



# Data Analysis: A Practical Introduction for Absolute Beginners

## Lab 7: Data Visualisation

### Learning Objectives

- Use Excel Online to create line graphs, histograms, and bar graphs.

### Data Set

Mod4Labs.csv

**What You'll Need** To complete the lab, you will need the online version of Microsoft Excel.

### Overview

In this lab, we'll create three different types of visualization for the movie data we looked at in the previous lesson's lab.

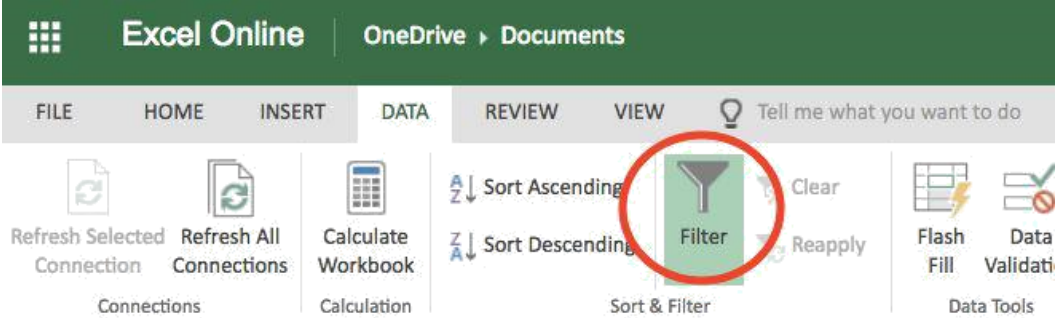
### Exercise 1: Line Graphs

We'll start things out by creating a simple line graph showing how all the movie runtimes relate to each other.

1. Open the data set in Excel, which shows 104 different movies along with their runtime (in minutes), rating, and liking score. Here's what the first few entries look like:

	A	B	C	D	
1	movieid	runtime	rating	liking	
2	6	112.74	PG13	3	
3	76	96.68	PG	3	
4	39	81.14	PG13	5	
5	89	104.07	PG	4	
6	93	101.38	G	4	
7	78	102.75	R	3	

- Before creating your graph, it'll make things easier to read if you first sort all this data by the movie ID numbers. Click into cell A1, then go to the ribbon and click Data > Filter.



The image shows the Excel Online ribbon with the 'DATA' tab selected. The 'Filter' button, represented by a funnel icon, is circled in red. Other buttons visible include 'Sort Ascending', 'Sort Descending', 'Clear', 'Reapply', 'Flash Fill', and 'Data Validation'.

	A	B	C	D	E	F	G	H
1	movieid	runtime	rating	liking				
2	6	112.74	PG13	3				
3	76	96.68	PG	3				
4	39	81.14	PG13	5				
5	89	104.07	PG	4				
6	93	101.38	G	4				

- A dropdown arrow should now appear next to each of the column titles.

	A	B	C	D
1	movieid	runtime	rating	liking
2	6	112.74	PG13	3
3	76	96.68	PG	3
4	39	81.14	PG13	5
5	89	104.07	PG	4
6	93	101.38	G	4

Click the arrow next to “movieid” in column A, then choose Sort Ascending.

	A	B	C	D
1	movieid	runtime	rating	liking
2				3
3				3
4				5
5				4
6				4
7				3
8	31	92.05	G	3

4. Once you've clicked Sort Ascending, all the data should rearrange itself by movie ID number.

	A	B	C	D
1	movieid	runtime	rating	liking
2	1	101.86	G	3
3	2	90.07	PG13	4
4	3	92.46	PG13	4
5	4	115.19	G	3
6	5	83.38	PG	5
7	6	112.74	PG13	3
8	7	106.36	PG13	3
9	8	108.69	PG13	4
10	9	90	R	5
11	10	94.56	PG13	5

5. With that step out of the way, you're ready to create your line graph. Highlight all the data in the "runtime" column (column B). Make sure *all* 104 movie runtimes are highlighted.

	A	B	C	D
1	movieid	runtime	rating	liking
2	1	101.86	G	3
3	2	90.07	PG13	4
4	3	92.46	PG13	4
5	4	115.19	G	3
6	5	83.38	PG	5
7	6	112.74	PG13	3

6. With column B highlighted, click on the Insert tab in the ribbon. In the Charts section, click Line ► Line with Markers (the icon in the lower-left corner).

The screenshot shows the Excel Online interface. The top bar indicates 'Excel Online' and 'OneDrive Documents'. The ribbon is set to 'Insert', and the 'Charts' section is active. The 'Line' button is highlighted, and the 'Line with Markers' chart type is selected from the dropdown menu. The background shows a spreadsheet with the 'runtime' column highlighted.

Excel Online | OneDrive Documents | Book 1

FILE HOME INSERT DATA REVIEW VIEW Tell me what you want to do OPEN IN EXCEL

Function Survey Table PivotTable Picture Shapes Office Add-ins Column Line Pie Bar Area Scatter Other Charts Hyperlink

Functions Tables Illustrations Add-ins Links

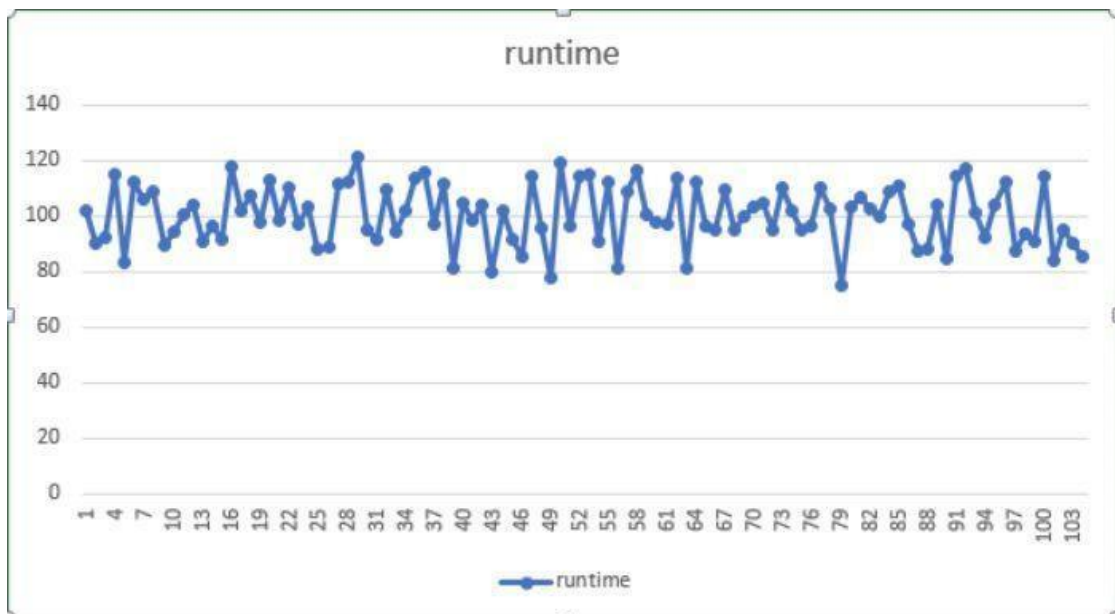
runtime

2-D Line

Line with Markers

Display trend over time (dates, years) or ordered categories. Useful when there are only a few data points.

- On that same spreadsheet, you should now see a graph showing each movie's runtime (on the vertical axis) and ID (on the horizontal axis).



- Finish up by adding titles to each axis, which will make things easier to read. Click on the graph itself, then click Chart Tools ► Axis Titles ► Primary Horizontal Axis Title ► Edit Horizontal Axis Title.

Excel Online | OneDrive ► Documents | CHART TOOLS | Book 1 | Go Premi

FILE HOME INSERT DATA REVIEW VIEW CHART Tell me what you want to do OPEN IN EXCEL

Switch Row/Column Select Data Data Column Line Pie Bar Area Scatter Other Charts Chart Title Axis Titles Legend Data Labels Table Axes Gridlines

Primary Horizontal Axis Title Primary Vertical Axis Title

None Do not display an Axis Title

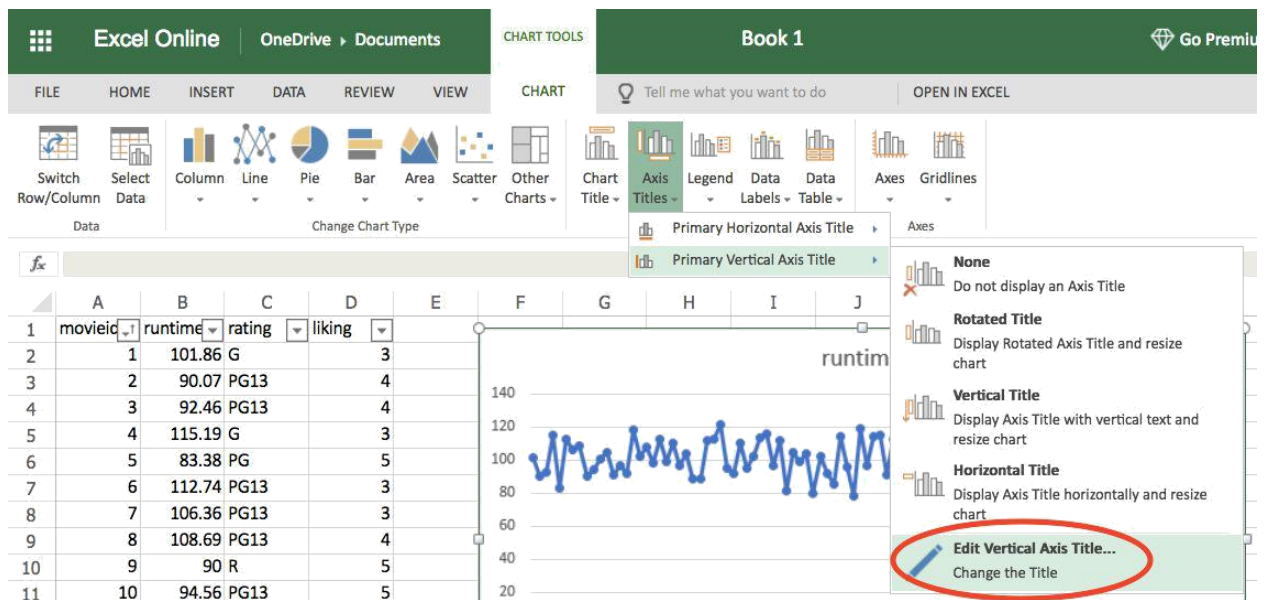
Title Below Axis Display Title below Horizontal Axis and resize chart

**Edit Horizontal Axis Title...** Change the Title

	A	B	C	D	E	F	G	H	I	J
1	movieid	runtime	rating	liking						
2	1	101.86	G	3						
3	2	90.07	PG13	4						
4	3	92.46	PG13	4						

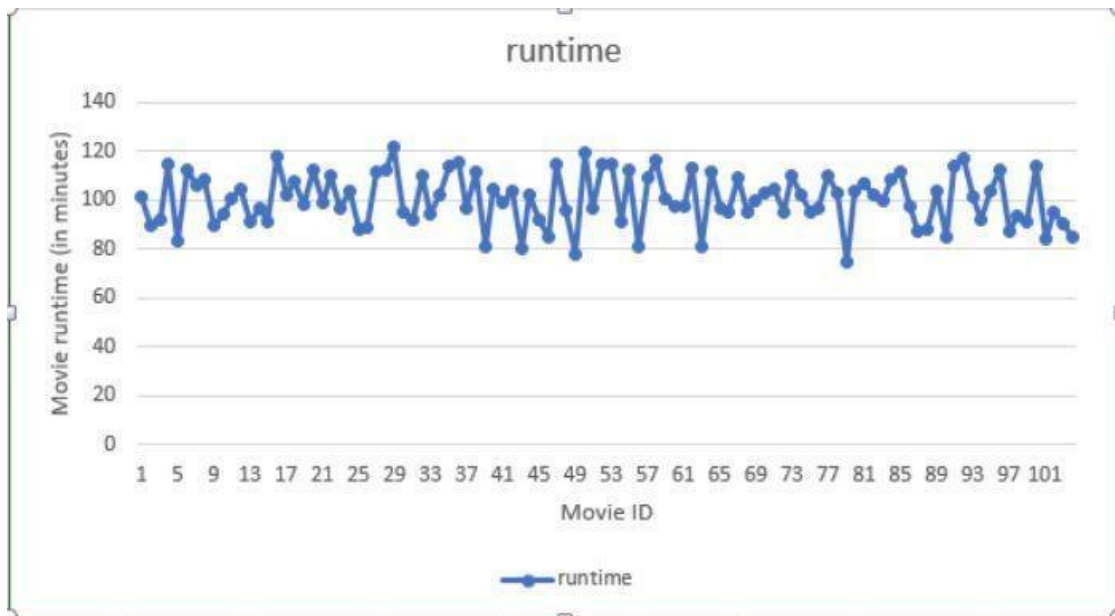
In the Title Text box, type in “Movie ID” and hit OK.

- Do the same thing for the vertical axis. Click on the graph itself, then click Chart Tools > Axis Titles ► Primary Vertical Axis Title ► Edit Vertical Axis Title.



In the Title Text box, type in “Movie runtime (in minutes)” and hit OK.

- Now you’ve got a nice, easy-to-read graph showing each movie’s length, in minutes. Each dot on the graph represents one movie.



With this data visualization, it’s easier to see that most of the movies fall between about 80 and 120 minutes in length, with a handful of outliers outside this range.

## Exercise 2: Histograms

The next type of graph we’ll look at is the histogram. We’ll use the movie runtime data again, but now we’ll see it in a different light.

1. In that same data set from Exercise 1 (with the data already sorted by movie ID), highlight everything in the “runtime” column again. Once again, make sure *all* 104 movie runtimes are highlighted.

	A	B	C	D
1	movieid	runtime	rating	liking
2	1	101.86	G	3
3	2	90.07	PG13	4
4	3	92.46	PG13	4
5	4	115.19	G	3
6	5	83.38	PG	5
7	6	112.74	PG13	3

2. With everything in column B highlighted, click the Insert tab in the ribbon and select Other Charts from the Charts section. Choose Histogram from the dropdown menu (it’s the first option under Statistical).

The screenshot shows the Excel Online interface with the 'Insert' tab selected in the ribbon. The 'Other Charts' dropdown menu is open, showing various chart types. A red arrow points to the 'Histogram' option under the 'Statistical' category. The background shows a spreadsheet with the 'runtime' column highlighted in green.

Excel Online | OneDrive > Documents | Book 1

FILE HOME INSERT DATA REVIEW VIEW Tell me what you want to do OPEN IN EXCEL

Function Survey Table PivotTable Picture Shapes Office Add-ins Column Line Pie Bar Area Scatter Other Charts Hyperlink Comment

Functions Tables Illustrations Add-ins Charts

fx runtime

	A	B	C	D	E	F	G	H	I	M
1	movieid	runtime	rating	liking						
2	1	101.86	G	3						
3	2	90.07	PG13	4						
4	3	92.46	PG13	4						
5	4	115.19	G	3						
6	5	83.38	PG	5						
7	6	112.74	PG13	3						
8	7	106.36	PG13	3						
9	8	108.69	PG13	4						
10	9	90	R	5						
11	10	94.56	PG13	5						
12	11	100.64	PG13	3						
13	12	104.44	PG13	5						
14	13	91.08	R	3						
15	14	96.78	PG13	3						
16	15	91.59	PG13	4						
17	16	118.04	PG13	3						

Waterfall

Funnel

Hierarchical

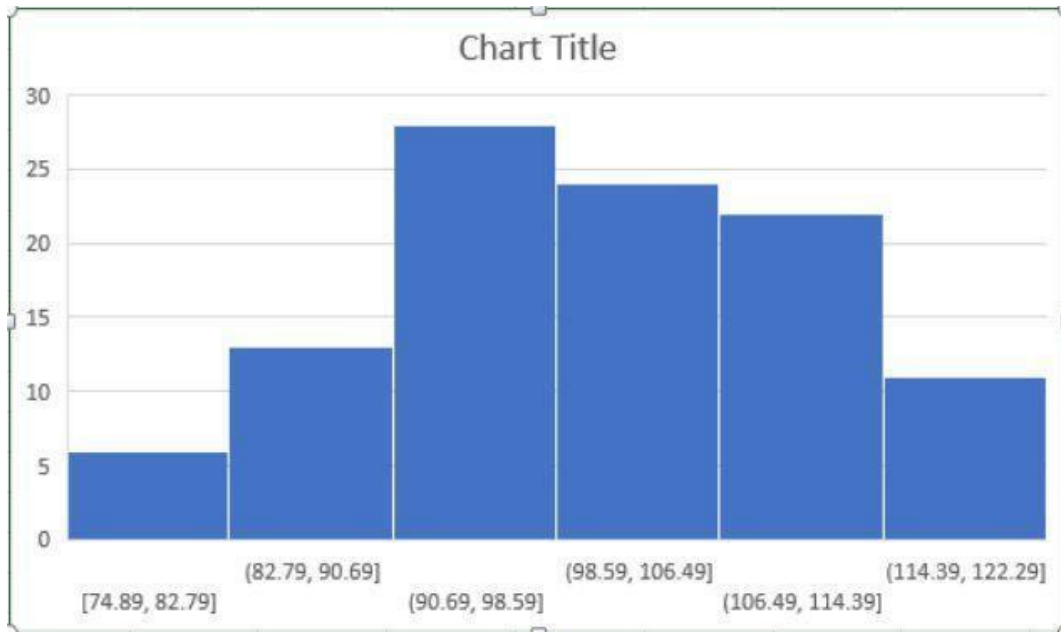
Statistical

Histogram

Rad Show the distribution of the data grouped into bins.

3. After clicking on the histogram icon, a new graph should pop up, like this:





It might look a little confusing at first, but here's how it works: The horizontal axis along the bottom shows different ranges, or **bins**, of movie runtimes. For example, the bin on the far left (the one labeled [74.89, 82.79]) represents all the movies that were between 74.89 minutes and 82.79 minutes.

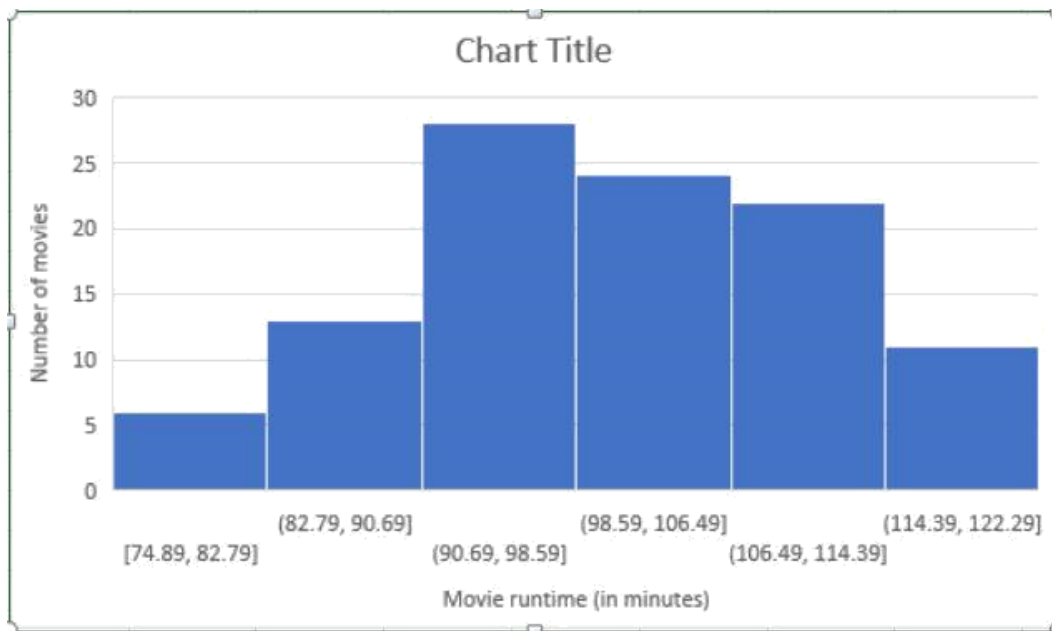
The vertical axis on the left shows the *number* of movies that fall into each bin category. For example, the blue bar on the far left is slightly above the marker for "5," which means that just over 5 movies on the list were between 74.89 minutes and 82.79 minutes long.

Notice how the program automatically chooses the bins for you based on an even distribution of the data. Sadly, you can't change the bin size in Excel Online (though if you have a desktop version of Excel, you can click Edit in Excel in the ribbon to specify the bin width). Those decimals are a little messy, but they'll do the job.

4. Now let's clean this histogram up by adding some helpful labels, exactly like we did in the previous exercise. Under Chart Tools ► Axis Titles, you can add titles for the vertical and horizontal axes. Make sure you click on the graph itself first.

Click Chart Tools ► Axis Titles ► Primary Horizontal Axis Title ► Edit Horizontal Axis Title, type in "Movie runtime (in minutes)" in the box, then click OK.

Then click Chart Tools ► Axis Titles ► Primary Vertical Axis Title ► Edit Vertical Axis Title, type in "Number of movies" in the box, then click OK. Your histogram should now look like this:



Much better, but let's add a couple more helpful labels.

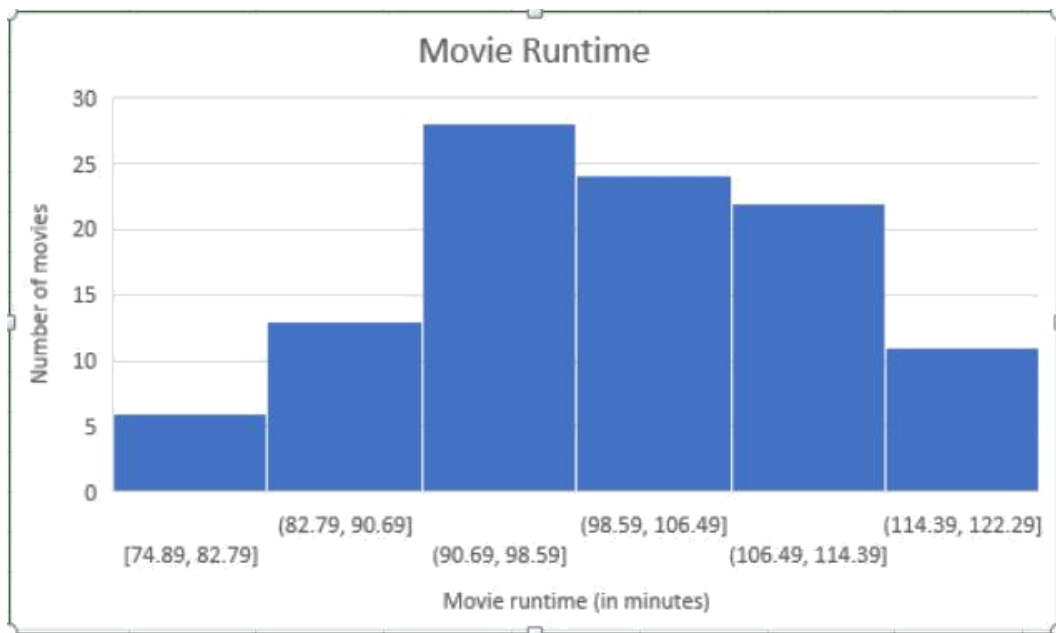
- Click on the histogram again, then go to Chart Tools ► Chart Title ► Edit Chart Title.

The screenshot shows the Excel Online interface with the 'Chart Tools' ribbon selected. The 'Chart Title' dropdown menu is open, showing options: 'None', 'Centered Overlay Title', 'Above Chart', and 'Edit Chart Title...'. The 'Edit Chart Title...' option is highlighted with a red circle.

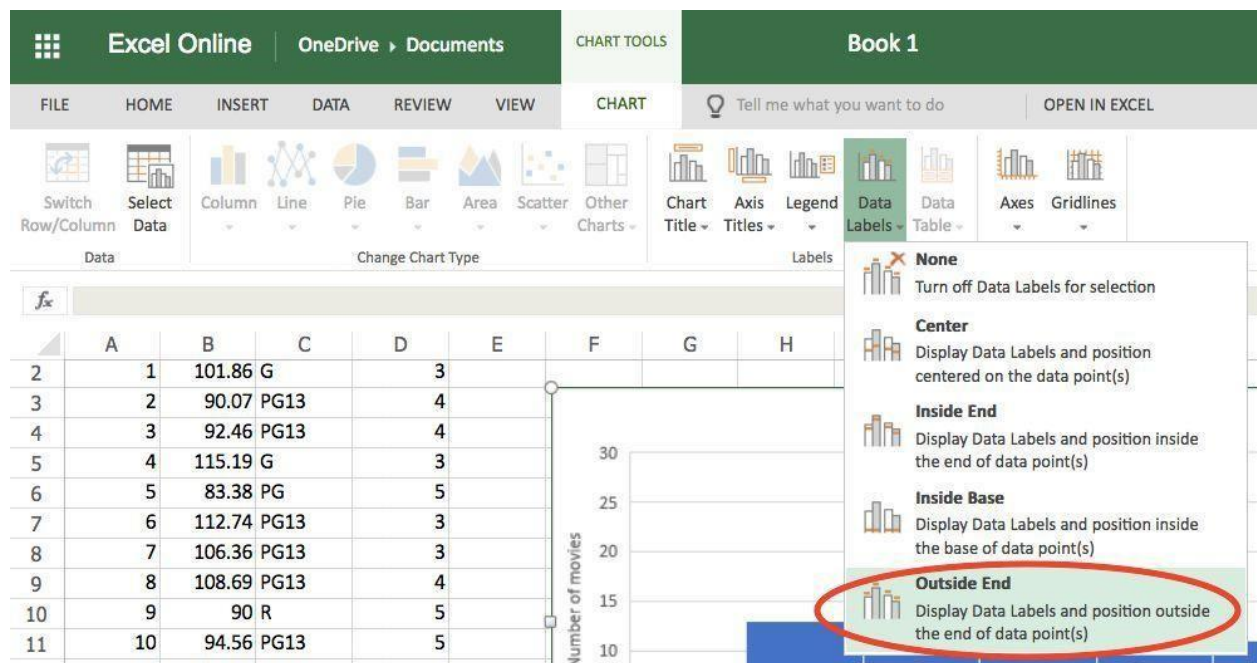
	A	B	C	D	E	F
2	1	101.86	G		3	
3	2	90.07	PG13		4	
4	3	92.46	PG13		4	
5	4	115.19	G		3	
6	5	83.38	PG		5	
7	6	112.74	PG13		3	
8	7	106.36	PG13		3	

Type in "Movie Runtime" and hit OK.

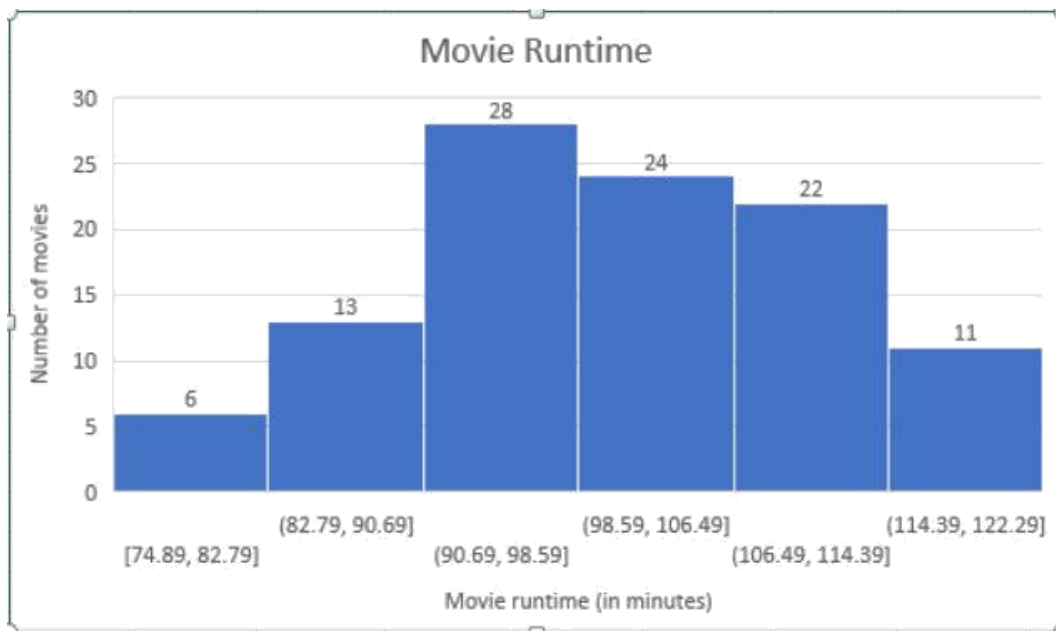




6. There's one other helpful label you can add to this histogram. Click on the graph, then choose Chart Tools ► Data Labels > Outside End.



This will add an actual count for each category above each bin, like so:



Now you can see exactly how many movies fell into each category. For example, there were 28 movies that were between 90.69 minutes and 98.59 minutes.

### Exercise 3: Bar Graphs

Sometimes, we have data that's *categorical* instead of numerical — it falls into categories that don't have any numerical value. One example is the movie rating data from this lab's data set, which shows whether each movie was rated G, PG, PG13, or R. These ratings aren't numbers, so we can't use a histogram to visualize them. But we can use a different type of visualization: a bar graph.

- Before you can create a new bar graph for the movie rating data, you'll need to rearrange the data a bit. Why? Because Excel Online's bar graph feature needs some actual numbers to read. Create a new mini-table off to the side with a row for each of the four movie rating categories (G, PG, PG13, and R), like so:

	A	B	C	D	E	F	G
1	movieid	runtime	rating	liking		G	
2	1	101.86	G	3		PG	
3	2	90.07	PG13	4		PG13	
4	3	92.46	PG13	4		R	
5	4	115.19	G	3			
6	5	83.38	PG	5			

- Now populate each category by applying the COUNTIF function to the "rating" variable in column C. What this function does is count the number of times a specific value or term shows up in a range of cells. The syntax is **=COUNTIF(range, criteria)**, where the range is the first and

last cell separated by a colon. For example, to count the number of movies that were rated G, enter the range as C2:C105 (to represent everything in the “rating” column), and then enter your criteria as “G” or [cell F2](#). Do this in cell G1.

**Important note:** Since the criteria you want involves text instead of numbers, make sure you put “G” in quotation marks.

So here’s what you should type in cell G1:

F	G
G	15
PG	26
PG13	40
R	

*fx* =COUNTIF(C2:C105, "G")

Once you hit Enter, that cell will show the number of movies that were rated G.

F	G
G	15
PG	
PG13	
R	

There we go: 15 movies were rated G.

- Point the mouse cursor on the lower right corner of the cell hold left click and drag the formula from Cell G2 to G5 (notice that excel will auto-populate the formula of COUNTIF on the succeeding cell reference)

F	G	H
rating		
G	15	
PG13		
PG		
R		

F	G
rating	
G	15
PG13	40
PG	26
R	23

- In cell G4, repeat step 2 one more time to count the number of movies with an R rating.

fx =COUNTIF(C2:C105, "R")	
F	G
G	15
PG	26
PG13	40
R	23

Sure enough, if you add up those four categories, you get  $15 + 26 + 40 + 23 = 104$  movies, which was the total number of movies in this data set. We didn't miss anything.

- It's time to actually create the bar graph. Highlight that whole mini-table you created in the previous steps.

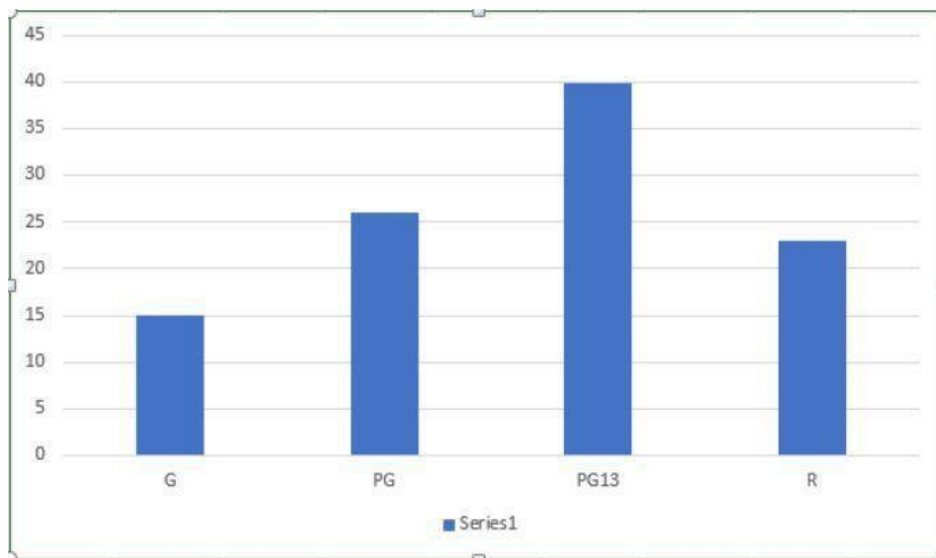
F	G
G	15
PG	26
PG13	40
R	23

In the ribbon, click Insert > Column > Clustered Column. It's the graphic on the left side of the dropdown menu.

The screenshot shows the Excel Online interface. The ribbon is set to 'INSERT'. The 'Column' chart type is selected in the 'Charts' group. A dropdown menu is open, showing '2-D Column' as the selected option. Below the ribbon, a table is visible with columns A through E. The table contains data for movie categories and their counts.

	A	B	C	D	E
1	movieid	runtime	rating	liking	
2	1	101.86	G	3	
3	2	90.07	PG13	4	
4	3	92.46	PG13	4	
5	4	115.19	G	3	

- Bam! Your new bar graph should pop up.

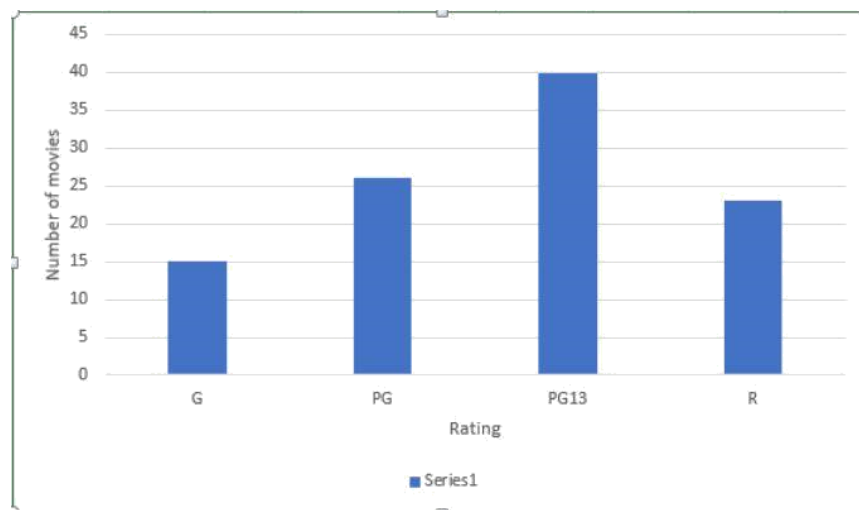


The ratings are shown along the horizontal axis on the bottom, while the number of movies in each category is shown along the vertical axis on the left.

7. As usual, it's a good idea to add some helpful labels to the graph before finishing up. Just like you did in Exercises 1 and 2, add a quick title for the horizontal and vertical axes.

Click Chart Tools ► Axis Titles ► Primary Horizontal Axis Title ► Edit Horizontal Axis Title, type in "Rating" in the box, then click OK.

Then click Chart Tools ► Axis Titles ► Primary Vertical Axis Title ► Edit Vertical Axis Title, type in "Number of movies" in the box, then click OK. Your bar graph should now look like this:



Now you can see how the movie ratings stack up against each other. It looks like the most popular rating was PG13, followed by PG, then R, then G.