experience creating graphs, you may wish to review the process with them in more detail.

Distribute graph paper to students, and have them graph the information they collected from their surveys. While students work, circulate through the classroom, and assess their understanding of data collection and display.

Note: When labelling their graphs, be sure students use correct print orientation. On the vertical axis, the print should appear sideways, with the bottoms of the letters closest to the axis line. The following example shows both the correct and the incorrect format:



When students have completed their graphs, explain that they will now present them to the rest of the class. Have each student write three questions to ask their classmates about the data on his/her graph. For example:

- How many students preferred mysteries over biographies?
- Which author is more popular among students: Robert Munsch or Beverly Cleary?
- How many students did I survey altogether?

Then, have students take turns presenting their graphs and asking their questions to the rest of the class.

Activity: Part Two

Before beginning this activity, prepare a chart like the following on chart paper:

Fiction	Science Fiction	Mystery	Non Fiction	Fantasy	Poetry

Show students the chart, and discuss each of the literary genres recorded on it. Have students identify familiar books that fall into each category. Also, review the definition of the word *genre* with students.

Give each student a sticky note, and have students write their names on their notes. Ask students to come up to the chart one by one and attach their sticky notes onto the column that best describes the literary genre they prefer. Then, distribute Activity Sheet B (2.1.2), and have students use the information from the class chart to complete it.

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Activity Sheet B

Directions to students:

Use information from the class chart to complete the activity sheet (2.1.2).

Problem Solving

Jacob surveys his classmates to see which Robert Munsch book they think is the funniest. Altogether, he surveys 24 students. Half of the students say they think *Pigs* is the funniest Robert Munsch book. One quarter say they like *Mmm, Cookies!* the best. One eighth say *Stephanie's Ponytail* is the funniest. The rest pick different books. How many students think each of the top three book choices is the funniest?

Note: A reproducible master for this problem can be found on page 85.

Activity Centre

Place a variety of books at an activity centre. Ask students to sort the books according to two or more attributes. Have students challenge classmates to guess their sorting rules.

Extension

Many authors have their own websites, which contain a wealth of autobiographical information. Have students research their favourite authors online, looking for details about the genres in which the authors write, the number of books they have written, and so on. Then, ask students to present their data to the rest of the class using graphs, tables, or diagrams (Venn, Carroll).

Assessment Suggestion

Review students' completed bar graphs to assess their abilities to:

- accurately transfer data from a tally to a bar graph
- give the graph an appropriate title
- label the graph axes appropriately
- calibrate the vertical axis

List these criteria on the Rubric sheet, found on page 16, and record your results.

Date: _____ **Name:** _____

Literary Survey

Survey Question: _____

_____

Answer Choices:

1	
2	
3	
4	
5	

Date: _____ **Name:** _____

Literary Genres

What is the favourite literary genre among students in the class?

_____

What is the least favourite literary genre among students in the class?

_____

How could you use this information to make suggestions to the school librarian or principal about which types of books to purchase for the school library?

_____

_____

_____

Survey your classmates to complete the Carroll diagram below:

Survey Question: What kinds of books do you prefer?

	Fiction	Nonfiction
Picture Books		
Chapter Books (no pictures)		