

Using Excel's, Google Sheets', and Numbers' SUM Function to Make a Cumulative Distribution Table for Continuous Data

Chelsea Andrews - Modeled after Owlcation: Using Excel's COUNT F function to make a Frequency Distribution by Blinkster. <https://owlcation.com/stem/Using-Excel-COUNTIF-Function-in-Frequency-Distribution>

Let's say we collected data on how many hours college students sleep each night. To learn how many students get 1 to 3 hours of sleep each night, how many students get 4 to 6 hours of sleep, and how many get 7 to 9 hours of sleep, we made a Frequency Distribution Table. In our Frequency Distribution Table we computed the Absolute Frequency of number of hours of sleep (Column E) and Relative Frequency of number of hours of sleep (Column F) for each of our three ranges, as illustrated in Figure 1.

Now let's say we want to learn how many students get 3 or fewer hours of sleep, 6 or fewer hours of sleep, and 9 or fewer hours of sleep. Therefore, want to compute a Cumulative Frequency Distribution Table. Remember that a cumulative frequency is like a running total.

To make our Cumulative Frequency Distribution Table, we'll add on to the Frequency Distribution Table we've already made for continuous data. We begin by creating a new Column Heading named "Cumulative Absolute Frequency," as illustrated in Column G of Figure 1 below. And we will use that column to create our running total, by cumulatively adding together our previous Absolute Frequencies.

We will use the SUM function to add together our previous Absolute Frequencies. Remember to use any function, we start by typing an equal sign = in the cell where we're building our formula. Immediately after typing the equal sign, we type the name of the function, which in this case is SUM, then we type an open parenthesis, and then we include the cells we want to sum.

For example, as illustrated in Figure 1, our first Absolute Frequency is in cell E2. Therefore, our first Cumulative Absolute Frequency, which we will build in cell G2, will simply sum cell E2, for example, **=SUM(E2)** For these data, the formula **=SUM(E2)** tells us that only one student gets 3 or fewer hours of sleep (thank goodness!).

Figure 1 - Excel & Google Sheets

	A	B	C	D	E	F	G
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency
2	4		1	3	1	0.056	=SUM(E2)
3	7		4	6	8	0.444	
4	5		7	9	9	0.500	
5	8						
6	3			Total	18	1.000	
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

Figure 1 - Apple Numbers

	A	B	C	D	E	F	G
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency
2	4		1	3	1	0.056	...
3	7		4	6	8	0.444	
4	5		7	9	9	0.500	
5	8						
6	3			Total	18	1.000	
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

Next, we want to know how many students get 6 or fewer hours of sleep. Therefore, to compute our second Cumulative Absolute Frequency, we will use cell G3 to sum cells E2 and E3 by building the formula **=SUM(E2:E3)**, as shown in Figure 2 below (and on the next page).

If we next want to know, for our running total, how many students get 9 or fewer hours of sleep, we need to sum the cells E2, E3, and E4, which we will do in cell G4 with the formula **=SUM(E2:E4)** (which is not shown in any Figure here).

When we're finished, we have a Cumulative Absolute Distribution Table for our data that shows us our running total of how many students get 3 or fewer hours of sleep, 6 or fewer hours of sleep, and 9 or fewer hours of sleep.

Figure 2 - Excel & Google Sheets

	A	B	C	D	E	F	G
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency
2	4		1	3	1	0.056	1
3	7		4	6	8	0.444	=SUM(E2:E3)
4	5		7	9	9	0.500	
5	8						
6	3			Total	18	1.000	
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

Figure 2 - Apple Numbers

	A	B	C	D	E	F	G
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency
2	4		1	3	1	0.056	1
3	7		4	6	8	0.444	...
4	5		7	9	9	0.500	
5	8						
6	3			Total	18	1.000	
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

We can also use the SUM function to make a Cumulative Relative Frequency table.

First, we create a new Column Heading named “Cumulative Relative Frequency,” as illustrated in Column H of Figure 3 below. And we will use that column to create our running total, by cumulatively adding together our previous Relative Frequencies.

Again, we will use the SUM function to add together our previous Relative Frequencies. For example, as illustrated in Figure 3, our first Relative Frequency is in cell F2. Therefore, our first Cumulative Relative Frequency, which we will build in cell H2, will simply sum cell F2, for example, `=SUM(F2)`

Figure 3 - Excel & Google Sheets

	A	B	C	D	E	F	G	H
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4		1	3	1	0.056	1	=SUM(F2)
3	7		4	6	8	0.444	9	
4	5		7	9	9	0.500	1	
5	8							
6	3			Total	18	1.000		
7	9							
8	7							
9	6							
10	5							
11	8							
12	4							
13	6							
14	7							
15	8							
16	5							
17	9							
18	7							
19	6							

Figure 3 - Apple Numbers

	A	C	D	E	F	G	H
1	Sleep (in hours)	Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4		1	3	1	0.056	1
3	7		4	6	8	0.444	9
4	5		7	9	9	0.500	18
5	8						
6	3		Total		18	1.000	
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

Next, we compute our second Cumulative Relative Frequency for students who get 6 or fewer hours of sleep. To compute this Cumulative Relative Frequency we will use cell H3 to sum cells F2 and F3 by building the formula `=SUM(F2:F3)`, as shown in Figure 2 below (and on the next page).

If we next want to know the Cumulative Relative Frequency for students who get 9 or fewer hours of sleep, we need to sum the cells F2, F3, and F4, which we will do in cell H4 with the formula `=SUM(F2:F4)` (which is not shown in any Figure here).

When we're finished, we have a Cumulative Relative Distribution Table for our data that shows us our Cumulative Relative Frequency for how many students get 3 or fewer hours of sleep, 6 or fewer hours of sleep, and 9 or fewer hours of sleep.

Figure 4 - Excel & Google Sheets

	A	B	C	D	E	F	G	H
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4		1	3	1	0.056	1	0.056
3	7		4	6	8	0.444	9	<code>=SUM(F2:F3)</code>
4	5		7	9	9	0.500	1	
5	8							
6	3		Total		18	1.000		
7	9							
8	7							
9	6							
10	5							
11	8							
12	4							
13	6							
14	7							
15	8							
16	5							
17	9							
18	7							
19	6							

Figure 4 - Apple Numbers

	A	C	D	E	F	G	H
1	Sleep (in hours)	Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4	1	3	1	0.056	1	0.056
3	7	4	6	8	0.444	9	...
4	5	7	9	9	0.500	18	
5	8						
6	3		Total	18	1.000		
7	9						
8	7						
9	6						
10	5						
11	8						
12	4						
13	6						
14	7						
15	8						
16	5						
17	9						
18	7						
19	6						

Finally, we will double-check that our Cumulative Absolute Frequency and Cumulative Relative Frequency tables are calculated correctly. To do this, we compare the Totals we computed for the Absolute Frequency and Relative Frequency Columns to our Cumulative Absolute Frequency running total and Cumulative Relative Frequency running total.

Our running total for Cumulative Absolute Frequency (cell G4) should be the same as the our total for Absolute Frequency (cell E6). In Figure 5, we can see that both the running total for our Cumulative Absolute Frequency and the Absolute Frequency Total are the same; they are both 18.

Our running total for Cumulative Relative Frequency (cell H4) should be the same as the our total for Relative Frequency (cell F6). In Figure 5, we can see that both the running total for our Cumulative Relative Frequency and the Relative Frequency Total are the same; they are both 1.00.

Figure 5 - Excel & Google Sheets

	A	B	C	D	E	F	G	H
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4		1	3	1	0.056	1	0.056
3	7		4	6	8	0.444	9	0.500
4	5		7	9	9	0.500	18	1.000
5	8							
6	3		Total		18	1.000		
7	9							
8	7							
9	6							
10	5							
11	8							
12	4							
13	6							
14	7							
15	8							
16	5							
17	9							
18	7							
19	6							

Figure 5 - Apple Numbers

	A	B	C	D	E	F	G	H
1	Sleep (in hours)		Min	Max	Absolute Frequency	Relative Frequency	Cumulative Absolute Frequency	Cumulative Relative Frequency
2	4		1	3	1	0.056	1	0.056
3	7		4	6	8	0.444	9	0.500
4	5		7	9	9	0.500	18	1.000
5	8							
6	3			Total	18	1.000		
7	9							
8	7							
9	6							
10	5							
11	8							
12	4							
13	6							
14	7							
15	8							
16	5							
17	9							
18	7							
19	6							

We have now created a Cumulative Distribution Table for Continuous Data!