

# GRADE 3 MATHEMATICS

Statistics and Probability (Data Analysis)



# Grade 3: Statistics and Probability (Data Analysis) (3.SP.1, 3.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:
<p><b>3.SP.1</b> Collect first-hand data and organize it using</p> <ul style="list-style-type: none"> <li>■ tally marks</li> <li>■ line plots</li> <li>■ charts</li> <li>■ lists</li> </ul> <p>to answer questions. [C, CN, V]</p>	<ul style="list-style-type: none"> <li>→ Record the number of objects in a set using tally marks.</li> <li>→ Determine the attributes of line plots.</li> <li>→ Organize a set of data using tally marks, line plots, charts, or lists.</li> <li>→ Collect and organize data using tally marks, line plots, charts, or lists.</li> <li>→ Answer questions arising from a line plot, chart, or list.</li> <li>→ Answer questions using collected data.</li> </ul>
<p><b>3.SP.2</b> Construct, label, and interpret bar graphs to solve problems. [PS, R, V]</p>	<ul style="list-style-type: none"> <li>→ Determine the attributes of bar graphs.</li> <li>→ Create bar graphs from a set of data including labelling the title and axes.</li> <li>→ Draw conclusions from a bar graph to solve problems.</li> <li>→ Solve problems by constructing and interpreting a bar graph.</li> </ul>

## PRIOR KNOWLEDGE

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Students may have formulated questions and collected data using concrete objects, tallies, check marks, charts, or lists. They may have constructed and interpreted concrete graphs and pictographs to solve problems.

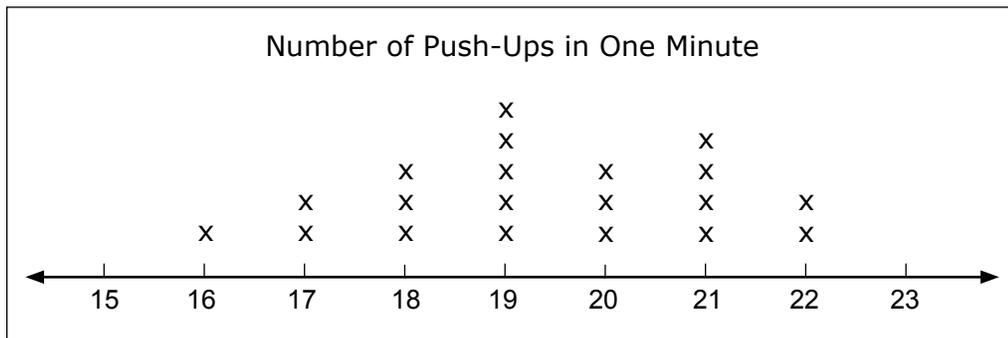
## BACKGROUND INFORMATION

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Students need to develop strategies to collect and record information using first-hand data. First-hand data is information that people collect on their own by counting, conducting polls, conducting experiments, or using measuring devices. The first-hand data should relate to the students and the community they live in. The goal is to have students communicate their understanding by recording data in an organized manner and by answering, asking, and writing questions concerning the data.

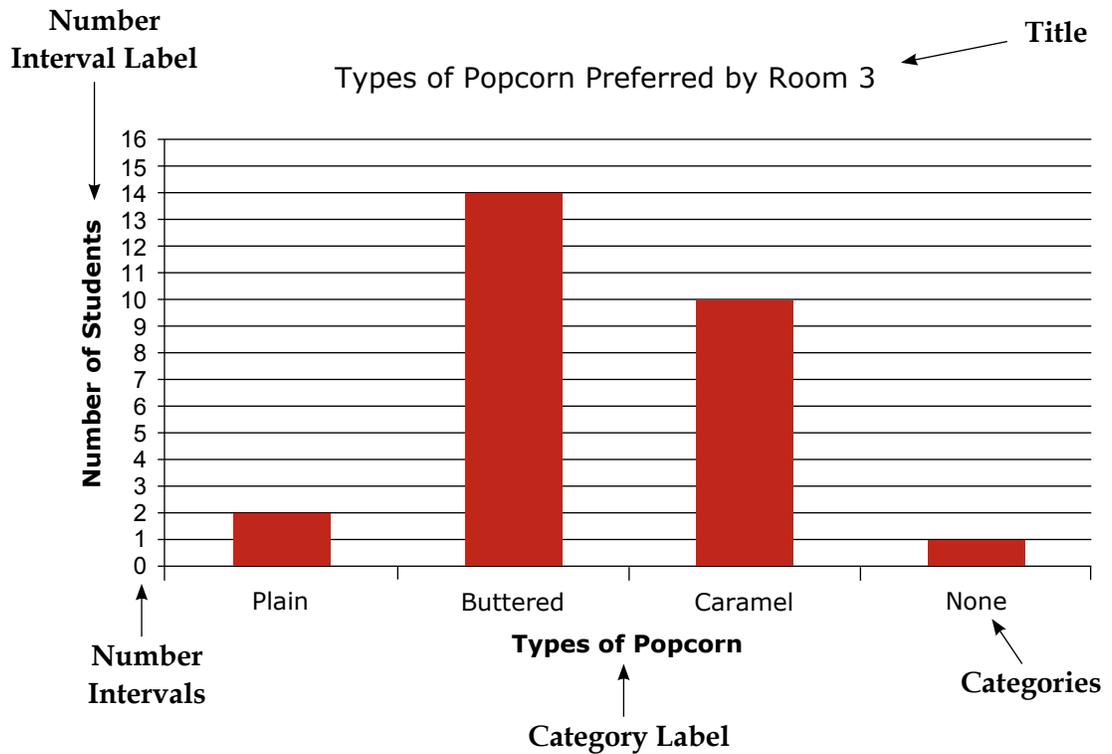
**Line Plot:** A number line on which each number in a set of data is plotted by making a mark (usually an X or a large dot) above that number on the number line.

Example:



**Bar Graph:** A bar graph is a graph that uses horizontal or vertical bars to display data.

Example:



A bar graph needs the following labels:

- title
- categories
- category label
- number intervals (Note: Numbers are labelled on the line not the space.)
- number interval label

Generally the data graphed at the elementary level is discrete data (data attained by counting in whole numbers). In this case, there are always spaces left between the bars.

**Chart:** A chart is a diagram that illustrates information in the form of a table, graph, or picture.

Example of a table:

<b>Name</b>	<b>Dog</b>	<b>Cat</b>
Mark	✓	
Allan	✓	
Dan		✓
Violet		✓
Sarah	✓	
Ryan	✓	
Jeanne	✓	✓

## MATHEMATICAL LANGUAGE

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categories

label

title

data

tallies

match

more

less

same amount as

most

least

bar graph

line plot

compare

survey

number intervals

chart

list

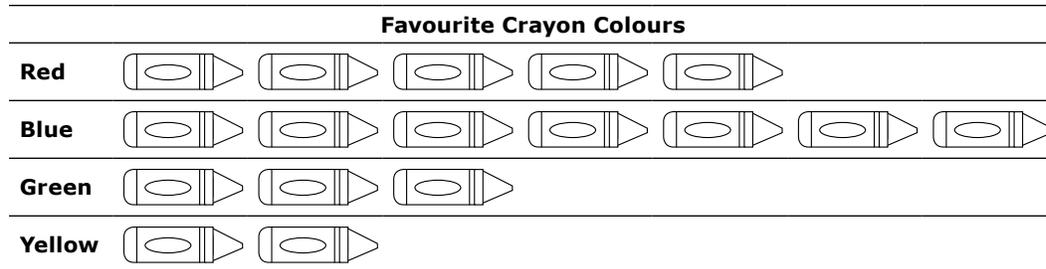
axes

## LEARNING EXPERIENCES



### Assessing Prior Knowledge

Present students with the following pictograph.



- Have students describe, orally or in writing, what the graph is showing (interpret the data). Use guiding questions if needed.
  - What does the pictograph show? How do you know?
  - What does this tell about the colours of crayons?
  - 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—red or green? How do you know?
  - How many people were surveyed? How do you know?
- Give students a set of data. Have them construct a concrete graph.

Do you like winter?	
Yes	No
	

#### Look for:

The student is able to

- describe the data represented on a pictograph
- answer questions pertaining to a pictograph
- create a concrete graph to display a given set of data
- answer questions pertaining to a concrete graph
- use mathematical language correctly

- Record the number of objects in a set using tally marks.
- Determine the attributes of line plots.
- Organize a set of data using tally marks, line plots, charts, or lists.
- Collect and organize data using tally marks, line plots, charts, or lists.
- Answer questions arising from a line plot, chart, or list.
- Answer questions using collected data.

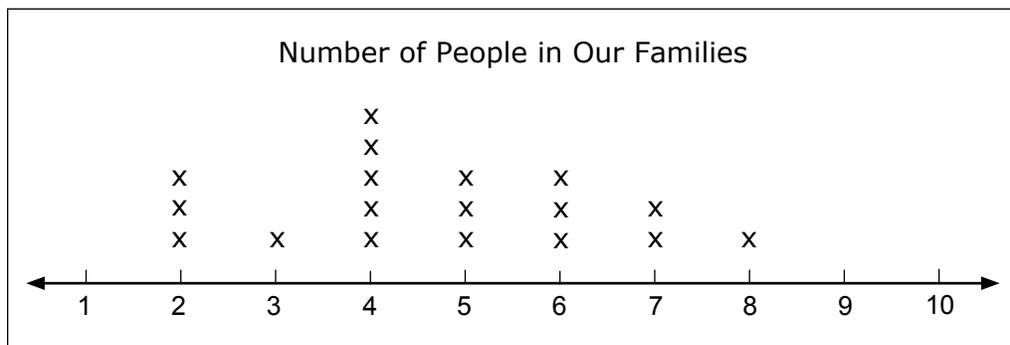
### Suggestions for Instruction

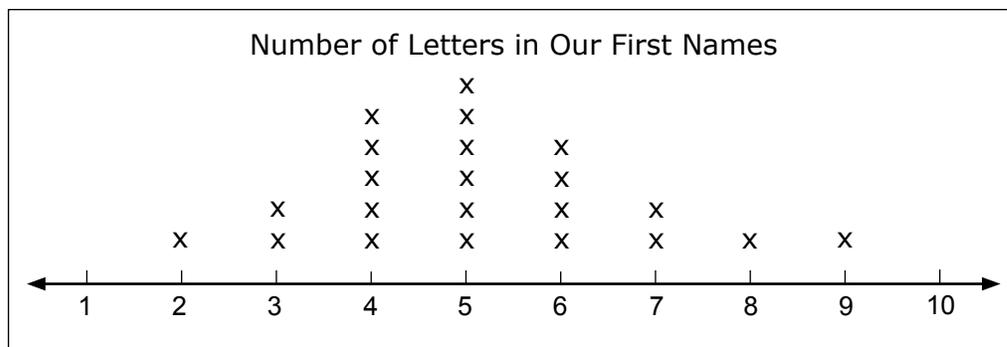
- Review the use of tally marks with students by
  - reading a book such as *Tally Charts* by Vijaya Khisty Bodach
  - having them take a handful of counters, cubes, et cetera, and record the number of objects in the set using tallies
  - having them do their own “Yes/No” survey and collect and record the data using tallies
- Create two or more line plots with the students. Use the class graphs or the pre-made graphs below. Have students look at the similarities between the line plots in order to identify their attributes.

Example:

Line plots have

- a number line
- Xs to represent the data
- a title





- **Investigation:** Each student in Room 10 was asked how many pockets they had.

This was the data collected.

Our Pockets—Room 10
3, 4, 7, 0, 1, 6
2, 4, 4, 0, 2, 4
2, 1, 0, 2, 0, 2
0, 4, 3, 2, 3, 5

- a. Show this information on a line plot.
- b. Collect the same information from the children in your class.
- c. Show this information on a line plot.
- d. Describe how your information is the same as or different from Room 10's.




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### Assessing Understanding

Develop criteria with the students. Possible criteria might include the following:

- Room 10's information is correctly displayed on a line plot.
  - Our class information is collected in an organized way.
  - Our class information is correctly displayed on a line plot.
  - Both line plots have a title and a number line.
  - Information is compared using "math language."
-

- Ten Grade 3 students were asked how they came to school. Three different methods were used to gather the data.
  - What information does each method provide?
  - Which method do you prefer? Explain your thinking.

**Chart**

<b>Car</b>	<b>Bus</b>	<b>Walk</b>	<b>Bike</b>
Sean Pam	Sasha Chen Arthur	Henri	Sarah Otis George Raven

**List**

car
bus
walk
bus
bike
car
bike
bus
bike
bike

**Tally**

<b>Transport</b>	<b>Number</b>
Car	
Bus	
Walk	
Bike	

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

Examples:

- special lunches, events, et cetera, over the school year
- surveys (classroom/school) on current issues (e.g., sustainable development)
- student-created questions:
  - How many pets do you have at home?
  - How many windows/rooms/doors are in your house?
  - How many telephones/televisions are in your house?
  - How many letters are in your first name?
  - How many letters are in your last name?
  - How many vowels are in your name?
  - In which month were you born?
  - What is your favourite single-digit number?

**Note:** The science, social studies, and physical education/health education curricula provide meaningful contexts for working with data.

Literacy with ICT can be integrated into this strand (collecting and displaying data).

- **Determine the attributes of bar graphs.**
- **Create bar graphs from a set of data including labelling the title and axes.**
- **Draw conclusions from a bar graph to solve problems.**
- **Solve problems by constructing and interpreting a bar graph.**

## Suggestions for Instruction

**Note:** Students should be able to construct a bar graph, but more importantly they need to be able to interpret the graph and to use the information to solve problems. The majority of time spent working on bar graphs should be on the interpretation rather than on the construction.

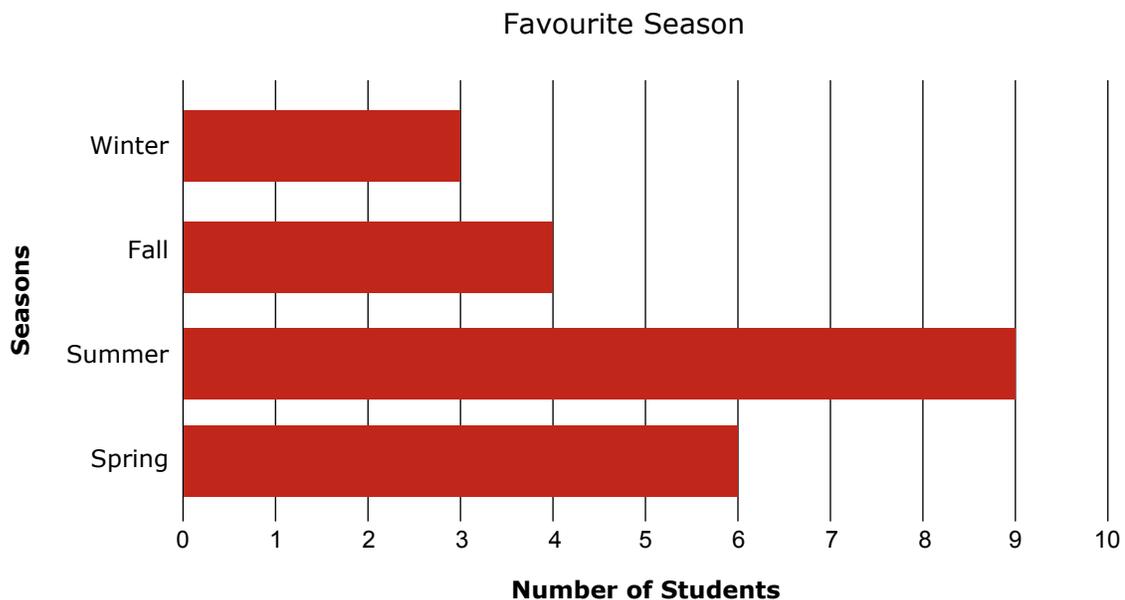
- Create two or more bar graphs with the students. Use the class graphs or the pre-made graphs below. Have students look at the similarities between the graphs in order to identify their attributes.

Example:

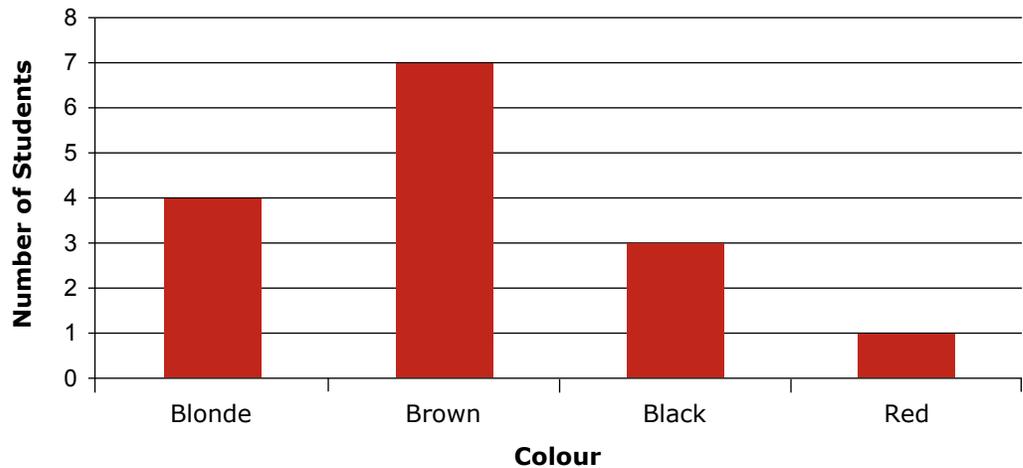
Bar graphs have

- title
- axes (numbers and categories)
- labels (number axis and categories axis)
- bars

**Note:** Spaces should be left between the bars because the data graphed at this level is generally discrete data.



Room 3 Hair Colour



- Use the identified attributes to develop criteria for students to use for self-assessment.

Example:

My Five Star Graph has
☆ a title
☆ both axes labelled
☆ the choices/categories labelled
☆ the numbers labelled on the lines
☆ the bars filled in correctly

- **Thinking Critically:** Once students are familiar with the attributes of bar graphs, read them a book such as *Lemonade for Sale* by Stuart J. Murphy, illustrated by Tricia Tusa (Math Start Level 3), or *Fair is Fair!* by Jennifer Dussling, illustrated by Diane Palmisciano (Math Matters). Both books have the characters use bar graphs to solve a problem, but there are problems in the way the graphs are presented (axes are not labelled in *Lemonade for Sale*, spaces are not left between the bars in *Fair is Fair!*).  
Read the book (showing the pictures) and see if the students notice the errors.

**BLM**  
**3.SP.2.1**

- Have students complete a “Data about Me” sheet after brainstorming a list of information the class wants to collect.

Post the data sheets (or have them in a binder/report cover).

Assign individuals or groups of students to one of the areas. Have them compile the data and then represent it on a bar graph.

When students have collected, organized, and displayed the data, they should share and discuss results with classmates.

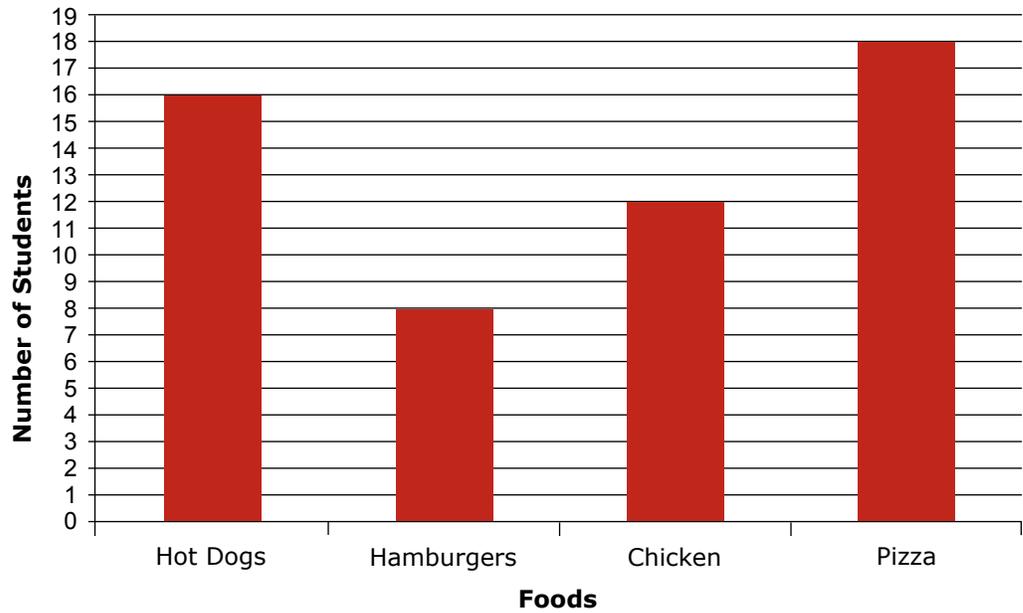
Sample “Data about Me” sheet:

The image shows a sample "Data about Me" sheet template. It is enclosed in a large rectangular border. In the center is a starburst shape containing the text "Data about Me". Surrounding this central shape are six other shapes, each containing a question for data collection:

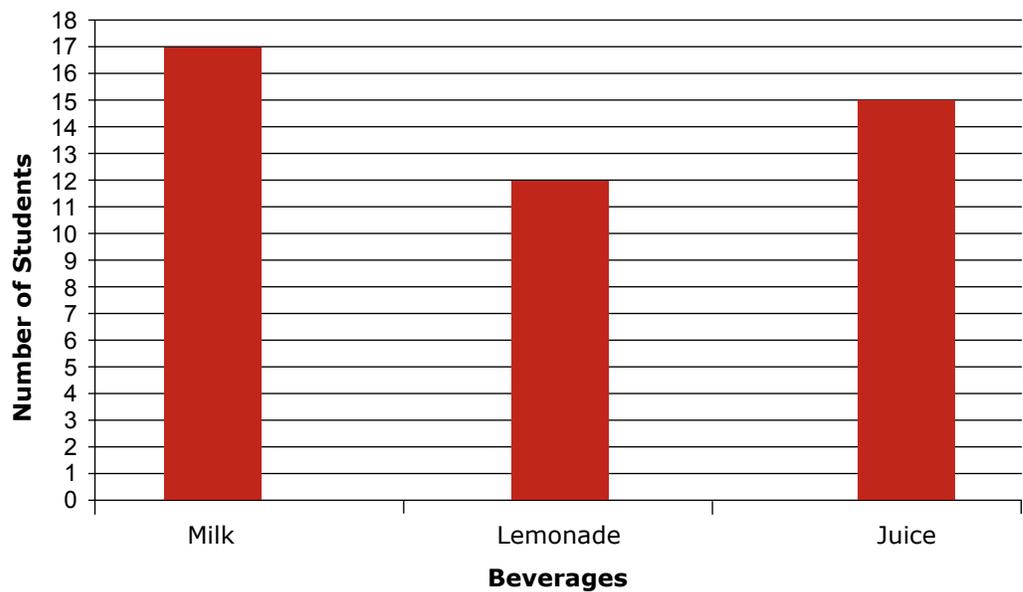
- A rectangle in the top-left corner with the text "Number of People in My Family".
- An octagon in the top-right corner with the text "Type of Pets".
- An oval on the left side with the text "Hair Colour".
- A pentagon on the right side with the text "Birthday Month".
- A triangle in the bottom-left corner with the text "Favourite Season".
- A rounded rectangle in the bottom-right corner with the text "Favourite Day of the Week".

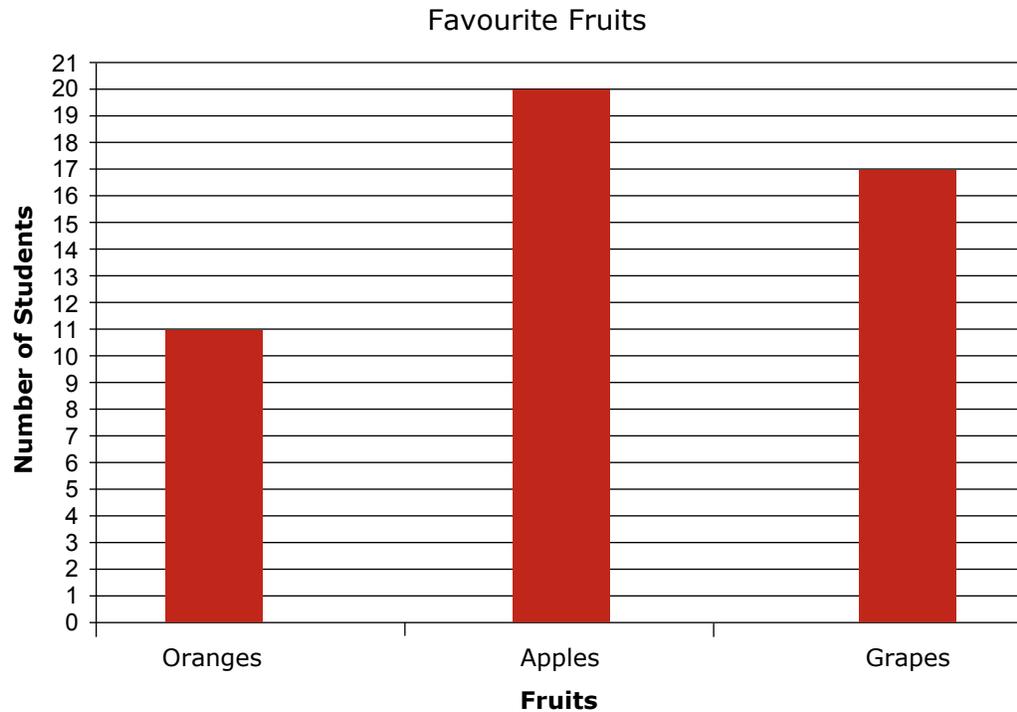
- **Problem Solving:** The parent group in the school is planning a special lunch. They surveyed some of the students to determine what they should serve. Here are the results:

Favourite Foods



Favourite Beverages





Use the data from the graphs. Write a note to the parent group explaining what food, beverage, and fruit they should serve. Be specific. Use both numbers and words to support your choices.

Expect students to use some comparison statements (e.g., Eleven students chose oranges. Six more students chose grapes than oranges. Apples had the most votes with 20).



### Planning a Math Night

**Context:** Explain to students that they are going to be planning a Math Night for their class/grade. Have them brainstorm things they need to consider (e.g., time, night of the week, refreshments, activities for each strand).

Have students work in partners or small groups. Assign each group (or have groups select) a topic or sub-topic (strand activities would have to be divided) from the brainstormed list. Have each group

- formulate a question
- determine the answer choices
- collect and organize the data
- represent the data using a line plot or bar graph
- summarize the data in written form
- present the results to the class

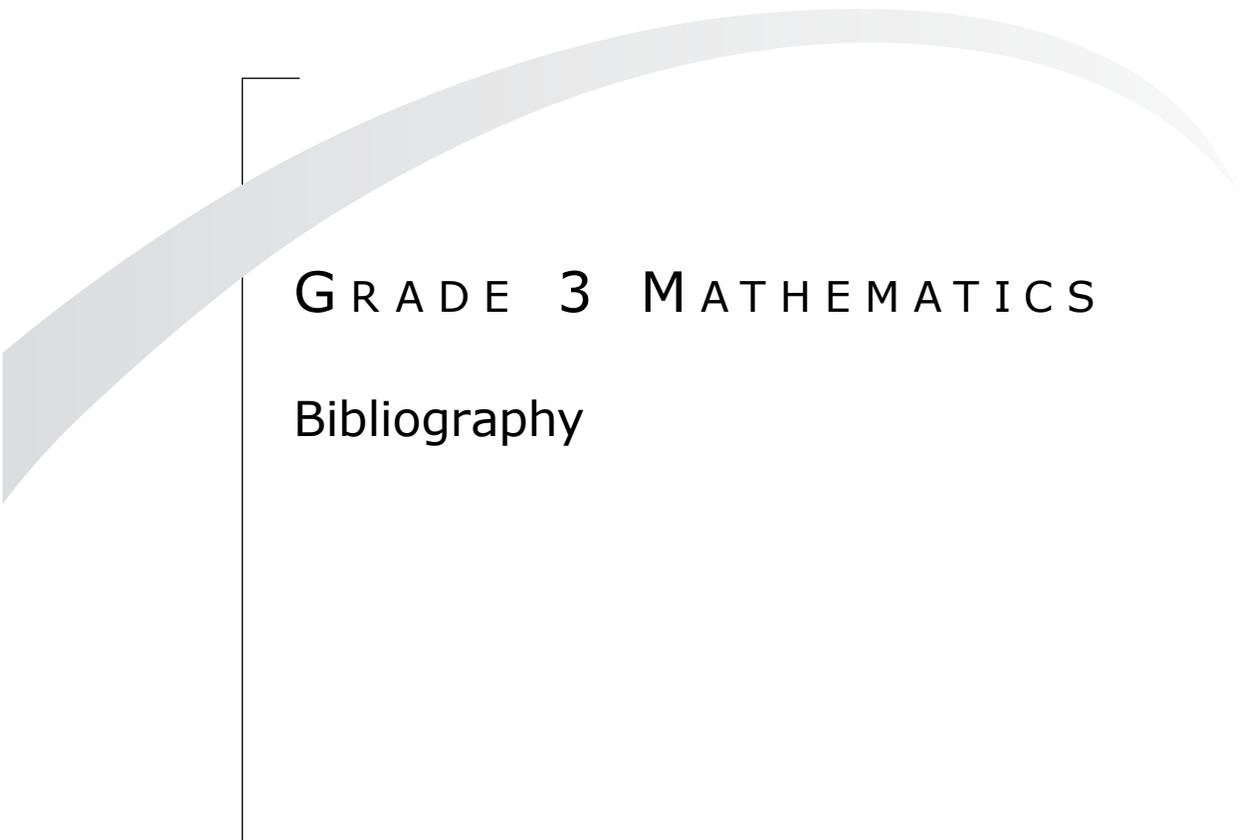
### Assessment Criteria:

Use the following assessment criteria:

- Question is clearly stated.
- Choices answer the question.
- Data is collected and organized.
- Representation of the data is accurate.
- Line plot/bar graph is correctly labelled.
- Data summary gives an accurate picture of the findings.
- Findings are presented in a clear, concise manner.

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## Notes



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Bibliography

