

Mathematics LBS 5

Spreadsheet Mathematics: Statistics and Graphing

Lab 6: Constructing Bar and Column Graphs



Microsoft Excel Logo and all screens captured by permission of Microsoft

Goal To construct bar and column graphs by using Chart Wizard in Microsoft Excel

Learning Outcomes After completing this section, the student should be able to

- enter data in an Excel worksheet
- use Chart Wizard to construct bar and column graphs
- save the worksheet and the chart (graph)
- print the worksheet and chart (graph)

Prior Learning Before attempting this lab, it is expected that the student has:

- completed **Spreadsheet Mathematics Lab 1: Entering, Formatting and Saving Data in an Excel Spreadsheet**

Contents

- enter data in an **Excel Spreadsheet** and create a bar or column graph using **Chart Wizard**
- save and print worksheets and graphs
- complete a practice assignment
- complete a hand-in assignment
- discuss with teacher any questions or concerns related to assignments

Spreadsheet Mathematics: Statistics and Graphing

Lab 6: Constructing Bar and Column Graphs

New Words: Bar Graph, Column Graph, scale, horizontal axis, vertical axis, frequency

A Bar Graph or a Column Graph

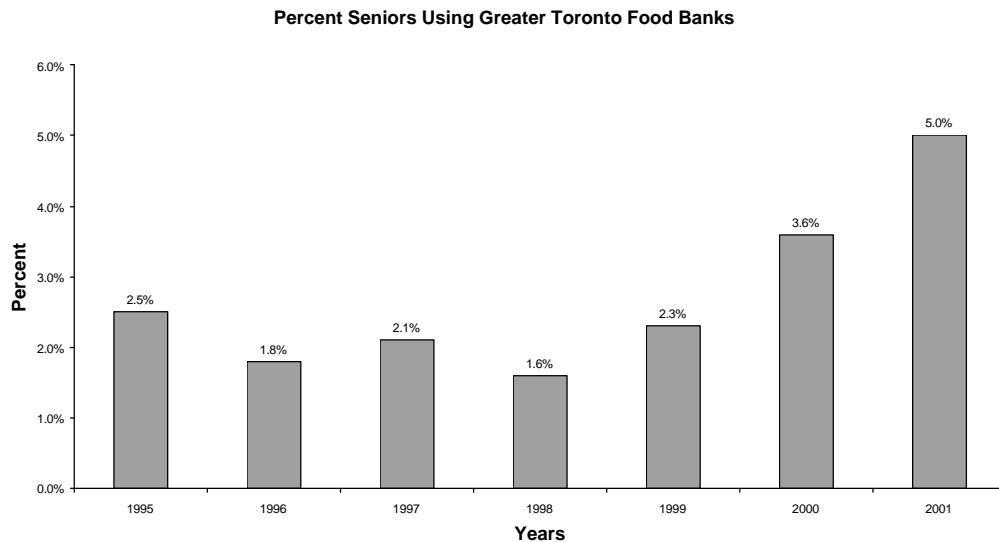
- compares the amounts, quantities, numbers or **frequencies** of several different groups of data.
- compares groups of data, and makes it easier for the reader to make quick generalizations about the data

A **Bar Graph** has horizontal bars. A **Column Graph** has vertical bars.

The following **Column Graph** is adapted from information **on Food Banks in the Greater Toronto Area** taken from the **Toronto Star, A6 Section, August 18, 2001**.

Looking at the graph, it is easy to see that the percent of seniors using food banks in Toronto has increased in the last few years.

Example of a Column Graph



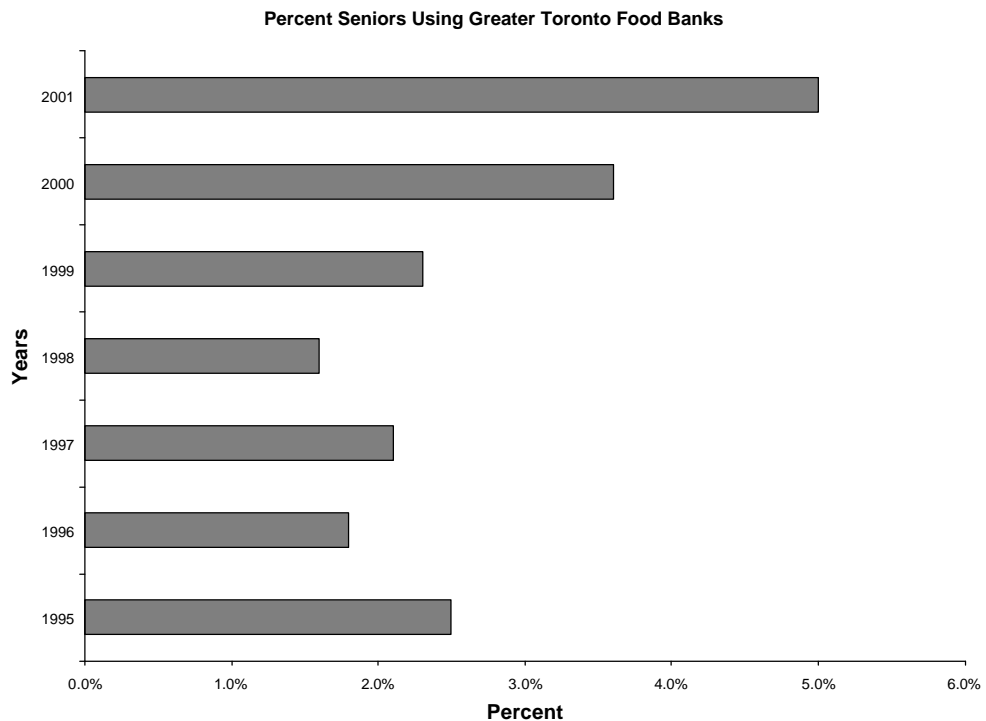
Each year's percent is represented by one **vertical column**. Each column is labelled along the horizontal axis of the graph. The vertical axis has a scale that shows the percent value of each column.

A Bar or Column Graph should have a good, descriptive title. Each axis (horizontal and vertical) should be clearly labelled and have an appropriate scale. In this case, the percent ranges from 1.6% to 5.0%. The scale goes from 0% to 6.0% in 1.0% intervals.

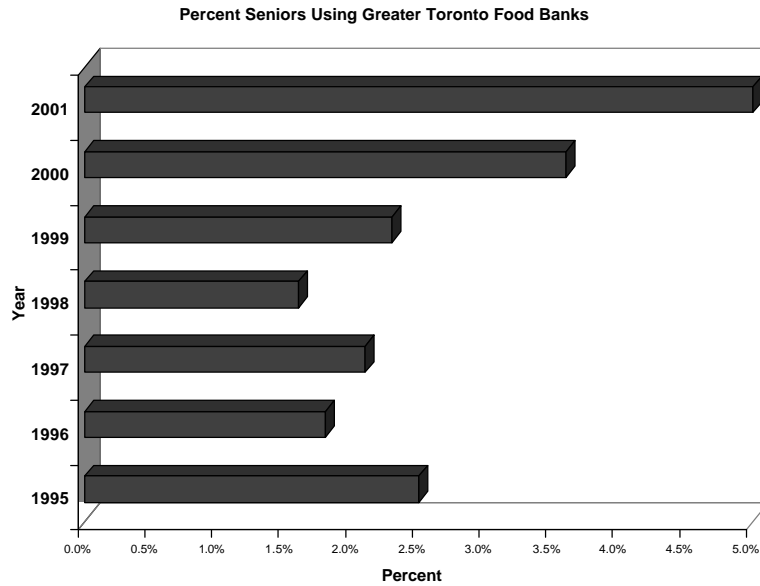
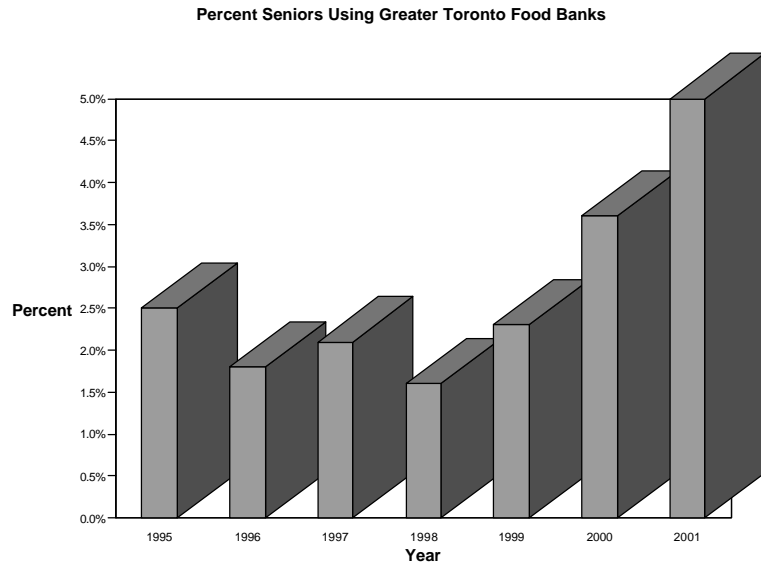
The bars and columns can be coloured or can be textured. In the examples above and on the next page, we have used different colours and textures. You could make a different colour or texture for each assignment or example that you do in this lab .

We can illustrate the same data by using a **Bar Graph**. Each horizontal bar represents a year and each year is labelled on the vertical axis. The horizontal axis now has a scale for the percent value of each year.

Example of a Bar Graph



We could make **3-D Column Graphs** or **Bar Graphs** as shown below. All the example graphs have been created by using **Chart Wizard** and an **Excel Spreadsheet** . You can be quite creative in creating these graphs. Let your imagination go and have fun !



Construct a Column or Bar Graph Using an Excel Spreadsheet and Chart Wizard

Let's make a column graph using the information on **Mike's Monthly Car Budget** from **Lab 4**. We will compare the amounts in each of the categories: Loan Payment, Repairs, Insurance and Gas.

Mike's Monthly Car Budget

Item	Amount (\$)
Loan Payment	350
Repairs	100
Insurance	250
Gas	55

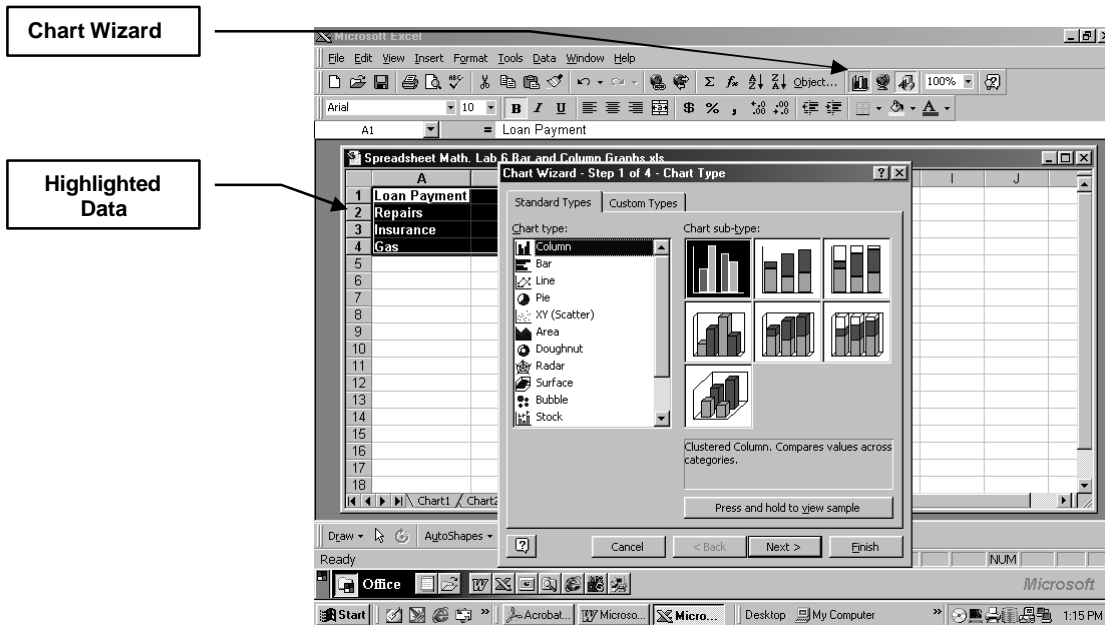
1. Open an **Excel** Worksheet.
2. Enter and format the data on **Mike's Monthly Car Budget** in your worksheet. Make sure you widen the headings columns so that entire headings fit into the cell.

The screenshot shows the Microsoft Excel interface with a worksheet titled "Spreadsheet Math. Lab 6 Bar and Column Graphs.xls". The data from the table above is entered into the worksheet as follows:

	A	B	C	D	E	F	G	H	I	J
1	Loan Payment	350								
2	Repairs	100								
3	Insurance	250								
4	Gas	55								
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										

A callout box labeled "Data entered in Worksheet" points to the data in the worksheet. The Excel interface includes the menu bar (File, Edit, View, Insert, Format, Tools, Data, Window, Help), the toolbar, and the status bar (Ready, NUM). The Windows taskbar at the bottom shows the Start button, several application icons, and the system clock (1:12 PM).

- Highlight cells **A1:B4**, and **Click** on the **Chart Wizard** button on the toolbar.



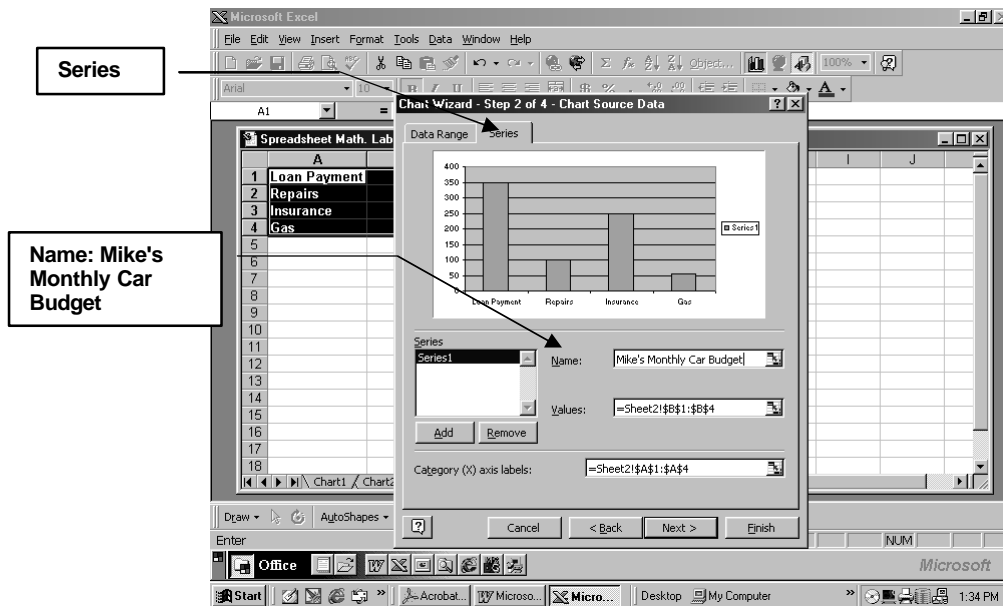
- Select the Chart type:
Click on Chart Type: **Column**
 Of the several column sub-types shown, **Click** on the first one. If you want to **Preview** what the column chart will look like, **Click and hold** on button that says "**Press and hold to view sample**". **Click Next >**
- Select the data range
 The data range is already selected, because you have highlighted the range **A1:B4** on the worksheet.
 You will see this range in the data range text box: **=Sheet1!\$A\$1:\$B\$4**

Click on **Series**.

Under the **Series** label, you will see **Series 1**.

Across from it, under **Name:** enter the name of your graph. In this case, the name is **Mike's Monthly Car Budget**.

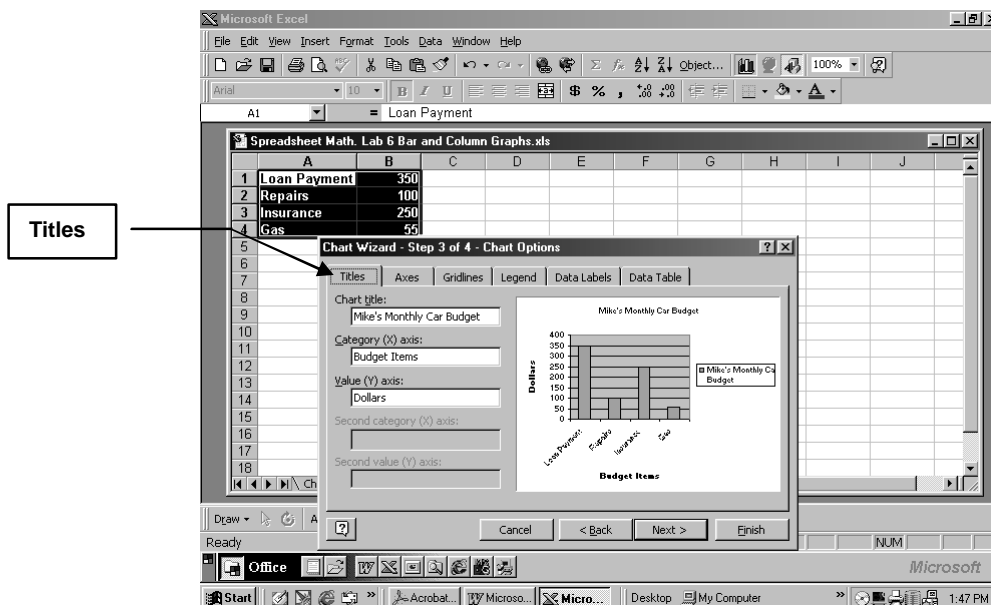
See an example of this screen on the next page.



Click on **Next >**

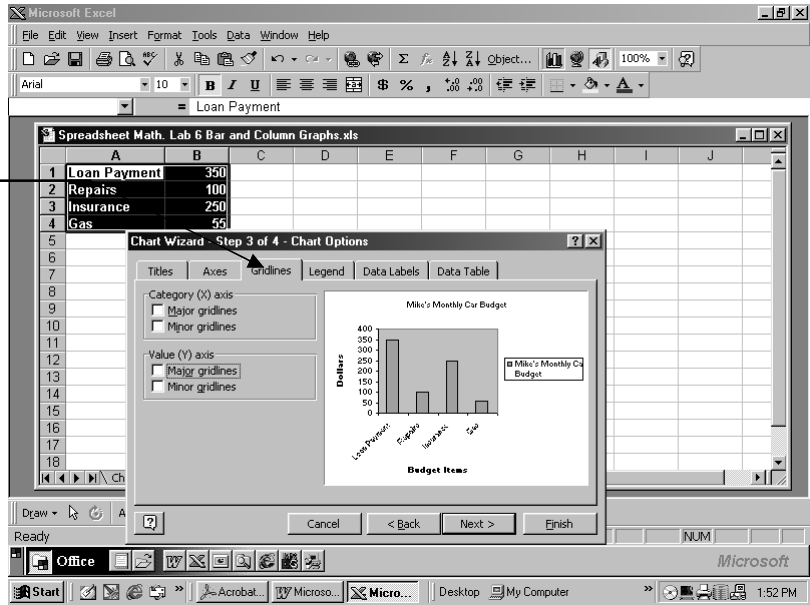
6. Select **Titles** Tab. The title of your chart, Mike's **Monthly Car Budget** is already there, as you named it as **Series 1**. The **(x) axis** is the **horizontal axis** of the graph and it is labelled **Budget Items (loan payment, repairs, insurance, gas)**.

The **(y) axis** is the **vertical axis** of the graph and it is labelled **Dollars**.



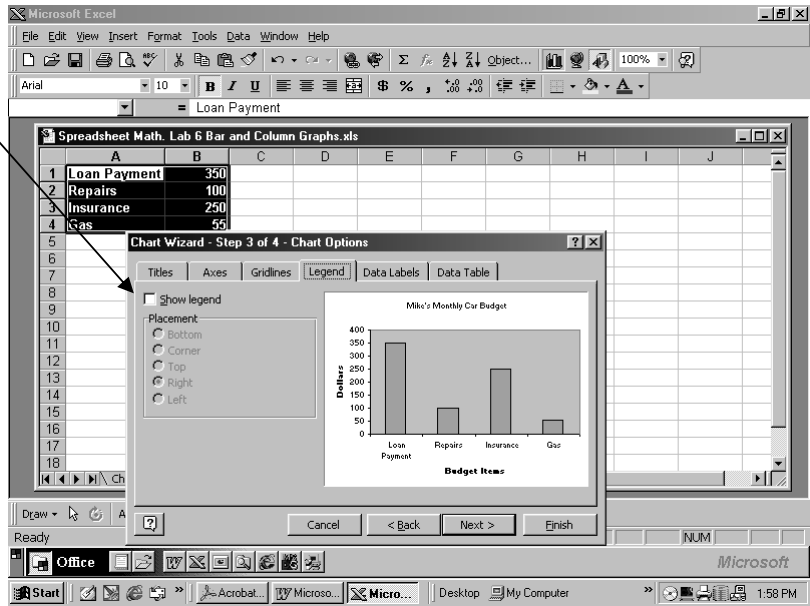
7. Select **Gridlines** Tab. Deselect the **Major Gridlines** under **Value (y) axis** by clicking the **†**. The **†** disappears and gridlines are gone.

Gridlines

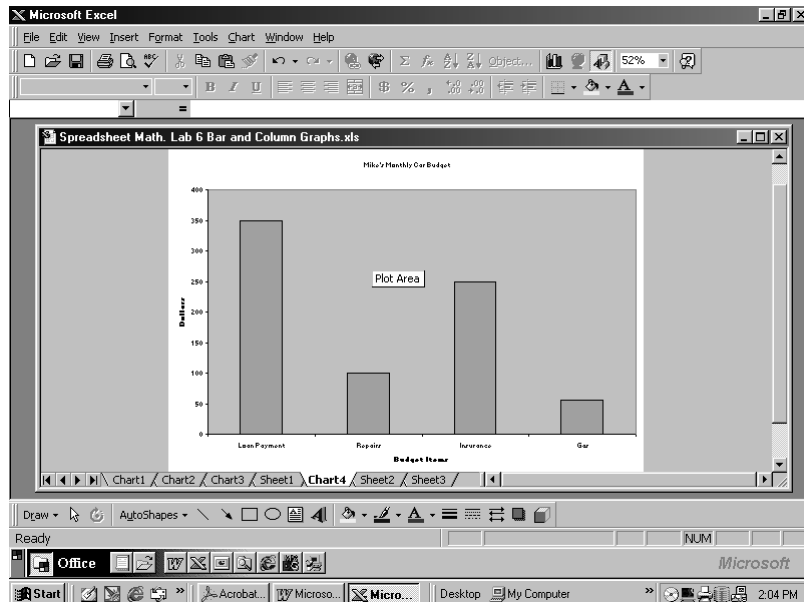


Select **Legend** Tab. **Deselect** the legend by clicking once on the **Show Legend Box**. This makes the legend disappear.

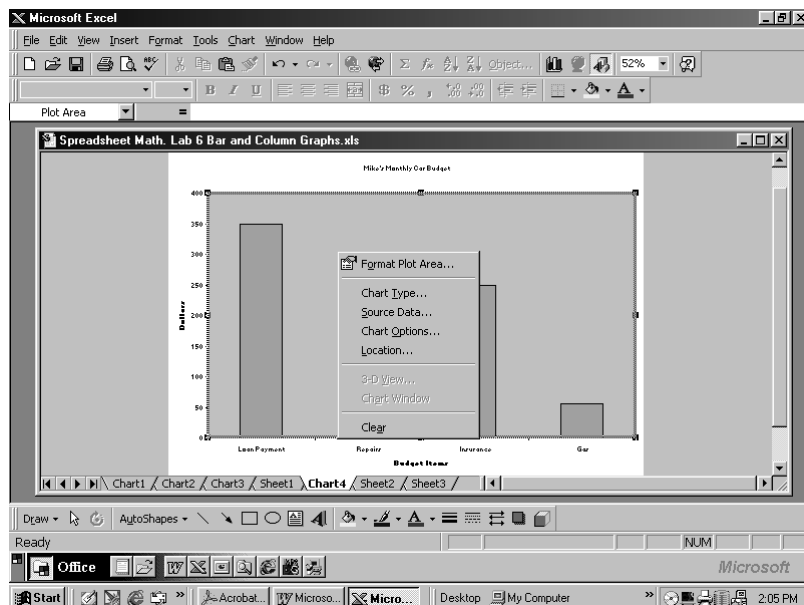
Legend Deselect Box



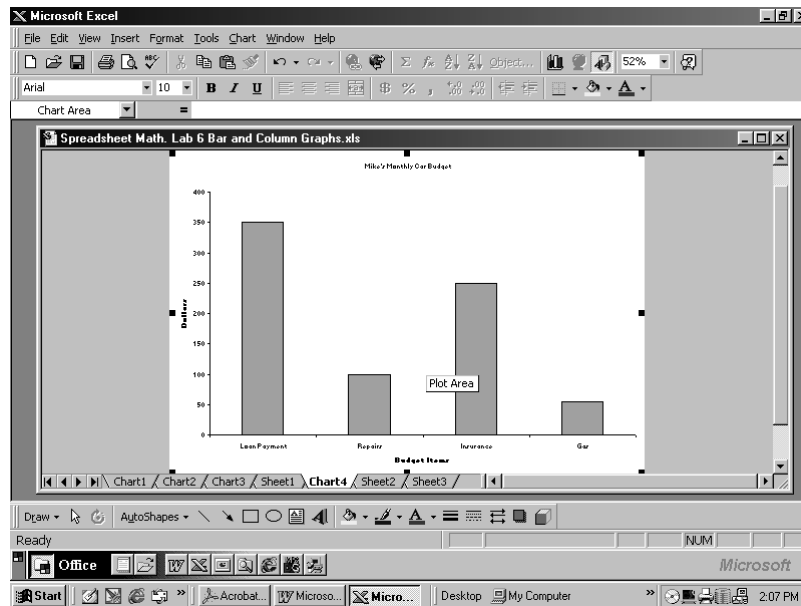
8. Click **Next >**
 Select **Place Chart**: as a new sheet and Click on **Finish**
 The column graph will appear on the screen.
 Place cursor on the grey Plot area



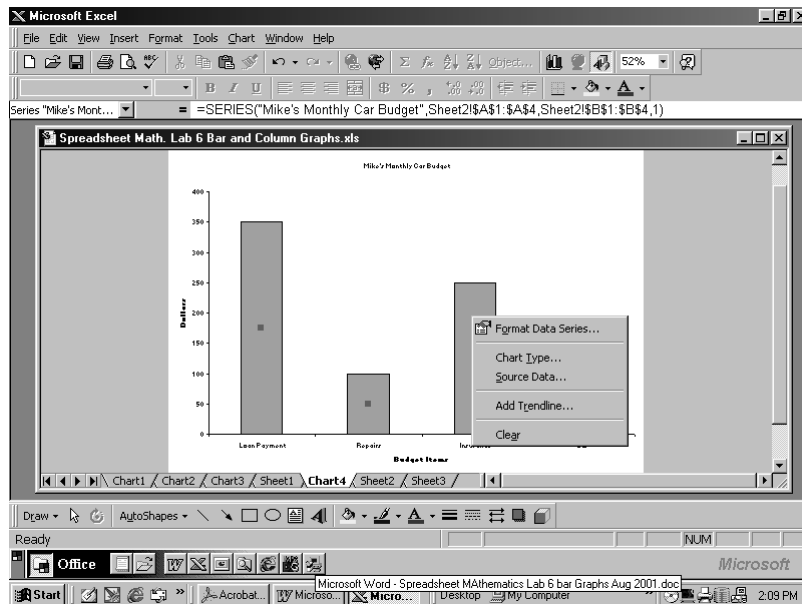
Right Click. You will see the following screen



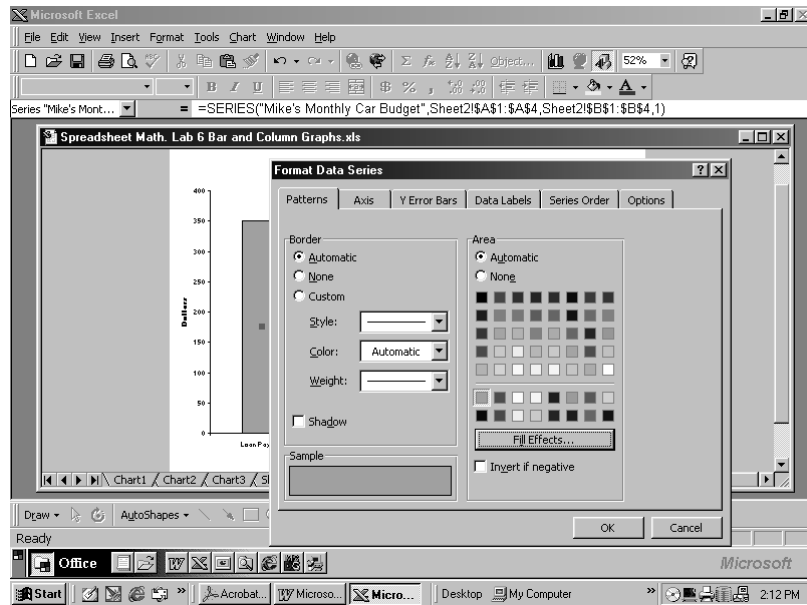
Now, **Left Click** on **Clear**. This will make the grey background of the graph turn white.



9. Place cursor on one of the columns of the graph and **Right Click**. You will see the following screen.



Now, **Click** on **Format Data Series**. The following Screen will come up.

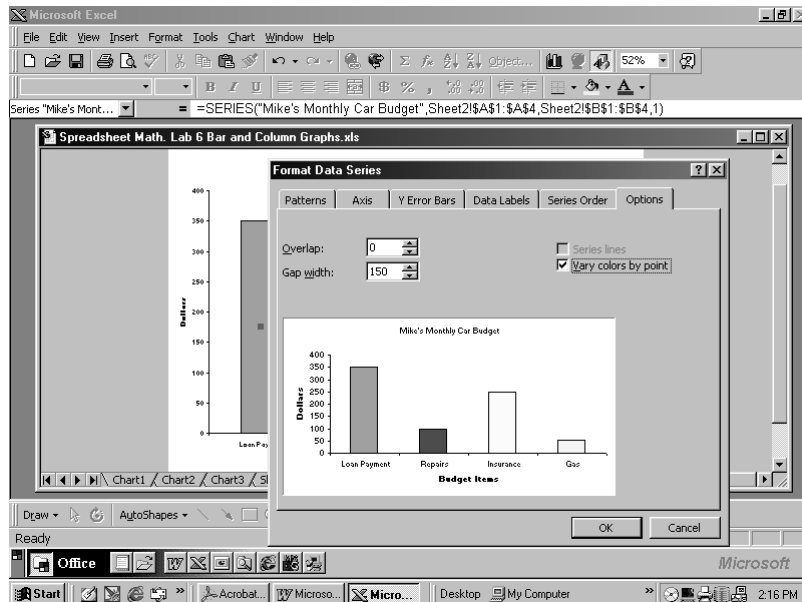


On the screen, you can change the bar **colours** and the **Fill Effects**. You may want to experiment with several choices.

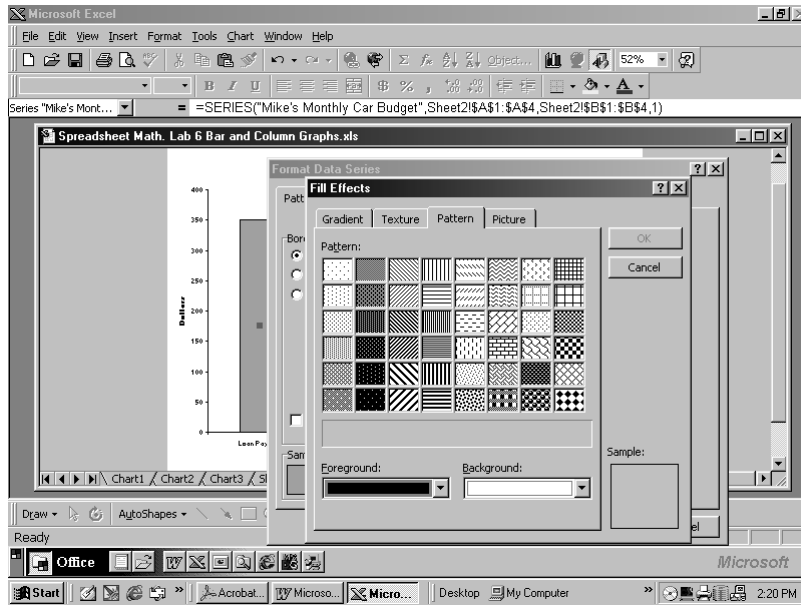
Let's **Click** on the **Options** Tab, and **Check** **Vary Colors by Point**.

You will see that each column gets a different colour.

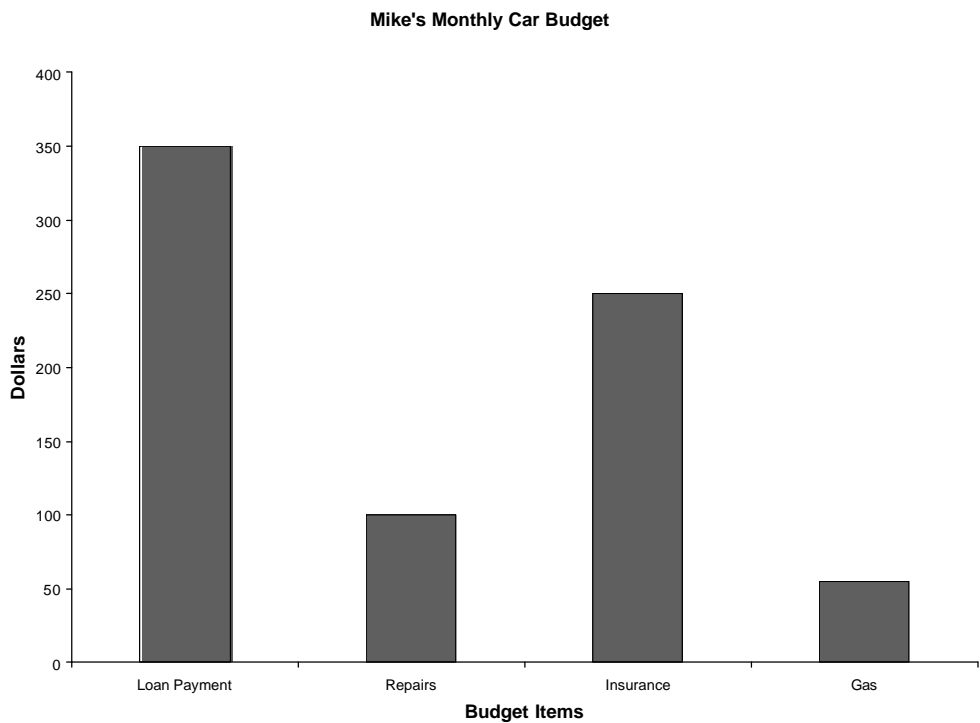
If you have a colour printer, then this can be a good effect to choose.



If you don't have a colour printer, you might want to use a patterned effect as is shown on the following screen.



10. Choose a **Fill Effect**, and you will get your completed graph.



11. To print your **Column Graph**, Click on **File** and **Select Print**.
The printer will print up you chart.
If you want to preview the chart before you actually print it, **Select Print Preview** on the **File menu**.
If you are satisfied with the chart, then you can go to **Print**.
 12. To save this Excel Spreadsheet and Column Graph : **Click on File** and **Select Save as**.

Give the file a name (you might use **Bar Graphs Lab 6**) and then **Click on Save**.
 13. Don't forget that the spreadsheet data page is saved as a Sheet. The graph is saved as a Chart. You will see the tabs for Sheets and Charts at the bottom of your Excel Spreadsheet screen. If this is a new Excel file, then the data is under Sheet 1 and the graph is under Chart 1.
-

You will now practice constructing Bar and Column Graphs using Excel and Chart Wizard.

Practice Assignment 1: Part A

Entering Data in a Worksheet and Creating a Bar or Column Graph

Open an Excel Worksheet. If you are using the same file as you used to prepare the previous example, then you will use Sheet 2.

Enter the data given in the chart below on Sheet 2. Follow the steps given in the **Example** to produce a bar or column graph. Print up your Excel Worksheet and graph.

Show your worksheet and graph to your teacher and discuss with your teacher any problems you had using the spreadsheet or the Chart Wizard.

Try some other styles of bar and column graphs using the Chart Wizard. Once you have the data entered on the spreadsheet, it is quite easy to experiment with the Chart Wizard to get different colours, textures and 3-D effects.

Data:

Average Hours Per Week of Television Viewing for Children 2-11 Canada 1999

Province	Children 2-11
Newfoundland	19.0
Prince Edward Island	15.9
Nova Scotia	15.3
New Brunswick	17.0
Quebec	19.0
Ontario	14.9
Manitoba	15.1
Saskatchewan	16.1
Alberta	13.7
British Columbia	13.1

Source: Statistics Canada, Catalogue no. [87F0006XIB](#).
Adapted from: *Statistics Canada's Internet Site*
<http://www.statcan.ca/english/Pgdb/People/Culture/arts23.htm>
August 28, 2001

Show your teacher the following:

1. A printed copy of your spreadsheet
2. A printed copy of your bar or column graph

Discuss with your teacher:

1. Problems or concerns you may have using Chart Wizard or Excel
2. The answers to the following questions:
" ***Which province has the highest average viewing hours per week for children 2 - 11 ?***"

" ***Which province has the lowest average viewing hours per week for children 2 - 11 ?***"

Part B: Entering Data in a Worksheet and Creating a Double Bar or Column Graph

It is quite easy using Chart Wizard to adapt a bar or column graph to compare two categories.

We can use the data from the previous chart and add to it data on "**average hours per week of television viewing for adolescence ages 12 - 17**".

**Data: Average Hours Per Week of Television Viewing
Comparing Children 2-11 and Adolescence 12 - 17
Canada 1999**

Province	Children 2-11	Adolescence 12-17
Newfoundland	19.0	16.3
Prince Edward Island	15.9	13.0
Nova Scotia	15.3	16.8
New Brunswick	17.0	17.5
Quebec	19.0	16.7
Ontario	14.9	15.3
Manitoba	15.1	14.2
Saskatchewan	16.1	15.5
Alberta	13.7	15.0
British Columbia	13.1	14.5

Source: Statistics Canada, Catalogue no. [87F0006XIB](#).
Adapted from: [Statistics Canada's Internet Site](http://www.statcan.ca/english/Pgdb/People/Culture/arts23.htm)
<http://www.statcan.ca/english/Pgdb/People/Culture/arts23.htm>
August 28, 2001

1. Add the data on **Adolescence 12 - 17** to the Excel spreadsheet that already contains data on **Children 2 - 11**.
2. Use Chart Wizard as you did in Part A of this assignment with several changes:
 - a. There are two series this time:
Label first series: **Children 2 - 11**
Label second series: **Adolescence 12 - 17**
 - b. Labelling axis is still the same. You will see that for each province, you will have two bars or columns.
 - c. You may want to leave the legend on this graph, so do not deselect the legend.
 - d. You will save this graph as a new chart, so as not to interfere with your last graph.

- e. You may want to experiment with changing textures or colours on your graph so that there is a contrast between the bars for children and adolescence in each province.
Get some help from your teacher if you are having trouble with this step.

Show your teacher the following:

1. A printed copy of your spreadsheet
2. A printed copy of your bar or column graph, showing comparison between children and adolescence for each province

Discuss with your teacher:

1. Problems or concerns you may have with using Chart Wizard or Excel. (Especially setting up the comparison between children and adolescence in this part)
2. The answer to the following question:
***" Compare the television viewing habits of children and adults in each province.
What are your conclusions ?"***

Part C: Entering Data in a Worksheet and Creating a Bar or Column Graph that Compares 4 Groups per Category

It is quite easy using Chart Wizard to adapt a bar or column graph to compare more than two categories.

We can use the data from the previous chart and add to it data on **"average hours per week of television viewing for Men over 18 and Women over 18"**

Data:

Average Hours Per Week of Television Viewing

Comparing Children 2-11, Adolescence 12 - 17, Men and Women 18 and Over Canada 1999

Province	Children 2-11	Adolescence 12-17	Men 18 and Over	Women 18 and Over
Newfoundland	19.0	16.3	23.2	29.0
Prince Edward Island	15.9	13.0	20.0	24.8
Nova Scotia	15.3	16.8	21.5	25.7
New Brunswick	17.0	17.5	21.8	26.7
Quebec	19.0	16.7	23.4	29.5
Ontario	14.9	15.3	19.6	24.2
Manitoba	15.1	14.2	19.7	24.4
Saskatchewan	16.1	15.5	20.0	24.5
Alberta	13.7	15.0	19.3	23.1
British Columbia	13.1	14.5	21.3	23.6

Source: Statistics Canada, Catalogue no. [87F0006XIB](#).
Adapted from: [Statistics Canada's Internet Site](http://www.statcan.ca/english/Pqdb/People/Culture/arts23.htm)
<http://www.statcan.ca/english/Pqdb/People/Culture/arts23.htm>
August 28, 2001

1. Add the data on **Men 18 and Over** and **Women 18 and Over** to the original Excel spreadsheet that already contains data on **Children** and **Adolescence**.
2. Use Chart Wizard as you did in Part A and B of this assignment with several changes:
 - a. There are four series this time:
Label first series: **Children 2 - 11**
Label second series: **Adolescence 12 - 17**
Label third series: **Men 18 and Over**
Label fourth series: **women 18 and Over**
 - b. Labelling axis is still the same. You will see that for each province, you will have four bars or columns.
 - c. You may want to leave the legend on this graph, so do not deselect the legend.

- d. You will save this graph as a new chart, so as not to interfere with your last two graphs.
- e. You may want to experiment with changing textures or colours on your graph so that there is a contrast between the bars for children, adolescence, men and women in each province.
Get some help from your teacher if you are having trouble with this step.

Show your teacher the following:

1. A printed copy of your spreadsheet
2. A printed copy of your bar or column graph, showing comparison between children, adolescence, men and women for each province

Discuss with your teacher:

1. Problems or concerns you may have with using Chart Wizard or Excel. (Especially setting up the comparison between children, adolescence, men and women in this part)
2. The answer to the following questions:
"After carefully studying your graph, can you come to any conclusions about television viewing from province to province or from group to group ?"

What are your conclusions ?

What further information might you need before you can come to any conclusions about the data ?"

Hand-In Assignment:

Use Information from a Web site to Create a Bar or Column Graph Using Excel Spreadsheet and Chart Wizard

In this hand-in assignment, you will go to a Statistics Canada Website and get some data. You will produce a bar or column graph by setting up a spreadsheet and using Chart Wizard.

1. Go to the website:
<http://www.statcan.ca/english/Pgdb/People/Labour/labor01a.htm>
2. There you will see the heading: **Average earnings by sex and work pattern**
You can select: **all earners, full-time workers, other workers.**
Select: **all earners**
You will see the following data chart.

	All workers		
Year	Women	Men	Earnings ratio %
1989	19,965	33,826	59.0
1990	19,969	33,413	59.8
1991	19,971	32,486	61.5
1992	20,654	32,363	63.8
1993	20,413	31,761	64.3
1994	20,623	33,168	62.2
1995	21,080	32,421	65.0
1996	20,879	32,336	64.6
1997	21,013	33,120	63.4
1998	21,999	34,171	64.4

Source: Statistics Canada, Income Statistics Division.

Adapted from: Statistics Canada's Internet Site:

<http://www.statcan.ca/english/Pgdb/People/Labour/labor01a.htm>

August 28, 2001

3. Set up an Excel spreadsheet and enter the data in the chart. Enter **Year, Men, Women. Do not enter Earnings Ratio %**.
4. You must **Format the dates as Text**. To do this:
 - a. **Select** the **range** of cells in the **Dates** column
 - b. **Select Format** on the Excel toolbar, then **Select Cells**, then **Number** and then **Text**.If you follow those steps, your Dates column will be formatted as Text. If you have been unsuccessful, you will see three columns or bars for each date. Get help from your teacher if this occurs

5. Use the Chart Wizard to create a double bar or column graph
6. Print up both your spreadsheet and your graph.

Hand In for Evaluation:

1. A printed copy of your spreadsheet showing the data you have entered.
2. A printed copy of your double bar or column graph produced by Chart Wizard
3. Answer to the following question written in a short paragraph;

"After carefully studying the data and the double bar or column graph you have produced, what conclusions can you come to about Average Earnings in Canada between 1989 and 1998 ?"

Discuss the paragraph with your teacher. You may want to work more on this paragraph and use it as an alternate communications assignment

Evaluation Rubric:

10 marks	8 marks	5 marks	0 marks
<ul style="list-style-type: none"> • Excellent title • Axis well labelled • Double bar or column with different colours or textures • Conclusions drawn from data and graph 	<ul style="list-style-type: none"> • Good title • Axis labelled • Double bar or column • Conclusions drawn from data and graph 	<ul style="list-style-type: none"> • One part of graph missing • Conclusions drawn from data and graph 	<ul style="list-style-type: none"> • Re-do graphs, spreadsheet, paragraph • (discuss with teacher before redoing)

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