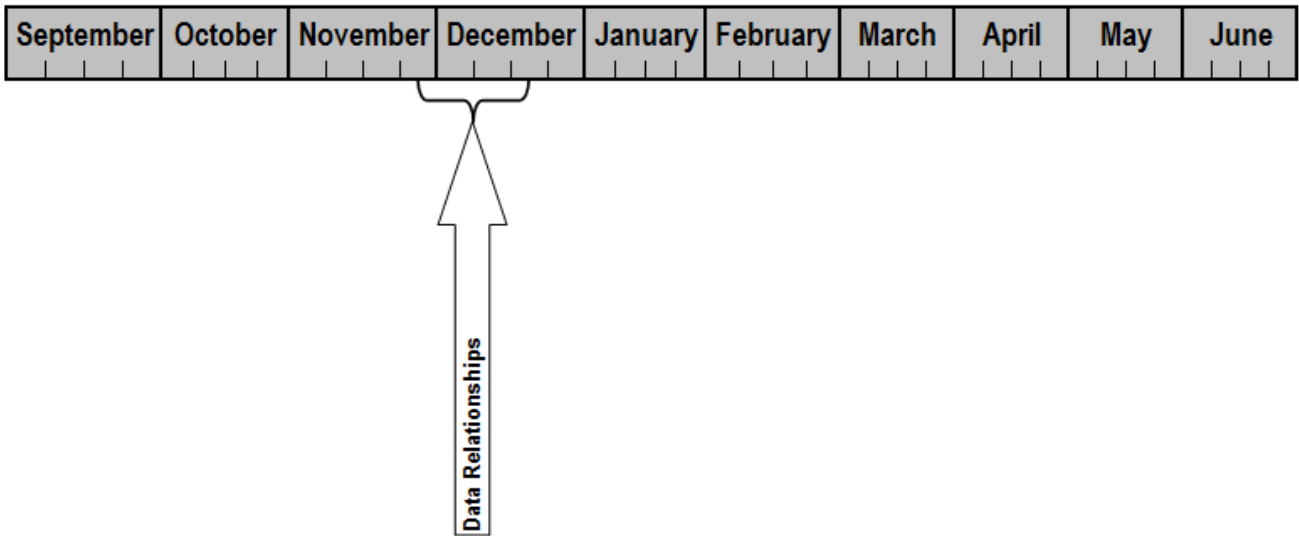


Data Relationships

Suggested Time: 3 Weeks



Unit Overview

Focus and Context

As students begin to understand ways of representing data, they will be ready to compare two or more data sets. Books, newspapers, the World Wide Web, and the media are full of displays of data, and by Grade 6, students need to learn to analyze these displays. Students should be able to compare the effectiveness of various types of displays (graphs) in organizing the data for further analysis or in presenting the data clearly to an audience.

Students should explore effective ways to gather their data and explore the most effective ways to display what they have found. This involves questioning techniques, and knowing the different types of graphs to display their data and various ways to organize their findings.

Once the data is organized, students should be encouraged to analyze the data, make inferences, comparisons and predictions.

Math Connects

Investigations involving data analysis offers a natural way for students to connect mathematics with other school subjects (Social Studies, Science, Physical Education, Health, etc) and with experiences in their daily lives.

Students need to know about data analysis in order to reason statistically and to develop skills necessary to become informed and intelligent citizens.

Through the study of data, students can learn that solutions to some problems depend on assumptions and they need to learn how to make inferences based on data.

Process Standards Key

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Curriculum Outcomes

STRAND	OUTCOME	PROCESS STANDARDS
Statistics and Probability (Data Analysis)	6SP1 Create, label and interpret line graphs to draw conclusions.	[C, CN, PS, R, V]
Statistics and Probability (Data Analysis)	6SP2 Select, justify and use appropriate methods of collecting data, including: <ul style="list-style-type: none"> • questionnaires • experiments • databases • electronic media. 	[C, CN, PS, R, T]
Statistics and Probability (Data Analysis)	6SP3 Graph collected data, and analyze the graph to solve problems.	[C, CN, PS, R, T]
Shape and Space (Transformations)	6SS8 Identify and plot points in the first quadrant of a Cartesian plane, using whole number ordered pairs.	[C, CN, V]
Patterns and Relations (Patterns)	6PR2 Represent and describe patterns and relationships, using graphs and tables.	[C, CN, ME, PS, R, V]

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP2 Select, justify and use appropriate methods of collecting data, including:

- questionnaires
- experiments
- databases
- electronic media.

[C, CN, PS, R, T]

Achievement Indicator:

6SP2.1 Select a method for collecting data to answer a given question, and justify the choice.

Elaborations—Strategies for Learning and Teaching

Give students opportunities to experiment with organizing and displaying data in a wide variety of ways. This can lead to discussions about which methods of data organization and display are the most effective and the easiest to understand.

In previous grades students were exposed to collecting information through first hand data and second hand data using questionnaires. Remind students that questionnaires are one way to gather information and brainstorm other methods for gathering information. They will come up with several examples from previous years of working with data. Some ideas include observation, surveys, interviews, polls, past records, searching the Internet and simulations.

Have a discussion about whether a questionnaire has multiple choice responses or Yes/No responses. Another way to gather information is through an interview, where the person doing the interview can probe for more information. Students may also suggest that they could also do an experiment or use databases and/or electronic media.

Write various questions on chart paper and have a discussion about whether or not these are good questions and justify.

Encourage students to think about what they already know about posing questions. Your questions could be related to Social Studies with reference to community – numbers of police officers, restaurants, recycling centres, etc.

Use teacher-created graphs or graphs from different sources (newspapers, Stats Canada, Social Studies textbook, etc) and ask students to generate questions based on that data. These questions will help students to think about the information on the graph and guide them in analyzing that information.

 General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Journal

- Ask students to write about:
 - (i) what they have learned about the different methods of data collection.
 - (ii) which method for gathering information they find the easiest and explain why.
 - (iii) what sample / data source they would use to determine the amount of milk an average grade 6 student would drink.
 - (iv) where they might go to find out the number of school-aged children in their province. (6SP2.1)

- Ask students to write in their journals about some topics that interest them and explain why they are important. Students will refer to this information later. (6SP2.1)

- Ask students to write one question for which a questionnaire would be the best choice to find the answers to the question. Write one question for which some type of experiment would be conducted to find the answers to the question. Ask them which question they would prefer to solve and explain why. (6SP2.1)

Resources/Notes

*Math Focus 6***Lesson 1:** Creating a Questionnaire

6SP2

6SP3

TG pp. 13 – 17

Additional Reading:

Small, Marion (2008), *Making Math Meaningful to Canadian Students K-8*, pp. 472 - 513

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP2 Continued**Achievement Indicator:**

6SP2.2 Design and administer a questionnaire for collecting data to answer a given question, and record the results.

6SP3 Graph collected data, and analyze the graph to solve problems.

[C, CN, PS, R, T]

Achievement Indicator:

6SP3.1 Determine an appropriate type of graph for displaying a set of collected data, and justify the choice of graph.

Elaborations—Strategies for Learning and Teaching

Brainstorm different topics for which they would like to create a survey or questionnaire. Ask students to select one topic on which they will gather information. They will create the survey questions or questionnaire, carry out the survey, and record the results. Where possible, students should be encouraged to carry out school-wide surveys or even community surveys. These surveys should be shared with the class. Discuss the various questionnaires and how whether their method of gathering information was effective.

Remind students the importance of formulating a good question.

Review the different types of graphing that are used to display data. Students have been previously exposed to bar and double bar graphs in Grade 5. In Grade 6 the focus will be 6SP1 - the line graph.

Ask students to search magazines and newspapers or various websites (weather sites, Stats Canada) to find different examples of graphs (or you can have several examples of various types of graphs already prepared to show the students). Guide students in a discussion as to why the various types of graphs are used for particular data.

“When students interpret graphs by others, they learn to appreciate the features that can help them make sense of a visual display of data. A good graph should communicate some overall impressions of the data to the reader at a glance. This goal is facilitated by the choice of the graph type that suits the data, clear labelling and titling, and accuracy in representing the data.” Small, *Making Math Meaningful to Canadian Students K-8* (2008) p. 503.

Remind students that different types of graphs are used to display different types of information. Some choices that they may offer are pictographs, Venn Diagrams, and bar graphs.

Brainstorm several types of data that could be collected within the class, the school or even to the community. Then ask students to justify which type of graph that they would use to display that particular data.

 General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Performance

- Present the following situation to students:

Carmen designed and handed out 100 questionnaires to students in her school. She asked this question:

‘What do you want to be?’

- Doctor/Dentist - Teacher - Lawyer
- Sports Manager - Coach

50 questionnaires were returned. Here are the results:

	Boys	Girls
Doctor/Dentist	### ###	###/
Teacher	//	### ###/
Lawyer	### ###/	###/
Sports Manager, etc	###	/

Carmen reached the conclusion that most students will become doctors or dentists. Do you agree with her conclusions? Explain. Describe what she might have done to improve:

- the wording of her question;
 - the method of gathering data; and,
 - the sample she chose to survey. (6SP3.1)
- Ask students to create a graph that compares two sets of data such as the number of pizza slices ordered by grade 5 and grade 6 students OR the number of books that students in Grade 5 and Grade 6 read over a 4 week period. (6SP3.1)
 - Ask students to create a question that they would like to use for a survey. Sample Questions: What is your favourite genre of music? Favourite types of snacks / foods? After-school activities? How much time do you spend watching TV? How do you spend your leisure time? What is the most important issue that our community is currently facing? Etc.
 - Ask them to use the question to gather the information and record the results. (6SP2.2)

Resources/Notes

Math Focus 6

Lesson 1 (Cont'd): Creating a Questionnaire

6SP2

6SP3

TG pp. 13 – 17

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP3 Continued**Achievement Indicator:**

6SP3.2 Solve a given problem by graphing data and interpreting the resulting graph.

Elaborations—Strategies for Learning and Teaching

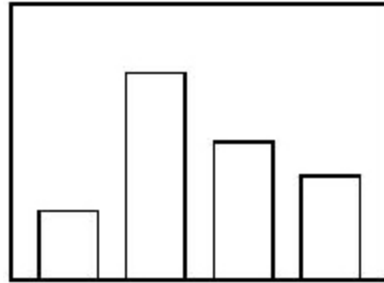
Students need to be aware that graphs give us all types of information. It is one way of sharing information other than using the written language. Students have to analyze graphs to get the information they are looking for. Students, in pairs, could create a problem, collect the data and graph the results. Ask them to write 3 questions based on the graph for other groups to answer.

 General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Performance

- Provide an untitled and unlabeled graph and ask students to come up with different sets of data that might realistically be represented by the graph.



E.g.,

- It might represent the number of students with each hair colour – red, brown, black and blond. (Using a scale of 2)
- The number of books read by 4 family members over the summer. (6SP3.1)

Journal

- Ask students to write about how they decide which type of graph best displays a set of data. Ask them to use examples in their explanations. (6SP3.1)

Resources/Notes

Math Focus 6

Lesson 1 (Cont'd): Creating a Questionnaire

6SP2

6SP3

TG pp. 13 – 17

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP2 Select, justify and use appropriate methods of collecting data, including:

- questionnaires
- experiments
- databases
- electronic media.

[C, CN, PS, R, T]

Achievement Indicators:

6SP2.3 Explain when it is appropriate to use a database as a source of data.

6SP2.4 Gather data for a given question by using electronic media, including selecting data from databases.

Elaborations—Strategies for Learning and Teaching

Students may have experience looking for information in an online database. Databases are used to store large amounts of information on various topics, from populations, birth and death rates to gathering information on lifestyles and careers.

Have a discussion about databases and what kinds of information would be contained within a particular database. Students need to know that a database is used for large amounts of data and that the type of database they choose to explore will depend on the type of question they want answered. (E.g., NHL, music data, Stats Canada) You could use a database to look for information from the past, or to look for information that covers a particular period of time.

Brainstorm topics where students might need to search a database to gather information. Allow students to visit particular databases so they can see how the information is stored, and how it is organized.

Ask students where they might search to find data about the number of school-aged children in their province.

Present students with a variety of topics for which they can research information. E.g., use the Weather Network website to investigate how the high and low temperatures in a given area have changed over the last 10 years.

Encourage the use of the Stats Canada website to find information on a given topic. A sample topic could be the number of immigrants who came to Canada in each of the last 5 years.

General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies*Presentation*

- Students can visit different databases such as Stats Canada, Guinness Book of Records, and the NHL Database. Provide opportunities for them to explore the sites and to discover the layout, to see how things are organized and to get used to navigating the database. Ask students to choose one database of interest, to collect some data that they are interested in and to share it with the class. (6SP2)

- Ask students to choose one of the following questions to answer by using an appropriate database.
 - How much has the moose population in Newfoundland and Labrador increased over the past 25 years?
 - What are some of the genres of Newfoundland musicians? Search online.Ask them to share their results with the class. (6SP2.4)

Performance

- Ask students to create a graph that shows the growth of the Canadian population over a period of 20 years. Discuss the various databases that could be accessed to find the information. (6SP2.4)

- Ask students where they would look if they wished to find out information about the population growth of their town or city, or the nearest centre to them, or a city they would like to visit. (6SP2.3)

Resources/Notes*Math Focus 6***Lesson 2: Using Databases****6SP2**

TG pp. 18 – 21

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP2 Continued**Achievement Indicator:**

6SP2.5 Answer a given question by performing an experiment, recording the results and drawing a conclusion.

Elaborations—Strategies for Learning and Teaching

The focus is on using experiments to collect data.

Have a discussion about experiments and when and why we would carry out experiments. Most students would think of Science experiments, which explain particular scientific processes.

Make the association that experiments can be conducted to investigate concepts such as which brands of particular products are best (e.g., which paper towel absorbs the most water).

We can use experiments to gather information. We can then analyze this information to make choices or to determine if one factor affects another (the age of a hockey player to the number of goals scored in a season). Students need to look at graphed data and be able to make inferences and draw conclusions about the information. For this performance indicator, you could show the students several graphs that show the results of experiments and ask them to answer specific questions about what they see.

Sample questions:

- What do you notice about the results? Is there another method you could use to answer the same question?
- Why was this experiment a good method to find out the answer to your question?
- Why would you not use another method of collecting your data?

 General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Performance

- Working in pairs, ask each student to roll a die 25 times. Record how many times each number occurs and then combine the individual's results with those of her/his partner. You can inform students that this is an example of an experiment. You can ask students to draw conclusions from this experiment. E.g. the number 4 was rolled the most often. (6SP2.5)

- Give students a choice of questions that could be answered by performing experiments. Ask them to conduct the experiments to answer the questions. Some possibilities are:
 - If you rolled a pair of dice 10 times, how many times would a double number show up?
 - If you used a spinner that is colour coded and spun it 20 times, how many times would you land on a particular colour?
 - If you flipped a coin 50 times, how many times would TAILS show up? (6SP2.5)

Portfolio

- Ask students to design an experiment to answer a question that is important or of interest to them. Discuss the student-created questions in class and ask them to determine if the experiment answers the question (s) investigated and whether changes may need to be made. Refer to journal activity for topics of interest that students created earlier. (6SP2.5)

Resources/Notes

Math Focus 6

Lesson 3: Performing an Experiment

6SP2

6SP3

TG pp. 22 – 27

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

**6SP3 Continued
Achievement Indicator:**

6SP3.1 Continued

Elaborations—Strategies for Learning and Teaching

Students often have little difficulty with creating graphs; however, they may be challenged to analyze the information depicted in the graphs.

Continue to provide opportunities for students to practice making graphs from previously collected data. Present them with some data that you create and ask them to graph it. Students should now be able to justify the reasons why they create the graph as they do. Students will need to be reminded to choose an appropriate scale and an appropriate graph.

Students can work in pairs to analyze the graphs – asking questions about what the graph shows and what kinds of predictions they can make from the data.

Consider writing some questions on the board to guide their thinking. Some possible choices for discussion are:

- State the facts that the graph shows.
- Which element on the graph is the greatest?
- Which element on the graph is the least?
- What trend does the graph show?
- Can you make a prediction based on the information provided in the graph?
- What could influence the trend in the data?
- Pose WHAT IF types of questions.

Students should be able to justify why they select one type of graph over another. There are many reasons as to why one type of graph is better suited.

Have a discussion with the class on the benefits of using one type of graph over another. Ask them which type of graph they prefer and ask them to explain why. Ask students to explain which type of graphs they see the most in magazines and newspapers and explain why they think that is the case.

 General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Performance

- Ask students to answer the following question by carrying out the experiment:

What is the relationship between the 'drop height' and the 'bounce height' of a ball? Make a prediction first before you do the experiment. Conduct trials to gather the data and to answer the question. Create a graph of the results and answer the questions: What can you say about the relationship between drop height and bounce? Was your prediction correct? Explain.

(Make sure that the ball is simply released and let the ball bounce on a hard surface. Try heights other than the ones that are in your experiment to confirm the results). (6SP3.1)

- Ask students to work in groups. On separate sheets of chart paper, write the names of types of graphs: bar graph, double bar graph, line graph, pictograph and Venn Diagram. Ask them to create two columns on each sheet: Column A - Advantages and Column B - Disadvantages. After they complete the chart, you may wish to ask them to share the results with the class.

Extend this activity by adding the kinds of questions that could be used for each type of graph. E.g. a bar graph is best used to graph comparisons, while a double bar graph can be used to compare the same information, which contains two distinct parts (e.g., male and female, cats and dogs, etc.) A Venn Diagram could be used to show how things are the same, as well as how they are different, etc. (6SP3.1)

Resources/Notes

Math Focus 6

Lesson 3 (Cont'd): Performing an Experiment

6SP2

6SP3

TG pp. 22 – 27

Children's Literature (provided):

Scieszka, Jon and Smith, Lane.

Math Curse

Refer to pages 8-9 which shows a bar graph and makes reference to children's birthday by month.

Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

6SS8 Identify and plot points in the first quadrant of a Cartesian plane, using whole number ordered pairs.

[C, CN, V]

Achievement Indicators:

6SS8.1 Label the axes of the first quadrant of a Cartesian plane, and identify the origin.

6SS8.2 Plot a point in the first quadrant of a Cartesian plane, given its ordered pair.

Elaborations—Strategies for Learning and Teaching

Students need to develop an understanding of ordered pairs as this will be a prerequisite for creating line graphs a little later. Have a discussion about where in everyday life and in what professions we use grids. (GPS Systems, shipping lanes, mapping, etc). This will give students some frame of reference for using grids.

Use the game of Battleship to teach coordinates. Without explaining what coordinates are, let the students play the game. Afterwards, talk about how they found the points that were given. They will discover that if they go over a number of places and up a number of places, they will find the coordinates. The students need to be exposed to the idea that these coordinates are called an ordered pair.

They should know that the first number in an ordered pair tells the horizontal distance from the origin and the second number in the ordered pair tells the vertical distance from the origin.

When describing an ordered pair, the pair is represented in alphabetical order. E.g., (x, y).

It is important that you draw attention to the Cartesian Plane. Students will be working with one quadrant of four on the Cartesian Plane, making the link to the notion that a Cartesian Plane is created when two lines, one horizontal and one vertical, meet at a point called the origin.

Lead a discussion on the concept of a coordinate grid, focusing on the visual aspect of the grid. Explain to the students that a coordinate grid is another name for the quadrants of a Cartesian Plane. It is used to locate points on the plane.

Model for students that in order to construct a picture of a coordinate grid, they need to draw a horizontal number line, called the x-axis and a vertical number line called the y-axis. These two lines intersect at a point called the Origin (0, 0). Use a coordinate grid on the board while you discuss these concepts with the class. Be sure to label the axes accurately. A common error students make when labelling the axes is putting the number in the middle of the blocks. This causes problems when plotting points.

Refer the students back to the game of Battleship and how students used the coordinates to locate the ships of their opponents. Also, you may discuss that the playing board of the Battleship game is the same as the first quadrant of the Cartesian Plane.

 General Outcome: Describe and Analyze Position and Motion of Objects and Shapes

Suggested Assessment Strategies

Performance

- Battleship - Ask students to change the scale on the horizontal (x-axis) and the vertical (y-axis) axes to other numbers and letters. Give them a strip of paper to create their scale and tape to the side of the game. Use the “new” coordinates to locate the ships. (6SS8.1)
- Twister - Using masking tape, create an x- and y-axis and number it 10 x 10 (use your floor tiles as a guide to your grid). Prepare two sets of number cards, 0 through 10. Place one set in a bag labelled X and the other Y. You will pull out a number from each bag to form a coordinate point (Replace it when you are done for the next round). Using a spinner, divide four equal sections and name each one as either right hand, left hand, right leg or left leg. Spin the spinner to find out which hand or foot must remain on that point. You could divide the class into two teams to help with the large scale of the grid and allow each team to work together to touch each of their coordinate points. If a student “falls” or moves from his coordinate point, the other team wins a point. Any student not wanting to participate could plot each team’s coordinates in alternating colors on a Cartesian Plane. (6SS8.2)

Paper and Pencil

- Ask students to practice locating points along the x-axis and the y-axis. One of the coordinates of the ordered pair will be zero. They need to make the connection that if one coordinate is 0, the point will need to be plotted on one of the axes. Present students with a grid showing points labelled on the x- and y-axis and ask the students to provide the coordinates for the labelled points. (6SS8.2)

Resources/Notes

Math Focus 6

Lesson 4: Plotting Points on a Grid

6SS8

TG pp. 28 - 32

Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

6SS8 Continued**Achievement Indicators:**

6SS8.3 Match points in the first quadrant of a Cartesian plane with their corresponding ordered pair.

6SS8.4 Plot points in the first quadrant of a Cartesian plane with intervals of 1, 2, 5 or 10 on its axes, given whole number ordered pairs.

6SS8.5 Draw shapes or designs, given ordered pairs, in the first quadrant of a Cartesian plane.

Elaborations—Strategies for Learning and Teaching

Explain to students that sometimes an ordered pair on a quadrant is given a letter name to identify the point in a quadrant. That is, a letter name is used in place of the coordinate pair. You may want to ask students to plot points on a grid and then give them letter names. This can be completed as a whole group using the overhead projector or interactive white board.

The students are now familiar with finding and plotting points on a Cartesian Plane. Students will learn to draw designs, shapes or block letters on a grid. Encourage students to be creative in their design. They will plot the points then connect them to complete the image. As an extension, they can give other students the coordinates for the points on their image and have others create the same image on their own grid.

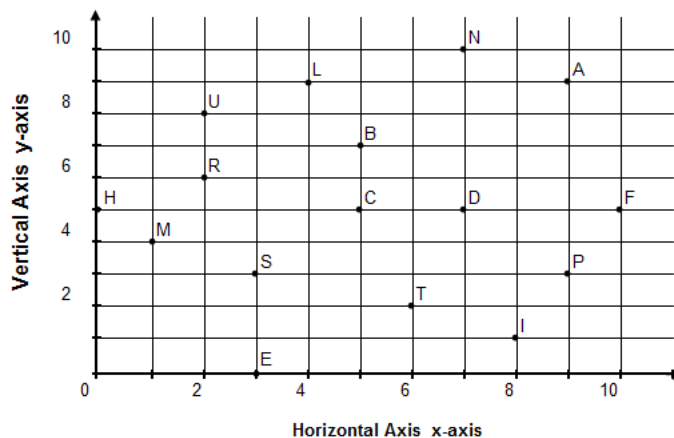
General Outcome: Describe and Analyze Position and Motion of Objects and Shapes

Suggested Assessment Strategies

Performance

- Give students a blank grid on which the axes have been labelled. Ask the students to randomly place 10 points anywhere on the grid. Call out points at random, and if the students have that point on their grid, they mark an X through that point. The first student to have all of their points marked with the X is the winner! (6SS8.2)
- Give students a grid that has points already labelled with letters as shown below. Ask students to find the letter on the grid represented by each ordered pair. Record the letters, in order, to figure out the message. (6SS8.3)

(1, 4) (9, 9) (6, 2) (0, 5) (8, 1) (3, 3) (10, 5) (2, 8) (7,10)



(6SS8.3)

Journal

- Ask students to explain, using words, numbers, and/or pictures, how to use ordered pairs to describe and locate points on a grid. (6SS8.3)

Presentation

- Give students a coordinate grid to plot the points listed below and join to them in order. The last point should be joined to the first point. Ask students to describe the figure they have drawn to the class.

A(2,2) B(5,3) C(8,2) D(7,5) E(9,8) F(6,7) G(5,10) H(4,7)
I(1,8) J(3,5)

(6SS8.5)

Resources/Notes

Math Focus 6

Lesson 4 (Cont'd): Plotting Points on a Grid

6SS8

TG pp. 28 - 32

Strand: Shape and Space (Transformations)

Outcomes

Students will be expected to

6SS8 Continued**Achievement Indicators:**

6SS8.6 Determine the distance between points along horizontal and vertical lines in the first quadrant of a Cartesian plane.

6SS8.7 Draw shapes or designs in the first quadrant of a Cartesian plane, and identify the points used to produce them.

Elaborations—Strategies for Learning and Teaching

Students need to focus on the distance between points along each of the horizontal and vertical lines. They often make the mistake when counting spaces to include the points of each square, instead of the number of squares between the points. Some practice may be needed.

Relate the movement along the axis as being similar to making jumps along a number line.

Give grids to the students with several points along horizontal and vertical lines. Ask them to count the distance between these points. They can work in pairs. This may not take a lot of practice but it is important that they understand how to measure the distance.

Using the interactive white board or an overhead projector, plot points on a grid and join the points together to create a closed figure. Ask students to label the points and to name the figure. You could also recite coordinates and ask students to plot the points on their own grid paper.

When you join points together on the graph, you are creating a line segment. Draw the students' attention to this fact. We can use line segments to measure the distance between two points on a Cartesian Plane.

This is a good way to encourage interaction and to motivate the class to focus on points on the grid and finding coordinates easily.

General Outcome: Describe and Analyze Position and Motion of Objects and Shapes

Suggested Assessment Strategies

Performance

- Give students a coordinate grid with axes labelled from 0 to 10. Ask students to plot each pair of points on the grid, join the points with a line segment and find the length of each line segment.

(i) (4,2) and (7,2)

(ii) (5,7) and (10,7)

Students can then work with a partner to share pairs of points and find the distance between them. (6SS8.6)

- Give students a grid with the x- and y-axes labelled and with various shapes drawn on it. Ask students to name the coordinates of each shape. Extension: Draw partial closed figures and ask students to complete the figure and label its coordinates. (6SS8.7)

Resources/Notes

Math Focus 6

Lesson 4 (Cont'd): Plotting Points on a Grid

6SS8

TG pp. 28 - 32

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

6PR2 Represent and describe patterns and relationships, using graphs and tables.

[C, CN, ME, PS, R, V]

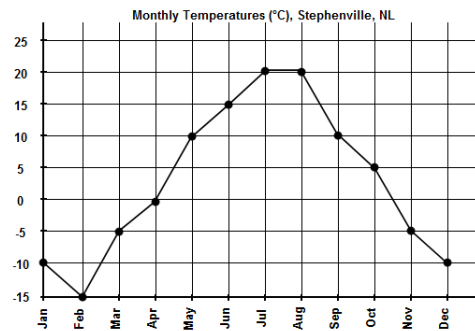
Achievement Indicators:

6PR2.1 Create a table of values from a given pattern or a given graph.

6PR2.2 Describe, using everyday language, orally or in writing, the relationship shown on a graph.

Elaborations—Strategies for Learning and Teaching

Students are already familiar with working with tables of values. In this unit students will represent a pattern using a line graph. Line graphs are new for Grade 6 students. A line graph is used when there is a numeric value associated with equally spaced points along a continuous number scale. Points are plotted and a line is drawn to connect the points. Every point on the line should have a value.



As well as creating graphs from a table of values, students need to be able to create a table of values from a pattern or graph.

Students should be presented with graphs and expected to create tables of values from the graphs. They will need to look for the patterns within the table of values and make the connection between that and the graph.

Students should not only be able to create graphs, but they need to be able to explain what the graph shows. They need to be able to explain what information they get from the graph and what questions can be answered by looking at the graph.

 General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Present students with tables and graphs and ask them to look for patterns. Keep the graphs and tables simple so that the pattern can be readily seen. (6PR2)

- Tell students that a relationship can often be found between two different body measurements, such as the measurement around a person's head to his or her height. Brainstorm, with students, some key questions that might guide the investigation of body relationships? Can they predict what conclusion might be expected for each? Ask them to write and carry out a plan to answer one of the questions. Include information on the following:
 - sources of your data;
 - sample size and type of people studied;
 - method of data collection. (6PR2.2)

- Give students multi link cubes and ask them to create an odd number pattern – starting with one cube, then add 2 each time with one to the bottom right and one on the top (L shape). The L shape will increase each time. Ask students to create a table of values and graph it. (6PR2.1)

Journal

- Ask students to write about as many ways in everyday life, as they think of, where patterns can be seen. Encourage them to use examples in nature as well as those they are able to identify such as in buildings, clothing, games, decorating, etc. (6PR2)

Presentation

- Students can be involved in collecting data from the class on the number of hours each person in their family sleeps each night for a week. At the end of the week, ask students to present their findings to the class in a graph. Ask students to create three questions for classmates to answer by looking at the graph. Students may want to share their results with other classes in order to talk about the importance of sleep (cross curricular – also meets Health outcomes). Extension: Students may survey other classes to see if most students get the recommended amount of sleep. (6PR2.2)

Resources/Notes

Math Focus 6

Lesson 5: Interpreting Line Graphs

6PR2

6SP1

TG pp. 36 - 40

Additional Reading:

Van de Walle, John and Lovin, LouAnn (2006) *Teaching Student-Centered Mathematics Grades 3-5*, p.334

Curious Math: A Graph is Worth a Thousand Words

6SS8

TG pp. 41 - 42

Math Game: Wei-Chi

6SS8

TG pp. 43 - 44

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP1 Create, label and interpret line graphs to draw conclusions.

[C, CN, PS, R, V]

Achievement Indicator:

6SP1.1 Determine the common attributes (title, axes and intervals) of line graphs by comparing a given set of line graphs.

Elaborations—Strategies for Learning and Teaching

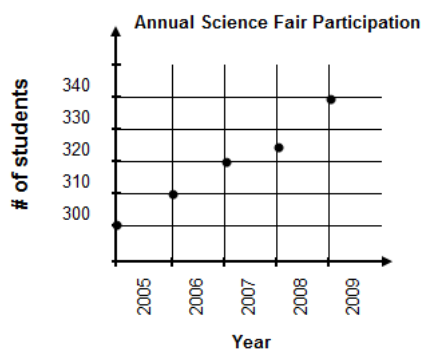
Students often see things differently and they may not use the same scales and/or titles for the same graphs. The information may be the same but the way in which they represent it may be different.

Discuss the term ‘attribute’ with the class and identify the attributes they may need to consider when working with graphs (title, axis, and intervals). Discuss with students that they may have to adjust the attributes they are using to fit the data they are analyzing. Ask them if the attributes that they have chosen are appropriate and ask them to justify their choices.

The scale will determine the size of the bars on a bar graph and likewise, the lines on a line graph will be different depending on the scale they have used.

Make sure that you discuss the importance of scale to the students. A scale has to represent the data accurately. Remind students that the scale is related to number lines. Look at the smallest value and the largest value and then determine the scale.

E.g.



Ask students to determine why each graph is different and which one has the best scale to show the trend.

Tell them that an inappropriate scale can skew (distort or depict unfairly) the data and be misleading. Provide other examples to reinforce the importance of scale. Stress to the students that although different graphs can show the same data, one graph may be a better choice to answer a particular question.

General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Student-Teacher Dialogue

- Give students data on a topic of your choice and ask them to graph it. The scale, the title and the intervals may be different among students. Ask students to explain and justify why they used the attributes they did (the scale, the intervals and the title). (6SP1.1)

Resources/Notes

Math Focus 6

Lesson 5 (Cont'd): Interpreting Line Graphs

6PR2

6SP1

TG pp. 36 - 40

Strand: Statistics and Probability (Data Analysis)

Outcomes

Students will be expected to

6SP1 Continued**Achievement Indicators:**

6SP1.2 Determine whether a given set of data can be represented by a line graph (continuous data) or a series of points (discrete data), and explain why.

6SP1.3 Create a line graph from a given table of values or a given set of data.

6SP1.4 Interpret a given line graph to draw conclusions.

Elaborations—Strategies for Learning and Teaching

Up to now, students have been working mainly with bar graphs and double bar graphs. Expose students to the fact that the horizontal axis is called the x-axis and the vertical axis is called the y-axis as this is the terminology that is used in Grade 7.

Line graphs are used to show trends in data, usually over time. The points are plotted to show relationships between two variables (one is usually time) and the points are joined with a line to make it easier to see trends. Like bar graphs, line graphs have a title, they are labelled and they use a clear scale.

Provide opportunities for students to learn the difference between continuous data and discrete data. If the data are continuous, the points on the graph are joined. The points on a line are connected when all the values between the points are permitted. Discrete data is a series of points that are not joined. When data are discrete, there are numbers between those given that are not meaningful in the context of a problem. For example, consider the points (1.3) and (2.6) plotted on a graph. These points can be joined if they represent distance against time, since distance could include values between 3 and 6 and time could include values between 1 and 2, such as 1.5. However, if the graph represents costs against the number of DVDs rented, the points should not be joined since it is not possible to rent 1.5 DVDs.

- Examples of discrete data – the temperature of a given day at each hour of the day. You can predict what the temperature would be at 9 PM based on the temperature trend over the day.
- Examples of continuous data – the temperatures of a particular place over a month. You cannot predict the temperature for tomorrow based on the temperature for the previous days because it changes.

After you have exposed students to various graphs, ask them to create their own.

Students should look at and analyze various line graphs that display data on different topics. They should distinguish between continuous and discrete graphs.

Have a whole group discussion about the differences between continuous and discrete data and when to use each type of graph.

Remind students that graphs can be used to see trends, to find out facts, or to determine information on many different topics. Provide students with several line graphs that are titled and ask them to interpret the data. The graphs should be pre-made and posted in the classroom for reference.

General Outcome: Collect, Display and Analyze Data to Solve Problems

Suggested Assessment Strategies

Performance

- Give students several examples of data. They have to determine whether they would graph the information using continuous or discrete data. Examples of data:
 - (i) The amount of recycling that each class does over a month.
 - (ii) Population trends of our province over the last 20 years.
 - (iii) The number of students who are absent in school for the month.
 - (iv) How much homework you have throughout the month.

(6SP1.2)

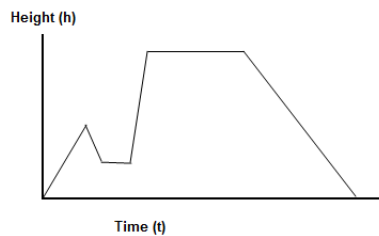
- Physical Education connection - Ask students to record how long it takes them to run 5m, 10m, 15m, 20m, 25m and 30m in gym class and bring that data to math class.

Model how to plot that information on a line graph. Ask the students what they see in the graph – what conclusions they can make. Ask the class if this is discrete or continuous data.

Ask students to create their own line graph using this information.

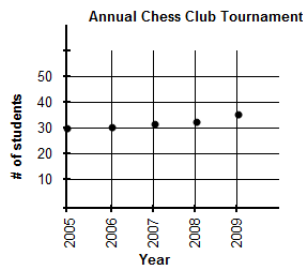
(6SP1.3)

- Students may enjoy interpreting line graphs that tell a story. Ask students to describe the graph below that shows Marc’s hike. (Small, 2008) (6SP1.4)



Presentation

- Use the graph to show that we can predict the number of students who will participate in the next Science Fair. (6SP1.4)



Resources/Notes

Math Focus 6

Lesson 5 (Cont'd): Interpreting Line Graphs

6PR2

6SP1

TG pp. 36 - 40

Additional Reading:

Small, Marion (2008). *Making Math Meaningful to Canadian Students K-8*, pp. 487-488

Math Focus 6

Lesson 6: Constructing Line Graphs

6PR2

6SP1

TG pp. 45 - 49

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

6PR2 Continued**Achievement Indicator:**

6PR2.3 Translate a pattern to a table of values, and graph the table of values (limited to linear graphs with discrete elements).

Elaborations—Strategies for Learning and Teaching

Students need to make a connection between the information on a graph and the table of values. They need practice in transferring the information on a graph to a table of values and vice versa. Focus on students' ability to explain how to collect, record and display the data appropriately.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies

Performance

- Give students a table of values and ask them to create a graph with the same information. They will need to label each axes in the same way as the table is labelled. Then do the reverse – give them a graph and ask them to create a table of values. Some simple data that could be used are (a) time and distance information and (b) growing patterns with multi-link cubes.

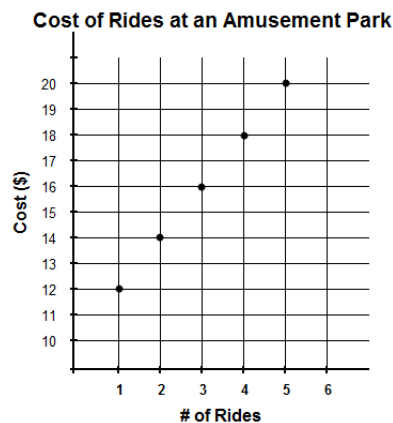
(6PR2.3)

- Ask students to create a graph to display the relationship between the number of tricycles and the number of wheels. They will discover that as the tricycles increase in number, the wheels will increase by 3. They should represent this data in a table of values as well. (6PR2.3)

- Present a graph drawn on the board and have a discussion about what it shows. Label the graph and give it a title. Guide the discussion with questions about what this graph tells us.

Drawing conclusions from the graph may be a challenge, but encourage your students to look beyond what the graph shows and make an inference.

Use the following graph to guide discussion.



(6PR2.3)

Resources/Notes

Math Focus 6

Lesson 6 (Cont'd): Constructing Line Graphs

6PR2

6SP1

TG pp. 45 - 49

Strand: Patterns and Relations (Patterns)

Outcomes

Students will be expected to

6PR2 Continued**Achievement Indicator:**

6PR2.2 Describe, using everyday language, orally or in writing, the relationship shown on a graph.

Elaborations—Strategies for Learning and Teaching

The focus is on expanding the students' ability to explain what they see in a graph, rather than creating the graph. If they are able to explain relationships involving data shown on graphs, they are better able to make connections. Encourage each student to explain everything about the data and the relationships that are shown. They need to draw on previous knowledge to make those connections clear.

General Outcome: Use Patterns to Describe the World and to Solve Problems

Suggested Assessment Strategies*Performance*

- After looking at graphs, encourage class discussions about what the graph tells them. Ask students to look at more graphs individually. You can use the following questions as prompts to help guide the students' thinking.

Some guiding questions or prompts to help students with their explanations are:

- Why do you think that?
- Would it also be true if...?
- Could there be a different answer?
- How did you figure that out?
- What strategies did you use to...? (6PR2.2)

Resources/Notes*Math Focus 6*

Lesson 7: Communicating about Data

6PR2

6SP2

6SP3

TG pp. 50 - 54

