SPREADSHEETS

(Data for this tutorial at <u>www.peteraldhous.com/Data</u>)

Spreadsheets are great tools for sorting, filtering and running calculations on tables of data. Journalists who know the basics can "interview" data to find stories and trends that others may miss. In this tutorial, we will work with LibreOffice Calc, which you can download from <u>here</u>.

Once you know your way around a spreadsheet, it's fairly easy to pick up the skills needed to work with many other tools for data analysis.

TIP! Whenever you get some new data, save it under a new name! Then if you mess things up, you can always go back to the original.

So, let's open the file **City Budget.xls**, available online <u>here</u>, by selecting **File>Open** and save it under a new name by selecting **File>Save As**.

Formatting, basic calculations and sorting

Spreadsheets use a simple co-ordinate system, with letters for columns and numbers for rows. You can make calculations on data using these coordinates.

This data was provided some years ago to a reporter working on a small city paper.

1. Formatting data

First, let's format the columns as currency. Select columns **B** and **C** by clicking on the letters while pressing **Ctrl** (Windows) or **command** (Mac); then select **Format > Cells** from the top Menu; when the dialog box pops up, select **Currency**, **USD \$** and **0** decimal places.

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	Arial1	•	10 🔹 🖉			🛱 🤳 🥊	% 0→ .00 0→) - F	• 🙋 • 🔳					
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1	Departmen	This year	Next year	00	0.0			Form	at Cells					
2	City Counci	105,207	95,452		Numbers	Font	Font Efforts	Alianma	nt Bordors	Packground	Coll Protocti	ion		
3	City Clerk	70,778	75,234		Inditibers	Font	Font Ellects	Anynme	Borders	Background	Cen Protecti	ION		
4	City Manage	182,540	190,321	C	ategory		Format			Language				
5	Municipal O	195,645	222,409	N	umber			nalish (US		Default - Eng	lich (IISA A			
6	Personnel	191,116	195,400	P	ercent		USD 3 E	ngiish (USA	v •	Delault - Eng				
7	Planning an	305,607	315,640	C	urrency		-\$1,234	20						
8	Fire Depart	2,456,789	2,537,901	D	ate		-\$1,234.0	00						
9	Police Dep>	3,101,345	3,545,367	Т	ime		-\$1,234	00						
10	Public Work	2,156,987	2,104,866	S	cientific		-\$1,234							
11	Community	85,654	90,447	F	raction		-1,234.00	USD		Maxta				
12	General Cit	1,234,823	1,482,950	B	oolean Value		-1,234.00	USD		Next	year			
13	Parks and l	1,400,400	1,235,674											
14	Health	1,033,188	1,179,243	0	ptions									
15					Decimal plac	es	0		Negative nur	mbers red				
16	Totals	12,520,079	13,840,904				- 0		reguire nui	inders red				
17					Leading zero	es	1 (*)	V	Thousands s	eparator				
18														
19	Revenues	This year	Next year	Fo	ormat code									
20	General Pro	2,500,234	2,661,234	[\$\$-409]#,##0	0:-[\$\$-40	09]#,##0							
21	Sales Taxe	3,967,138	4,020,112											
22	Other local >	2,623,456	2,846,980											
23	Licenses an	264,675	289,620											
24	Fees and S	330,345	350,900											
25	Revenue F	1,096,345	1,234,341											
26	Building Re	188,000	192,000											
27	Miscellaneo	158,782	162,234						OK	Cancel	Help F	Reset		
28	Interest	1,231,209	1,323,456	_		-						-		
29	Fines	234,645	250,786											
30														
31	Totals	12,594,829	13,331,663											
32														

So, now we have everything in \$, but we still can't see everything in column A, so let's format the column width.

Click the square at the top left, which selects all the data in the sheet. Then **Format>Column>Optimal Width** and **OK** at the next dialog box.

TIP! If ever you see a column containing ###, it contains a number that is wider than the column. Use the same trick to fix the problem.

2. Performing basic calculations

Now let's calculate how the budget has changed from last year to this year. All calculations start by entering = into the cell. So, the formula for first cell is =(C2-B2).

(At this stage, we may need to format the cells in the column so that they are also in .)

Move the cursor to the bottom right hand corner of the cell until you see it change to a cross, then double click. Calc **autofills** the column, performing the same calculation for each row until it hits a space.

TIP! Calc can recognize other patterns in your data and autofill in the same way. To number a list of records, for instance, type 1, 2, 3, into the first three cells next to a column of data, select those three cells and autofill.

You can also **Copy (Ctrl-C or command-C)** the first cell and **Paste (Ctrl-V pr command-V)** all the way down the column. See how the "marching ants" form around the cell you've copied.

(This will give 0s where the cells are blank, and #VALUE! errors as Calc tries to perform a calculation on text. These can simply be deleted.)

TIP! You can lose your work if you later delete data that was used to calculate values that you are still working with. If this is a possibility, **Copy** the calculated data and paste it into a new column by selecting **Edit>Paste Special** and selecting **Numbers**, **Text** etc, as appropriate.

So let's do that here:

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E1	· <u>₩</u> Σ=											
	Α	В		С	D	E	F	G	н	1		
1	Departments	This year	Next	year	Difference						1	
2	City Council	\$105,207		\$95,452 -\$9,755								
3	City Clerk	\$70,778		\$75,234	\$4,456							
4	City Manager	\$182,540	5	\$190,321	\$7,781							
5	Municipal Court	\$195,645	5	\$222,409	\$26,764							
6	Personnel	\$191,116	5	\$195,400	\$4,284							
7	Planning and Community Development	\$305,607	5	\$315,640	\$10,033							
8	Fire Department	\$2,456,789	\$2	.537.901	\$81.112							
9	Police Department	\$3,101,345	\$3				Paste Specia	al				
10	Public Works	\$2,156,987	\$2	Selectio	on		Operations			014		
11	Community Services	\$85,654	Paste all				None			OK		
12	General City Fund	neral City Fund \$1,234,823		\$1						Cancel		
13	Parks and Recreation \$1,400,40) \$1 🗹 Text				Add			Guillet		
14	Health	\$1,033,188	18 \$1 🗸 N		✓ Numbers		Subtract H			Help		
15			79 \$13 Date		Date & time		O Multiply					
16	Totals	\$12,520,079										
17							Divide					
18			Next Co		Comments							
19	Revenues	This year										
20	General Property Taxes	\$2,500,234	\$2	🗌 Fo	ormats							
21	Sales Taxes	\$3,967,138	\$4		Objects							
22	Other local taxes	\$2,623,456	\$2									
23	Licenses and permits	\$264,675	-	Options	5		Shift cells					
24	Fees and Service Charges	\$330,345		S	cip empty cells		Don't sh	ift			- 11	
25	Revenue From Other Sources \$1,096,345		\$1	ПТ	ransnose		Down					
26	Building Rentals \$188,000			<u> </u>	unspose		O Domin					
27	Miscellaneous \$158,782		-	Li	nk		Right					
28	Interest \$1,231,209		\$1									
29	Fines	\$234,645	5	\$250,786	\$16,141						_	
30												
31	Totals	\$12,594,829	\$13	,331,663	\$736,834						_	
32												

You may need to format our new column to currency once more. See how the cells now contain the numbers, not the formulas used to calculate them.

Then delete the old column D by selecting the cells, then **Edit>Delete Cells**.

Now let's calculate the percentage change in budget, rather than the absolute \$ value.

The formula for the first cell is: =((C2-B2)/B2) or =(D2/B2).

So enter this, and copy down the column as before. Again, you may need to format to have the results displayed as a percentage, rather than a decimal.

3. Sorting data

Let's sort by % change. To do so, highlight the range of data you want to sort, then select **Data>Sort**. When the dialog box pops up, select **Sort key** 1> % Change and check **Descending** order.

TIP! When sorting, make sure Calc has recognized that your data has a header row if there is one present, otherwise that will be sorted as well. Look under the **Options** tab in the **Sort** dialog box and if necessary check **Range contains column labels**.

TIP! Make sure when sorting to select the full range of data you want to sort, and no more. Missing rows or columns from sorts, or including extraneous data are common ways to scramble your data. Use **Edit>Undo** if you make a mistake. In this case we want to sort separately on the Departments and Revenues tables, Taking care not to include the Totals.

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	Arial1 🔹 10 💌 🙈		1 🗏 🛱 🍶 %	∕o 0,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	× 🖷 • 📰 •	i - 🗐					
A1:E	14 🚽 🏂 🚬 = Departme	ents									•
	А	В	с	D	E	F		G	Н	1	
1	Departments	This year	Next year	Difference	% change						
2	City Council	\$105,207	\$95,452	-\$9,755	-9.279	6					
3	City Clerk	\$70,778	\$75,234	\$4,456	6.309	6					
4	City Manager	\$182,540	\$190,321	\$7,781	4.269	6					
5	Municipal Court	\$195,645				Sort					
6	Personnel	\$191,116			So	rt Criteria	Options				_
7	Planning and Community Development	\$305,607	Sort key 1					_			
8	Fire Department	\$2,456,789								Ascending	
9	Police Department	\$3,101,345	% change						Ť	Descending	
10	Public Works	\$2,156,987	Fort Lou 2							Descending	
11	Community Services	\$85,654	Sort key 2							Ascending	
12	General City Fund	\$1,234,823	- undefined	-					*	Ascending	
13	Parks and Recreation \$1,400,400 Descending						Descending				
14	Health	\$1,033,188	Sort key 3							o	
15			- undefined	_					<u>.</u>	Ascending	
16	Totals	\$12,520,079								 Descending 	
17											
18											
19	Revenues	This year									
20	General Property Taxes	\$2,500,234									
21	Sales Taxes	\$3,967,138									
22	Other local taxes	\$2,623,456									
23	Licenses and permits	\$264,675									
24	Fees and Service Charges	\$330,345									
25	Revenue From Other Sources	\$1,096,345					OK	Cancel	Help	Reset	
26	Building Rentals	\$188,000		10.100							-
27	Miscellaneous	\$158,782	\$162,234	\$3,452	2.179	6					
28	Interest	\$1,231,209	\$1,323,456	\$92,247	7.499	6					
29	Fines	\$234,645	\$250,786	\$16,141	6.889	0					
30	7-4-1-	A10 504 000	#10 001 000	#700 CC 4	E 050	,					_
31	Iotais	\$12,594,829	\$13,331,663	\$736,834	5.85%	0					_
32											

Sorting by % change and Difference, for both Departments and Revenues can produce ideas for story angles. What might the reporter have pursued in this case?

TIP! Always check any calculations that you haven't done yourself

The mantra of journalism should be: if your mother says she loves you, check it out! We should be as skeptical of numbers as we are of human sources. So let's just check that the totals we were given add up correctly.

To check the Total for This Year, Departments, the formula is =**SUM(B2:B14)**.

Now **Copy** this cell, and **Paste** into columns C and D. What's our reporting plan now?

4. Performing anchored calculations

In each calculation we've performed so far, we've moved down or across the spreadsheet performing the equivalent calculation for that row or column. But sometimes that isn't what we want to do.

Let's calculate the increase in revenue from each source as a percentage of the total increase in revenue.

Use the formula: =(D20/\$D\$31), and then autofill. The \$ signs anchor the calculation. To anchor to a specific cell, you need a \$ in front of both coordinates.

Importing data, filtering, subtotals and pivot tables

Now we're going to look at a larger dataset, used in reporting <u>this story</u> about the drug company Pfizer's payments to doctors, to show how you can use a spreadsheet to drill down to selections from the data, and to perform useful summary calculations.

Data is often provided as text (.txt) or comma separated values (.csv) files, so we'll first learn how to import a text file into Calc.

TIP! Databases should always be able to export data as .txt or .csv files, so bear this in mind whenever an organization says it can't provide data because it's in a special format.

1. Importing a text file

Find the file **Pfizer payments.txt**, available online <u>here</u>, and open it in a text editor See that individual entries are separated by Tabs and some of the entries are surrounded by double quote marks.

Open a new document in Calc by selecting **File>New>Spreadsheet.** Then select **Insert>Sheet From File**.

Browse for the file **Pfizer payments.txt** and open it. Fill in the dialog box as follows:

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A 1	- 7 %						
AI	▼ jnx ∠						
A	B C D I	F G	H	J	K L	M	N
2	000	Text Import – [Pfizer	%20payments.txt	:]		-	
3	Import						
4	Character set		•		OK	-	
6	onicode	011-6)	Ŧ		Cancel		
8	Language Default -	English (USA)	A T		Cancer	-	
9	-)			Help		_
10	From row)			ПСР	-	
12	Separator options						
13						-	
15	Tixed width						
16	 Separated by 						
18	🗹 Tab 🛛 🔾	omma	Other				_
20	Samicalan S	220				-	
21	Semicolon	pace					
22	Merge delimiters	Te	xt delimiter	• •		-	
24	Other entions						
25	Other options					-	
27	Quoted field as text						
28	Detect special numbers					-	
30	F 1.11						
32	Fields						
33	Column type	*					
35		Circular 1	C 1 1				
36	1 Organization/individual	First name plue	Standard	City			
38	2 3-D MEDICAL SERVICES LLC	STEVEN BRUCE	DEITELZWEIG	NEW ORLEANS			
39	3 AA DOCTORS, INC.	AAKASH MOHAN	AHUJA	PASO ROBLES			
40	4 ABBO, LILIAN MARGARITA	LILIAN MARGARITA	ABBO	MIAMI		-	
42	5 ABBO, LILIAN MARGARITA	LILIAN MARGARITA	ABBO	MIAMI			
43	6 ABBO, LILIAN MARGARITA	LILIAN MARGARITA	ABBO	MIAMI			
44	7 ABDULLAH RAFFEE MD PC	ABDULLAH	RAFFEE	FLINT			
46	8 ABEBE, SHEILA Y	SHEILA Y	ABEBE	INDIANAPOLI:			
47							
48)	
50							
51							
52							

Click OK at the next dialog box, and the data should import.

Format the columns as desired, making the last three currency, and the header row bold.

TIP! To keep the header row present when you scroll through the spreadsheet, select the row beneath it and then select **Window>Freeze**.

Save this file as **Pfizer payments**, and then again under a new name, by selecting **File>Save As.** You can save as an ODF spreadsheet, or in Excel format.

Notice that we have a list of more than 10,000 payments, which in this form doesn't tell us very much.

2. Filtering data

So let's set up the spreadsheet so we can filter for what we're interested in. Let's say we want a list of all doctors in California who were paid \$10,000 or more to run expert-led forums.

Select the entire spreadsheet be clicking the square at top left, then select **Data>Filter>Standard Filter**, and fill in the dialog box as follows:

Filter criteria				
Operator	Field name	Condition	Value	
	State	*	\$ CA	T
AND	Category	\$	pert-Led Fo	rums 🔻
AND	Total	*	10000	•
	– none –	*	A V	•
More Option	s ∓ He	lp	ОК	Cancel

Click OK, and you should have a list of 31 doctors.

For this filter, we connected the **Filter criteria** by **AND** operators, which ensured that rows were selected only if all the stated criteria were met. Filters obey <u>Boolean logic</u>; see what happens if you replace the first **AND** with **OR**.

TIP! If you need to keep, or do further calculations on a filtered subset of the data select the data, **Copy** it and **Paste** into a new worksheet. To rename the sheet for future reference, right click on the sheet tab and select **Rename Sheet**

Select **Data>Filter>Remove Filter** to return to the entire spreadsheet.

3. Calculating subtotals

Let's now find out how much money went to each state. Select **Data>Subtotals** and fill in the dialog box as follows:

000	Subtotals
1st Group	2nd Group 3rd Group Options
Group by	
State	\$
Calculate subtotals for	Use function
 Organization/individual First name plus Last name City State Category Monetary payment Non-monetary payment Total 	Sum Count Average Max Min Product Count (numbers only) StDev (Sample) StDevP (Population) Var (Sample) VarP (Population)
	OK Cancel Help Reset Delete

Click **OK**, and then click on the **2** at top left to hide the data and just leave the subtotals (**1** hides everything except the grand total.)

Notice that we added together the totals by state using the function **Sum**, but we could have used other functions to aggregate the data in other ways.

Select **Data>Subtotals>Delete** to clear the subtotals.

4. Making pivot tables

What if we want to know subtotals by state and by category of payment? We can do that in one step, using a pivot table.

Select **Data>Pivot Table>Create**, click **OK** at the initial dialog box, and then drag and drop in the dialog box as follows:

000	Pivot ta	able	
Layout			OK
	Page Fields	Organizat First nam Last name	Cancel Help
_	Category Column Fields	City State Category Monetary	Remove Options
State Row Fields	Sum – Total Data Fields	Non-mon Total	
Drag the fields int	o the desired position.		More ¥

Notice that the calculation for Totals has defaulted to **Sum**, which is what we want, but we can select other aggregate functions by double clicking on **Sum** - **Total**.

Click **OK**, and the pivot table will be inserted into a new sheet. Format the column widths as necessary.

		Α	В	С	D	E	F	G	Н	I.	J	K
1		Filter										
2												
3		Sum - Total	Category 🔻									
- 4	- 8	State 💌	Business Related Tra≯	Educational Items	Expert-Led Forums	Investigator-Initiated P	Meals	Pfizer Sponsored Res+	Pfizer Sponsored Res+	Professional Advising	(empty)	Total Result
5		AK			\$1,750							\$1,750
6		AL	\$29,123	\$431	\$129,850	\$55,937	\$10,217	\$279,485	\$66,096	\$110,560)	\$681,699
7		AR	\$3,783	\$318	\$72,825		\$3,700	\$77,670		\$2,636		\$160,932
8		AZ	\$15,101	\$173	\$134,600	\$76,102	\$13,409	\$225,615	\$107,979	\$68,872		\$641,851
9		CA	\$248,627	\$947	\$1,460,650	\$173,563	\$156,716	\$1,125,624	\$328,149	\$1,243,531		\$4,737,807
10		co	\$18,207	\$144	\$176,550		\$12,433	\$596,437		\$111,467	,	\$915,238
1	1	СТ	\$20,747	\$79	\$94,325		\$9,133	\$252,213	\$90,000	\$165,785	i	\$632,282
17	2	DC	\$31,098		\$48,500		\$7,774	\$22,371		\$140,798	1	\$250,541
13	3 1	DE	\$2,961	\$135	\$40,425		\$1,344	\$622		\$8,500		\$53,987
14	4	FL	\$87,865	\$495	\$525,875	\$41,187	\$74,806	\$306,600	\$1,267,809	\$259,410	1	\$2,564,047
1	5	GA	\$39,915		\$252,800		\$25,410	\$180,632	\$7,500	\$112,388	l .	\$618,645
10	5	HI	\$5,834		\$21,200		\$3,336	\$6,247		\$6,000		\$42,617
1	7	A	\$7,025	\$78	\$56,225		\$4,671	\$32,207	\$123,375	\$20,125	i	\$243,706
1	B	D	\$3,617		\$20,725		\$1,064			\$12,250		\$37,656
- 19	9 1	L	\$51,222	\$1,465	\$341,775	\$90,000	\$38,810	\$393,395	\$79,922	\$260,236	i	\$1,256,825
20		IN	\$29,810	\$291	\$145,375		\$15,018	\$19,876	\$3,333	\$135,886	i	\$349,589
2	1	KS	\$16,763	\$210	\$89,025		\$7,566	\$7,442	\$117,220	\$68,979		\$307,205
27	2	KY	\$24,084	\$228	\$95,850	\$4,530	\$9,707	\$211,385	\$4,800	\$86,354		\$436,938
2	3	LA	\$18,819	\$463	\$159,875		\$14,575	\$21,171		\$47,018		\$261,921
24	4	MA	\$137,898		\$154,875	\$129,500	\$21,498	\$795,327		\$525,673	l .	\$1,764,771
2	5	MD	\$33,693	\$99	\$134,367	\$90,288	\$17,202	\$391,499		\$203,757	,	\$870,905
20	5	ME	\$1,757		\$15,225		\$1,249			\$500)	\$18,731
2	7	MI	\$50,940	\$235	\$299,925	\$85,266	\$26,190	\$259,748	\$184,966	\$239,015	i	\$1,146,285
21	3	MN	\$35,747	\$47	\$185,036		\$11,527	\$155,872		\$181,071		\$569,300
29	9	MO	\$34,272	\$517	\$331,950		\$18,032	\$225,788	\$84,411	\$278,616	i	\$973,586
- 30	D I	MS	\$4,570	\$345	\$59,750		\$6,111			\$14,500	1	\$85,276
3	1	MT	\$2,623		\$8,100		\$485					\$11,208
32	2	NC	\$61,072	\$31	\$534,150		\$38,175	\$1,205,370	\$167,818	\$321,819	SC SC	\$2,328,435
3	3	ND	\$121		\$15,825		\$200					\$16,146
34	4	NE	\$5,616		\$67,300		\$2,772	\$109,242	\$1,071	\$14,249		\$200,250
3	5	NH	\$10,404		\$109,375		\$3,245	\$36,346		\$12,999	1	\$172,369
- 36	5	NJ	\$21,924	\$409	\$269,625		\$39,425	\$137,154	\$1,500	\$130,805	i	\$600,842
3	7	NM	\$2,272		\$24,700	\$18,750	\$1,683	\$5,000	\$1,500	\$9,925	i	\$63,830
31	3	NV	\$3,632	\$135	\$46,000		\$2,932			\$20,325	i	\$73,024
- 39		NY	\$139,120	\$506	\$792,992	\$94,138	\$85,004	\$322,747		\$630,535	i i	\$2,065,042
4(ОН	\$80,428	\$744	\$362,625	\$18,734	\$42,998	\$213,955		\$299,966	i	\$1,019,450
4	1	OK	\$3,424	\$242	\$72,250		\$4,067	\$11,753		\$19,787		\$111,523
4	2	OR	\$12,823		\$55,000		\$4,105	\$186,490		\$45,322		\$303,740
4	3	PA	\$63,983	\$357	\$301,300	\$150,778	\$44,034	\$1,271,285	\$15,944	\$636,824		\$2,484,505
4	4	PR	\$5,770		\$91,775		\$11,460	\$19,464		\$1,925	i	\$130,394
4	5	RI	\$14,200		\$25,250		\$8,494	\$104,420	\$19,000	\$38,840		\$210,204
4	5	SC	\$14,093		\$101,275	\$70,041	\$11,798	\$159,177		\$65,107		\$421,491
4	7	SD	\$3,751	\$79	\$20,150		\$1,773			\$3,750		\$29,503
41	3	TN	\$35,033	\$325	\$353,200		\$31,186	\$136,401	\$177,786	\$115,294		\$849,225
4	9	TX	\$142,218	\$1,955	\$680,125	\$302,641	\$70,976	\$1,013,070	\$6,000	\$585,211		\$2,802,196
50)	UT	\$18,209		\$91,650	\$11,000	\$7,856	\$224,997		\$27,180		\$380,892
5	1	VA	\$24,198	\$85	\$127,625	\$22,000	\$15,344	\$85,646	\$3,000	\$90,094		\$367,992
5	2	VT	\$2,993		\$5,000		\$242			\$21,653		\$29,888
5	3	WA	\$27,583	\$184	\$145,100		\$15,470	\$89,007	\$37,732	\$80,990		\$396,066
54	4	WI	\$31,547	\$570	\$189,500	\$7,400	\$13,405	\$209,075		\$58,625		\$510,122
5	5	WV	\$12,786		\$69,675		\$9,483	\$9,749		\$26,679		\$128,372
50	5	WY	\$2,028		\$34,325		\$1,309			\$2,300		\$39,962
5	7	Total Result	\$1.695.329	\$12.322	\$9.643.220	\$1.441.855	\$979.419	\$11.137.574	\$2.896.911	\$7.564.131	S	\$35,370,761
- 51	8											

The final pivot table should look like this: