

Unit 1 - Working with Data

MAP 4C Foundations for College Mathematics

BIG PICTURE

Students will:

Personalize the course, and capitalize on their interests, post-secondary and career pathways

Collect, analyze, and summarize one-variable data using a variety of tools and strategies, and interpret and draw conclusions from the data

Distinguish situations requiring one-variable and two-variable data analysis

Analyze the use and misuse of data in the media

Day	Lesson Title	Math Learning Goals	Expectations
1	A Survey of Surveys <i>Lesson Included</i>	<ul style="list-style-type: none"> Analyze a variety of surveys/questionnaires (e.g. Teen Magazine, Match Making Valentine Questionnaire, Census at Schools, etc.) in order to describe the characteristics of an effective survey/questionnaire 	DM1.2
2	Designing a Questionnaire <i>Lesson Included</i> <i>*New Jan/08*</i>	<ul style="list-style-type: none"> Design and critique questionnaires to collect data about the class (e.g. college destination, career interests, personal interests, mathematics background, etc.) Create a class questionnaire in order to conduct a survey about the class (consider incorporating questions from the Census at School questionnaire for later comparisons in Day 6) Assessment of class interests 	DM1.2
3		<ul style="list-style-type: none"> Use examples from the media that include common statistical terms (e.g. percentile, quartile, standard deviation) and expressions in order to review and interpret them. Analyze the class data using the statistical terms and expressions for use by the media 	DM2.1
4-5	Statistics in the Media <i>Lessons Included</i>	<ul style="list-style-type: none"> Interpret statistics presented in the media. Explain how the media misuses statistics. Create a media advertisement from the class data that would promote a certain point of view in order to lobby for a school interest Assess the validity of the conclusions presented by the class media advertisements Assess the validity of the conclusions presented in the media 	DM2.3, 2.4
6-7	Are more or Less People Smoking <i>Lesson Included</i> <i>*New Jan/08*</i>	<ul style="list-style-type: none"> Analyze data from a secondary source (e.g. Census at School) with technology (e.g. Fathom, spreadsheet, graphing calculator) Validate class analysis of common attributes using the secondary source (e.g. sample size, demographic bias) Look for mathematical relationships in the data Distinguish situations requiring one-variable and two-variable data analysis 	DM2.1, 2.3, 2.4. 1.1, 1.3
8	How Popular is your Program <i>Lesson included</i>	<ul style="list-style-type: none"> Summative Assessment (e.g. collection of case studies with individual report, data project with report) 	

Unit 1: Day 6 & 7: Are More or Less People Smoking?		
Minds On: 30	Learning Goal: <ul style="list-style-type: none"> Retrieve and analyze data from the internet with technology (e.g. Fathom, spreadsheet, graphing calculator) Determine which statistical measures are meaningful for the data and determine any forms of bias Look for mathematical relationships in the data Distinguish situations requiring one-variable and two-variable analysis 	Materials <ul style="list-style-type: none"> Computer Lab graphing calc. (optional) BLM 1.6.2 BLM 1.6.3 or BLM 1.6.4 or BLM 1.6.5
Action: 90		
Consolidate:30		
Total=150 min		
Assessment Opportunities		
Minds On...	Small Groups → Think, Pair, Share Have students work individually to answer the questions below. Then discuss their answers in pairs. <i>Which measure of central tendency (mean, median, or mode) is best to use in each situation? Why?</i> <ol style="list-style-type: none"> Marks on a test: 42 68 72 73 73 75 77 81 82 82 83 84 Sizes of a particular shoe sold at Payless Shoes Store in one day: 5 5 5 6 6 6 6 6 6 6 7 7 7 8 8 9 9 9 10 11 Whole Class → Discussion Point out to students that mean, median and mode are all examples of one variable statistics (along with standard deviation and range) as they only ever refer to one variable. Introduce the idea of two variable statistics (relationships between two different variables) using the following game, where one variable is given and students must think of the second variable that would fit the situation. Groups of 4 → Game Write the following six sentences on the board, leaving the blanks in each. Divide students into groups of four. <ul style="list-style-type: none"> As population of a city increases, _____ increases. As population of a city increases, _____ decreases. As temperature increases, _____ increases. As temperature increases, _____ decreases. As a person's age increases, _____ increases. As a person's age increases, _____ decreases. For each sentence, a group must think of at least one word that could be used in the blank. Students may list more than one possibility for each sentence. Each group should share their answers with the class, scoring a point for each original suggestion not given by any other group. Expectations/Presentation/Anecdotal Feedback: Give groups feedback on the answers that they give and discuss reasons for answers to ensure understanding.	Literacy Strategy: Think, Pair, Share
Action!	Pairs → Activity Distribute one of BLM 1.6.3 or BLM 1.6.4 or BLM 1.6.5 (depending on technology). Students should complete the activity in pairs. Mathematical Process Focus: Reasoning and Proving – Students will make conclusions based on the data collected using different statistical methods.	
Consolidate Debrief	Whole Class → Discussion Discuss the difference between one variable statistics and two variable statistics. Focus on what questions required the use of one variable statistics and what questions required the use of two variable statistics.	
<i>Application</i>	Home Activity or Further Classroom Consolidation Complete the questions on BLM 1.6.2.	

1.6.2: Analyzing Data – Follow-Up Questions

1. For each of the data sets below, decide whether one variable or two variable analysis should be used.
 - a) A class set of test marks.
 - b) The percentage of Canadian teenagers who smoke and the number of programs available to help people quit smoking.
 - c) Number of people in a household that have jobs.
 - d) The winning times for the women's 100m dash in the Olympics from 1975 to 2000.
 - e) Number of canned drinks sold and the number of cans recycled.
 - f) The ages of individuals involved in car accidents.
 - g) The salaries of players on a professional sports team.
 - h) Students' marks and the number of hours spent watching television.
 - i) Model year of cars on the road.
 - j) The percentage of Canadians who are overweight between years 1980 and 2005.
 - k) Team scores in a national mathematics competition.
2. For each of the data sets above involving one variable analysis, state whether the mean, median or mode would be the most appropriate measure.
3. Using one of the surveys from earlier in the unit, select two questions where the answers would be used for single variable analysis (eg. mean, median, mode, standard deviation, range). For each selected question, explain which measure would be most appropriate to analyse the data collected.
4. Using one of the surveys from earlier in the unit, select two questions where the answers would be used for two variable analyses. Predict the relationship that exists between the variables. (For example, each person taking a particular survey must give their age and their height. These two variables are most likely related: the older a person is, the taller they are likely to be.)

1.6.3: Statistical Analysis Using a Graphing Calculator

Creating a Scatter Plot

Step 1

- Press **Stat, 1** to access the list editor. Enter your data into L1 and L2. L1 refers to x-values and L2 refers to y-values.

Step 2

- Turn the stat plot on by pressing **2nd, y=, enter, enter**. Make sure your screen looks like Figure 1.

Step 3

- Press **graph**.
- Press **zoom, 9**. This will adjust the window settings, providing a graph of the data.

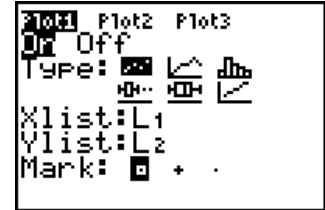


Figure 1

Calculating Measures of Central Tendency and Standard Deviation

- Clear the memory by pressing **2nd, +, 7, 1, 2**.
- Press **Stat, 1** to access the list editor.
- Enter your data into L1.

To Find the Median and Standard Deviation:

- Press **1** (1-Var Stats) and **enter**.
- \bar{x} is the mean and σ_x is the standard deviation

To Find the Median:

- Press **2nd, Stat** and move your cursor to **MATH** (use right arrow key)
- Press **2nd, 1, enter** to find the median of the data in L1.
- Press **Stat** and then move your cursor to **CALC** (use right arrow key).

To Find the Mode:

- Press **Stat** and then **2, 2nd, 1, enter** (this will sort your data in L1 in ascending order).
- Now you can go back to L1 by pressing **Stat, 1** and check to see what the mode is.

1.6.4: Statistical Analysis Using Excel

Creating a Scatter Plot

Step 1

- Enter your data into the spreadsheet by putting x-values in column A and y-values in column B. See Figure 1.

Step 2

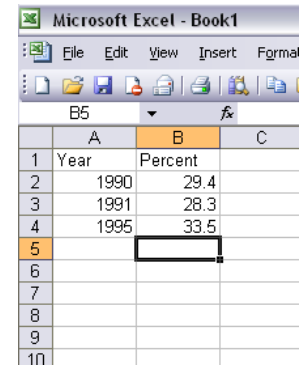
- Highlight your data. Click on the insert pull-down menu at the top of the screen and then select chart. See figure 2.

Step 3

- Highlight **XY (Scatter)** and click on **next**.

Step 4

- Click on **next**.
- Under **Chart Title**, enter a title for your graph.
- Under **Value (X) axis**, enter a title for the x-axis.
- Under **Value (Y) axis**, enter a title for the y-axis.
- Click on **Finish**.
- Your graph will be displayed on the screen.



The screenshot shows the Microsoft Excel interface with a spreadsheet titled 'Book1'. The spreadsheet has three columns: A, B, and C. Column A is labeled 'Year' and column B is labeled 'Percent'. The data is as follows:

	A	B	C
1	Year	Percent	
2	1990	29.4	
3	1991	28.3	
4	1995	33.5	
5			
6			
7			
8			
9			
10			

Figure 1

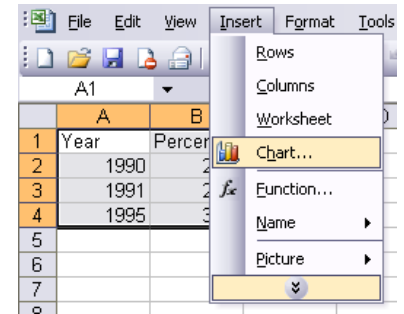


Figure 2

Calculating Measures of Central Tendency and Standard Deviation

- Enter data values in cells A1 to A10 (if you have 10 values)
- In any other cell, type in the expressions below to find what you need
- =average(A1:A10) (mean)
- =median(A1:A10) (median)
- =mode(A1:A10) (mode)
- =stdev(A1:A10) (standard deviation)

1.6.5: Statistical Analysis Using Fathom

Creating a Scatter Plot using Fathom

Step 1

- Create a **case table** by clicking and dragging the table icon from the menu bar onto the main screen. See Figure 1.

Step 2

- Click on **<new>** and type in a name for the x-axis (e.g. Year). To put a space between each word, use the underscore symbol.
- Enter your x-values into the column.

Step 3

- Click on **<new>** (2nd column) and type in a name for the y-axis (e.g. Percentage of High School Seniors that Smoke).
- Enter your y-values into the column.
- Your table should look similar to Figure 2 (you will have more data entered)

Step 4

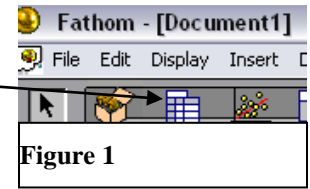
- Create a graph by clicking and dragging the graph icon from the menu bar onto the main screen. See Figure 3.

Step 5

- In your table, left click on the heading in your first column (i.e. Year) and drag it onto the horizontal axis of your graph.
- In your table, left click on the heading in your second column and drag it onto the vertical axis of your graph.
- Left click in the top right corner of your graph and select scatter plot. You may be able to skip this step if scatter plot is already selected for you.

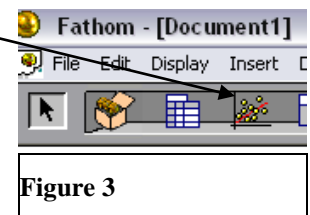
Step 6

- Add a title to your graph by double-clicking on "Collection 1" which can be found in the top left corner of your graph.
- Type in your title (remember to use underscores for spaces between words).



Collection 1			
	Year	Percent...	<n
1	1990	29.4	
2	1991	28.3	
3	1995	33.5	

Figure 2



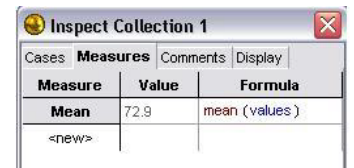
1.6.5: Statistical Analysis Using Fathom (Continued)

Calculating Measures of Central Tendency and Standard Deviation

- Open a new case table and enter in the data values.
- Label the column of data as “**values.**” See Figure 1.
- Under the **Edit** menu choose **inspect collection**.
- Click on **Measures**.
- Click on new and type “Mean”.
- Double click in the box for the formula for the mean and a formula box will appear.

Figure 1

- Type **mean(values)** and then press enter. See Figure 2.



Measure	Value	Formula
Mean	72.9	mean (values)
<new>		

Figure 2

- repeat the above 3 steps to find the median, and standard deviation
- **Note:** To get the standard deviation type **sampleStdDev(values)**