

# Mathematics LBS 5

## Spreadsheet Mathematics: Statistics and Graphing

### Lab 4: Constructing Pie Charts and Circle Graphs



*Microsoft Excel Logo and all screens captured by permission of Microsoft*

**Goal** To construct pie charts (circle graphs) by hand and by using Chart Wizard in Microsoft Excel

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

- construct pie charts (circle graphs) using protractor and compass
- enter data in an Excel worksheet
- use Chart Wizard to construct pie charts (circle graphs)
- save the worksheet and the chart (graph)
- print the worksheet and chart (graph)
- compare hand constructed graphs with computer generated graphs
- complete several practice assignments

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

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

### **Contents**

- construct a pie chart (circle graph) using a compass and a protractor
- enter data in an **Excel Spreadsheet** and create a pie chart using **Chart Wizard**
- complete two practice assignments
- complete a hand-in assignment
- discuss questions or concerns about assignments with your teacher

# Spreadsheet Mathematics: Statistics and Graphing

## Lab 4: Constructing Pie Charts or Circle Graphs

**New Words:** Pie Chart, Circle Graph , Graph title, sector, sector label

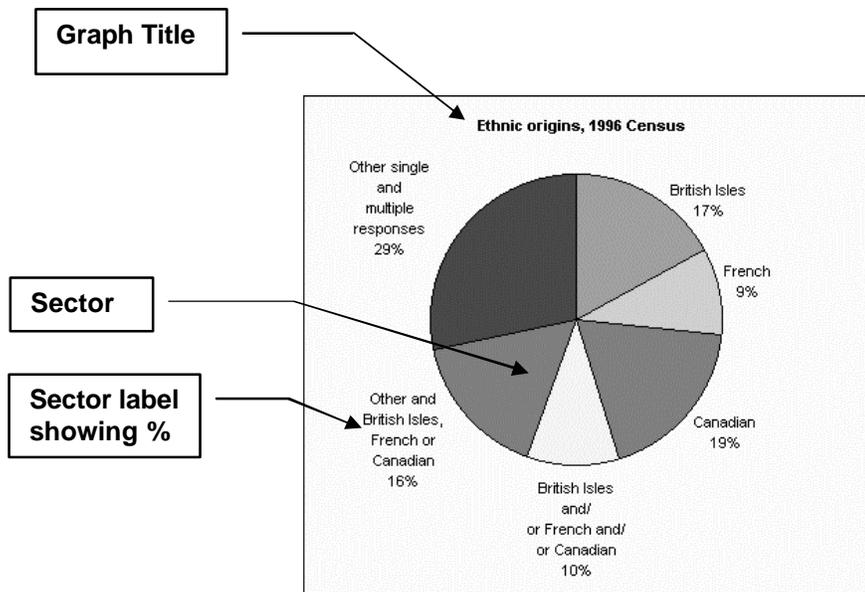
A graph is a picture that illustrates charts of numerical data and makes the data more understandable to the ordinary person.

A Pie Chart is a graph that shows the ***fraction*** or ***percentage*** that "***one part***" is of a "***whole thing***".

Each section of the pie chart is like a "***piece of pie***" (apple, cherry, pumpkin !!!) By glancing at the ***pie chart***, we quickly get a picture of what fraction each little piece is of the whole amount.

The ***pie chart*** should be labelled carefully so that you know what each section represents. You may want to use colour or black and white. There are many choices that you can make so that your ***pie chart*** is interesting. You want to show the data you have collected in a clear and colourful way.

Here is an example of a Pie Chart taken from the 1996 Canadian Census.



- Captured by permission of Statistics Canada
- <http://www.statcan.ca/english/edu/prototype/glossary/circle.gif>
- August 16, 2001

Now, we will produce our own pie charts and circle graphs both by hand and by using an Excel Spreadsheet and the Chart Wizard.

### Construct a Pie Chart or Circle Graph by Hand Using a Compass and a Protractor

An easy example of data to illustrate with a Pie Chart would be a **Mike's Monthly Car Budget**. First, we look at the total amount of the budget. Then we make a pie chart to show how the whole budget is divided up into:

- **Loan Payment**
- **Repairs**
- **Insurance**
- **Gas**

In other words, the "**whole pie**" is cut up into "**slices**" or **sectors**, with each "**slice**" representing one part or fraction of the whole pie. Each slice (sector) represents a percentage of the total amount. We need to remember that the "**whole pie**" is **100%** and since it is a circle, is also **360°**.

We need to know the total monthly car costs, and how much is spent on each item in the budget. From that information, we can calculate the fraction and percentage that each item is of the whole amount. Finally, we can divide the 360° into sectors that represent each item.

#### Mike's Monthly Car Budget

For our example, we will look at Mike's monthly car budget. His total car costs each month are \$755 and he budgets for: Loan Payment, Repairs, Insurance and Gas.

1. The first step is to make a chart and list all the information. Next, we do the calculations necessary for the pie chart.

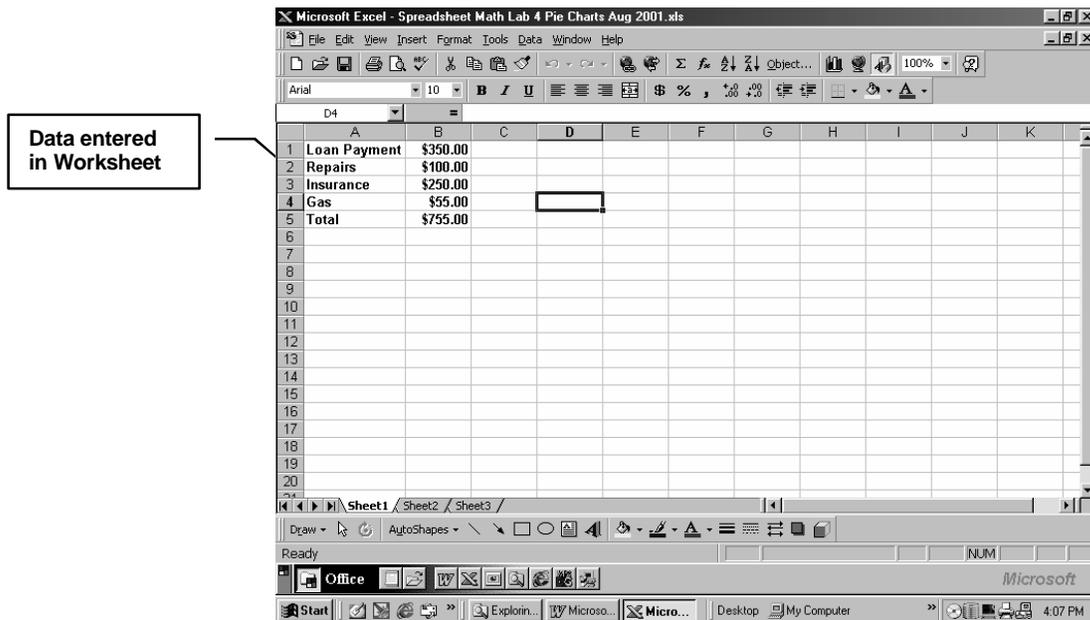
Item	Amount (\$)	Percent (%)	Fraction	Degrees
Loan Payment	350	46.4%	$\frac{350}{755}$	$\frac{350}{755} \times 360^\circ = 166.9^\circ$
Repairs	100	13.2%	$\frac{100}{755}$	$\frac{100}{755} \times 360^\circ = 47.7^\circ$
Insurance	250	33.1%	$\frac{250}{755}$	$\frac{250}{755} \times 360^\circ = 119.2^\circ$
Gas	55	7.3%	$\frac{55}{755}$	$\frac{55}{755} \times 360^\circ = 26.2^\circ$
<b>Total</b>	<b>755</b>	<b>100%</b>	$\frac{755}{755}$	<b>360°</b>

2. Draw a large circle on paper using a compass.
3. Use the protractor to divide the circle into "slices", using the degree values calculated in the previous chart.
4. Label each "slice" (sector) and colour it if you want to. You should use some sort of colouring or shading to show differences between each sector of your pie chart.
5. Give your Pie Chart a clear, descriptive title.
6. Next, you will prepare the same Pie Chart using an Excel spreadsheet and Chart Wizard. Then you can compare the hand-constructed graph with the computer generated graph.

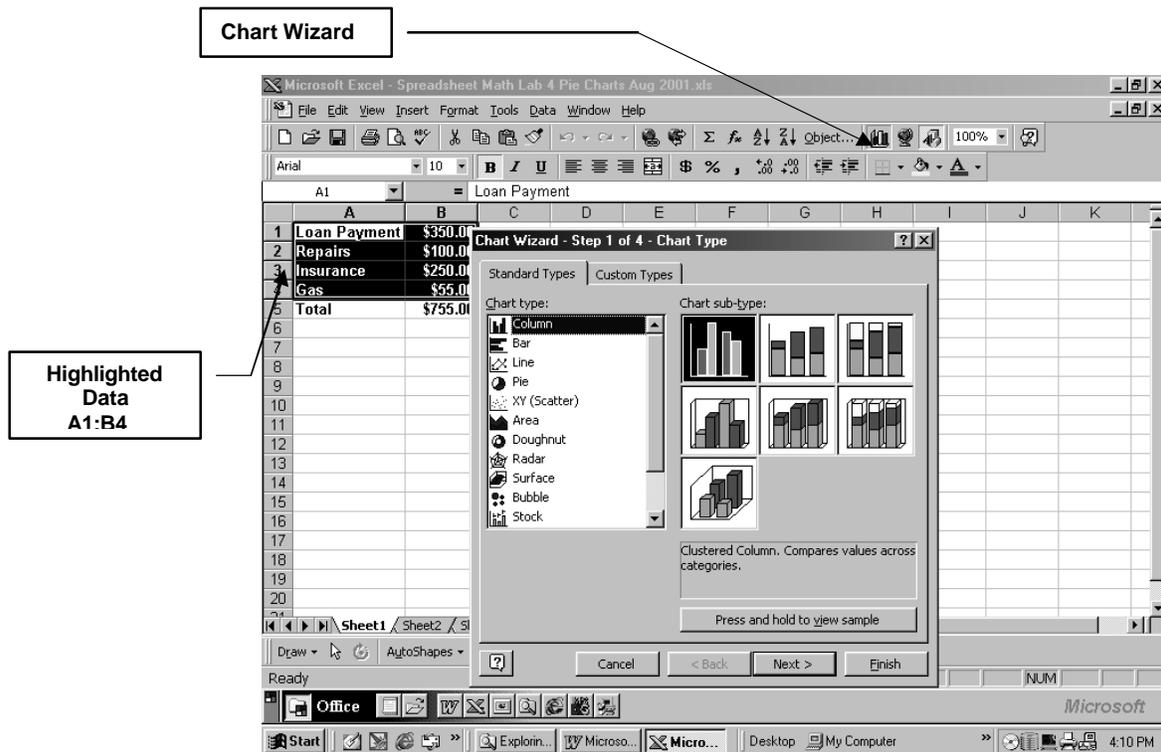
### Constructing a Pie Chart or Circle Graph Using an Excel Spreadsheet and Chart Wizard

1. Open an **Excel** Worksheet.
2. Enter and format the following data on your worksheet. Make sure you widen the headings column so that entire heading fits into the cell.

Monthly Car Expenses	
Loan Payment	\$350
Repairs	\$100
Insurance	\$250
Gas	\$55
<b>Total</b>	<b>\$755</b>

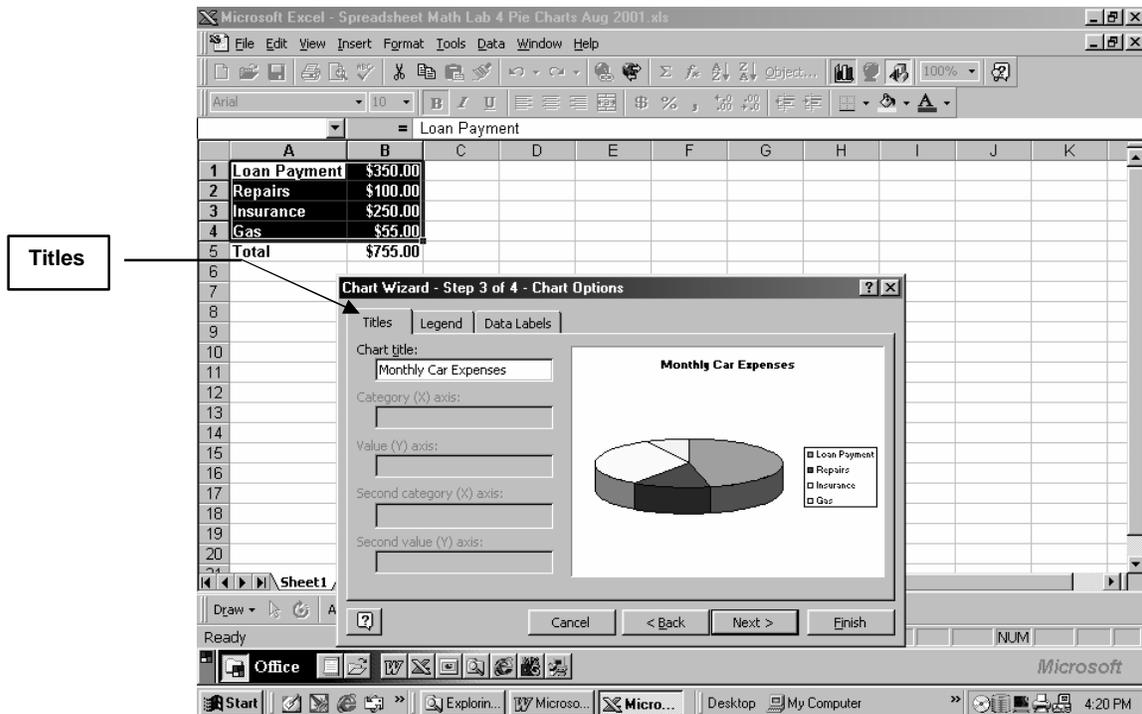


- Highlight cells **A1:B4**, and **Click** on the **Chart Wizard** button on the toolbar. Do not include the Total row.



- Select the Chart type:  
**Click** on Chart Type: **Pie**  
Of the several Pie sub-types shown, **Click** on the second one.  
If you want to **Preview** what the pie 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**  
The series should be in columns and should already be selected.  
**Click Next>**

6. Select **Titles** Tab. Type in the title of your chart. For this example, use **Monthly Car Expenses**.



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

7. Select **Data Labels** Tab. As you can see, you have a choice:

- None**
- Show value**
- Show percent**
- Show label**
- Show label and percent**

For this graph, choose **Show label and percent**. Then, **Click Next.>**

Data Labels

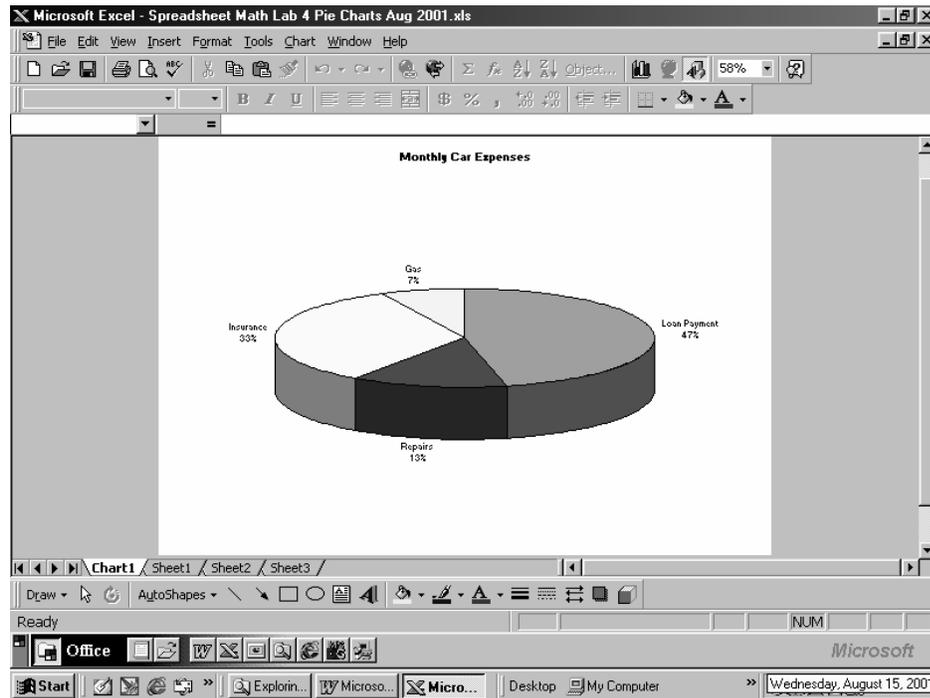
	A	B	C	D	E	F	G	H	I	J	K
1	Loan Payment	\$350.00									
2	Repairs	\$100.00									
3	Insurance	\$250.00									
4	Gas	\$55.00									
5	Total	\$755.00									

8. Finally, **Select Place Chart** : as a new sheet .

Place Chart:  
New Sheet

	A	B	C	D	E	F	G	H	I	J	K
1	Loan Payment	\$350.00									
2	Repairs	\$100.00									
3	Insurance	\$250.00									
4	Gas	\$55.00									
5	Total	\$755.00									

9. Click on **Finish** > . Your Pie Chart should look like the one below.



- To print your Pie Chart, 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**.
10. To save this Excel Spreadsheet and Pie Chart : **Click on File** and **Select Save as**.  
Give the file a name and then **Click on Save**.

## Practice Assignment 1: Entering Data in a Worksheet and Creating a Pie Chart Using Chart Wizard

Use the data provided to create a Pie Chart. Set up an Excel Worksheet, enter the data and following the steps given in Example 1 (above), print up your Excel Worksheet and Pie Chart.

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

### Data:

At a local music store, 250 people were surveyed about their favourite Canadian artist. The table below shows the results. Use the data to construct a spreadsheet and a Pie Chart.

Make sure that you use a good descriptive title for your Pie Chart.

Why not try some other styles of Pie Charts as shown in the Chart Wizard ?  
Once you have the data entered on the spreadsheet, it is quite easy to experiment with the Chart Wizard.

Canadian Music Artist	People surveyed
Anne Murray	31
Bryan Adams	52
Alanis Morissette	45
Céline Dion	90
Alana Miles	32

Adapted from: Statistics Canada's Internet Site: <http://www.statcan.ca/english/kits/circ12.htm>  
July 19, 2001

### Show your teacher the following:

1. A printed copy of your spreadsheet
2. A printed copy of your Pie Chart

### Discuss with your teacher:

1. Problems or concerns you may have with using Chart Wizard or Excel
2. The answer to the following question:

***"If you owned this music store which artists would you stock?  
Is there any other information you would like before making  
your decision?"***

## Practice Assignment 2: Use Information from a Web site to Create a Pie Chart

Adapted from: Statistics Canada's Internet Site: <http://www.statcan.ca/english/kits/graph.htm>  
July 19, 2001

In this assignment, you will go to a Statistics Canada Website, get some data, set up a spreadsheet and then using the Chart Wizard, create a Circle Graph or Pie Chart.

1. Go to the website: <http://www.statcan.ca/english/kits/graph.htm>
2. Scroll down until you get to: **Activity 4: Circle-Graph creation**
3. Click on **Crimes by type of offence.** You will go to a chart of data showing Crimes by type of offence from 1996 to 2000.

You will most likely want to print out the chart of data.

4. Decide what you want to illustrate in your circle graph. Remember that it should be simple and easy to understand.
5. Enter the data that you choose to use in a spreadsheet and using the Chart Wizard, create a circle graph (pie chart)

### Show your teacher the following:

1. A printed copy of your spreadsheet showing data you entered.
2. A printed copy of your Circle Graph

### Discuss with your teacher:

Write a short paragraph to explain what your circle graph represents and what challenges you encountered while creating your circle graph.

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

**Hand-In Assignment: Use Information from a Web site to Create a Pie Chart**  
**a. By Hand Using Protractor and Compass**  
**b. Using Excel Spreadsheet and Chart Wizard**

Adapted from: Statistics Canada's Internet Site <http://www.statcan.ca/english/kits/geography/table6.htm>  
July 23, 2001

In this hand-in assignment, you will go to a Statistics Canada Website and get some data. You will produce a pie chart using a compass and protractor and then you will set up a spreadsheet and use the Chart Wizard to create a pie chart.

Finally, you will compare your hand drawn pie chart with the pie chart from Chart Wizard.

1. Go to the website:  
<http://www.statcan.ca/english/kits/geography/table6.htm>

2. There you will see the heading:  
**Table 6. Sample Population-Graphing Assignment**  
**Ninety-six percent of Canadians come from somewhere else**  
and a table containing the following data on the ethnic origins of Canadians:

Ethnic Origins (1991)	
British	28%
British and French	4%
French	23%
British and/or French and other	14%
European	15%
Asian	6%
Aboriginal	4%
Other	6%

3. Make a chart of the data and complete each of the following steps in order to draw a pie chart by hand. (see **Mike's Monthly Car Budget** chart on page 3 for an idea on how to set up chart)
  - a. Make list of the groups by % from highest to lowest.
  - b. Convert the % for each group to degrees.

**Example:**  $28\% = \frac{28}{100} \times 360^\circ = 100.8^\circ$

- c. Construct a circle graph using your compass and protractor to measure the angles.

- d. Give your pie chart a good title, and label each sector clearly
- 4. a. Now set up an Excel spreadsheet and using the Chart Wizard, create a pie chart.
- b. Print up both your spreadsheet and your pie chart

**Hand In for Evaluation:**

1. Your hand-drawn pie chart (using protractor and compass)
2. A printed copy of your spreadsheet showing the data you have entered.
3. A printed copy of your pie chart produced by Chart Wizard Graph

<b>5 marks</b>	<b>4 marks</b>	<b>3 marks</b>	<b>0 marks</b>
<ul style="list-style-type: none"> <li>• Excellent Title</li> <li>• % converted into degrees for hand drawn graph</li> <li>• Labels on each sector and % shown</li> </ul>	<ul style="list-style-type: none"> <li>• Good title</li> <li>• % converted into degrees for hand drawn graph</li> <li>• Labels on each sector and % shown</li> </ul>	<ul style="list-style-type: none"> <li>• Some parts of graph missing</li> <li>• % incorrectly converted into degrees for hand drawn graph</li> </ul>	<ul style="list-style-type: none"> <li>• Re-do graphs and spreadsheet</li> <li>• (discuss with teacher before redoing)</li> </ul>

**Credits**

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