

## QUANTITATIVE METHODS

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# LAB 4

## Graphs – Part II

### Time Series

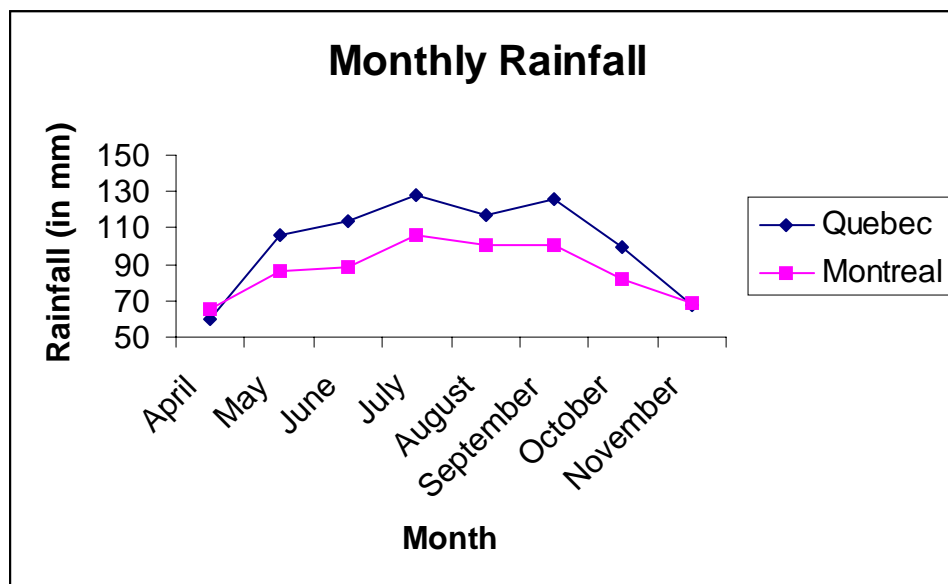
In order to compare the average rainfall during the summer months for two cities, Quebec and Montreal, a meteorologist recorded the following data.

Month	Average rainfall (in mm)	
	Quebec	Montreal
April	60	65
May	106	86
June	114	88
July	128	106
August	117	101
September	126	101
October	100	82
November	68	69

Make the usual heading and labeling of sheet 1.

Reproduce the above table in cells A7:C16.

To make the graph, blacken the cells A8:C16 and then click on the Chart Wizard. Choose LINE in the CHART TYPE. Fix your graph so that it looks something like this.



## Histograms

An ecologist wishes to know about the size of the trees in a forest. A sample of 50 trees is taken, and each of their height (in decimeters) is measured. Let us organize this data into a frequency distribution table, and then represent it graphically.

Make the usual heading and labeling to sheet 1.

In cell A6 “Height in dm” in bold (where dm stands for decimeters, 1dm = 10 cm). Adjust the width of the columns so that the words appear in full. Open the worksheet “Data – Tree Height” from my web site and copy the sample results in cells A7:A56.

### Frequency Distribution Table

Let us organize the data into a frequency distribution table. To start, we need to see what our classes will be. To do this, let us first find the maximum and the minimum value in our statistical series. In cell C7 write “Min” and in cell C8 write “Max”. Go to cell D7 and click on the  $f_x$  icon and go to STATISTICAL – MIN – OK. In NUMBER 1, write the range of your data, that is A7:A56 (or, equivalently, darken the cells A7:A56 with your mouse). Repeat the same thing for the max in D8. In cell C9 write “Range” and in cell D9 calculate the range, using a formula ( Max – Min ). In cell C10 write “Width” and in cell D10 divide the range by the number of classes we would like to have. In this case, say 7. The answer obtained, 4.56, means the width of our interval should be around this. Thus, rounding this number off, we obtain a class width of 5. Since the smallest number is 19.7, we can make our first class start at 15, giving us the class 15.0 to 19.9. The next class is then 20.0 to 24.9 and so on. (Note that this will give us 8 classes, not 7, but that’s alright since 7 was an arbitrary number.)

Using the classes found above let us make a relative frequency distribution table in cells C14:H24 that looks like this (ignore the gray lines, they simply outline the cells in Excel):

Distribution of the height for a sample of 50 trees				Relative Frequency	Class Midpoint
Height (dm)			Frequency		
15.0	to	19.9			
20.0	to	24.9			
25.0	to	29.9			
30.0	to	34.9			
35.0	to	39.9			
40.0	to	44.9			
45.0	to	49.9			
50.0	to	54.9			
<i>Total</i>					

To compile the data go to cell F16 and use the function FREQUENCY in  $f_x$ . For DATA\_ARRAY, we give the block of cells representing the height of our trees, so the cells A7:A56, and for BINS\_ARRAY the upper class limits, that is, the cells E16:E23. Click OK. Next, to get the other numbers, we darken the block of cells for the frequency, that is, F16:F23 and then press the key F2 followed by CTRL-SHIFT-ENTER. The frequencies should appear. The rest of the numbers in the table can be obtained through formulas.

Your results should look like this:

6	Height in dm					
7	32.9	Min = 19.7	dm			
8	26.1	Max = 51.6	dm			
9	36.7	Range = 31.9	dm			
10	43.9	width = 4.56	dm			
11	43.4					
12	47.1					
13	19.7					
14	35.2					
<b>Distribution of Height for a Sample of 50 Trees</b>						
		<b>Height (dm)</b>		<b>Frequency</b>	<b>Relative Frequency</b>	<b>Class Midpoint</b>
15	42.7	15.0	to 19.9	1	2%	17.45
16	27.4	20.0	to 24.9	7	14%	22.45
17	30.2	25.0	to 29.9	9	18%	27.45
18	23.2	30.0	to 34.9	12	24%	32.45
19	22.1	35.0	to 39.9	8	16%	37.45
20	28.2	40.0	to 44.9	7	14%	42.45
21	29.6	45.0	to 49.9	4	8%	47.45
22	20.2	50.0	to 54.9	2	4%	52.45
23	31.0	<i>Total</i>		50	100%	
24	32.2					
25	35.0					

**Graphing**

Let us make a histogram with the above data. With the Chart Wizard, make a bar diagram with the relative frequency the same way you did in lab 4, with appropriate titles, no legend, no gray background, and no gridlines. For ‘Category (X) axis labels’ use the Midpoints.

In histograms, the rectangles should touch one another. Double click on a rectangle and go to OPTIONS and reduce GAP WIDTH to 0.

