Calculating Averages

ASX

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1 Introduction

There are three types of "average" that are used in statistics:

1. **Mean**: to calculate the mean, you add up all the values and divide by how many there are.
   This is useful when the actual values of the data are important.
2. **Median**: to find the median, you sort the values and pick the middle one. If there is no "middle one", you find the mean of the two middle values.
   This is useful if you want to divide your data into two equal groups.
3. **Mode**: to find the mode, you find the value that appears the most.
   This is useful if you want the most common value.

In the following, you will calculate each of these averages for each row of your data. You will do this by calculating them for one row and then copying the formulae to the other rows.

Not all your rows may contain data initially, so you might want to do the initial calculations on a row that has some data. In which case, in all of the following formulae change the `2` for the row that you are actually working with.

2 Calculating the Mean

To calculate the mean, we add up the entries in a row and divide by the number of entries in that row.

1. In cell `N1` type `Mean`.
2. In cell `N2` type `=sum(B2:M2)` to calculate the total of the data in the second row.
3. In cell `O2` type `=count(B2:M2)` to count the number of entries in that row.
4. In cell `P2` type `=N2/O2` to divide the total by the count.
5. In cell `Q2` type `=average(B2:M2)` to display what the spreadsheet thinks the average is.
6. Copy the formulae from `N2:Q2` into rows `3` to `43` to compute the means for the other rows.

3 Calculating the Median

To calculate the median, we make a copy of each row with the data in order and then pick out the middle value (if there is one, if not the mean of the two middle values).

1. In cell `R1` type `Median`.
2. Click on the + at the bottom left of the spreadsheet window to create a new sheet.
3. Click on the `Sheet2` tab at the bottom to select it.
4. In cell `B2` type `=transpose(sort(transpose(Sheet1!B2:M2),1,true))` to make a sorted copy of the second row of data.
5. Copy this into cells `B3` to `B43` to make a sorted copy of all the rows of data.

6. Click on the Sheet1 tab at the bottom to go back to the first sheet.
7. In cell R2 type (all on one line):
   =if(isodd(O2),index(Sheet2!B2:M2,(O2+1)/2),(index(Sheet2!B2:M2,O2/2)+
   index(Sheet2!B2:M2,O2/2+1))/2)
   This picks out the middle value in the list, if the list has an odd number of entries, or the mean of the middle two if even.
8. In cell S2 type =median(B2:M2) to display what the spreadsheet thinks the median is.
9. Copy the formulae from R2:S2 into rows 3 to 43 to compute the medians for the other rows.

4 Calculating the Mode

To calculate the mode we first put the entries into "bins" of width 0.1. That is, we put all the values that are between, say, 0 and 0.1 together.

1. In cell T1 type Mode.
2. Click on the + at the bottom left of the spreadsheet window to create a new sheet.
3. Click on the Sheet3 tab at the bottom to select it.
4. In cell A1 type 0.
5. In cell B1 type =A1+.1 and copy this into cells C1 to U1. These define the "bins" into which we'll put our data.
6. In cell A2 type =countif(Sheet1!$B2:$M2,"<"&B$1)-countif(Sheet1!$B2:$M2,"<"&A$1) (note the dollars) and copy this into cells B2:T43.
   This counts how many entries in a given row lie between the value at the top of the column and the value at the top of the next.
7. Click on the Sheet1 tab at the bottom to go back to the main sheet.
8. In cell T2 type =max(Sheet3!A2:T2) to find the largest bin size.
9. In cell U2 type =match(T2,Sheet3!A2:T2,0) to find which bin this occurs in.
10. In cell V2 type =index(Sheet3!A$1:T$1,1,U2) to find the label on that bin, which is the mode for this data.
11. In cell W2 type =mode(arrayformula(if(isnumber(B2:M2),rounddown(B2:M2,1),))) to find what the spreadsheet thinks the mode of the data is.

5 Finding the Special People

Let's say someone is *special* if one of their measurements is either the largest or smallest of that measurement.

1. In cell X1 type Maximum and in cell AA1 type Minimum.
2. In cell X2 type =max(B2:M2) and in cell AA2 type =min(B2:M2) to find the maximum and minimum values in the row.
3. In cell Y2 type =match(X2,B2:M2,0) to find which column the maximum lies in and in cell AB2 type =match(Y2,B2:M2,0).
4. In cell Z2 type =index(B$1:M$1,1,Y2) to get the corresponding person's "name" and in cell AC2 type =index(B$1:M$1,1,AB2).
5. Right-click (or two-finger tap) on cell B1 and select Conditional Formatting.
6. In the new panel, in the menu Format cells if... select Custom formula is and in the box underneath type =match(B1,$Z2:$Z43,0) > 0. Click Done.
7. Click Add new rule and do the same but in the box type =match(B1,$AC2:$AC43,0) > 0.
8. Click again on cell B1 and use Ctrl+C to copy it. Then select cells C1:M1, right-click (two-finger tap), and hover over Paste special to bring up the second menu from which select Paste conditional formatting only. This will mean that the *special* people are highlighted.

How many people are *special*?