Introduction to Spreadsheets
Microsoft Excel

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The spreadsheet is the fundamental building block of computer-assisted journalism. Every reporter in every newsroom ought to have access to one, and know how to use it. Why? Because it's an inexpensive tool that will run on any computer and make your life easier almost any time you're presented with numerical information. Put it in your toolbox and you will almost certainly be a better reporter.

A government budget

You are the municipal reporter covering the city of Lotsograft, Fla. One day in June, the city manager presents his proposed 1992-93 budget to the City Council. He makes a few remarks about how tough the times are, and how he has to propose a tax increase. You return to the office with a bound copy of the budget document. You have an interview with the city manager scheduled in an hour, so you start looking over the budget to figure out what questions to ask. Here's what you find near the front:

Description	1991-92	1992-93
EXPENDITURES		
Police	$18,965,491	$19,533,115
Fire	$ 8,899,063	$10,499,501
Garbage service	$ 7,063,201	$ 7,801,356
City Council	$ 1,212,007	$ 1,921,055
City manager's office	$ 818,015	$ 1,573,216
City attorney	$ 3,621,748	$ 4,950,713
Total expenditures	$43,690,312	$48,125,201
REVENUES		
Property taxes	$24,316,255	$27,996,305
Utility taxes	$ 5,669,305	$ 5,901,165
User fees	$ 1,005,699	$ 1,733,922
Water & sewer	$10,559,300	$11,215,883
Total revenues	$43,690,312	$48,125,201

How are you going to start making sense of this budget? Probably the best thing to do is figure out which budget categories (expenditures and revenues) are proposed to increase the most. Follow along as we use the spreadsheet to uncover the mysteries of the Lotsograft budget.

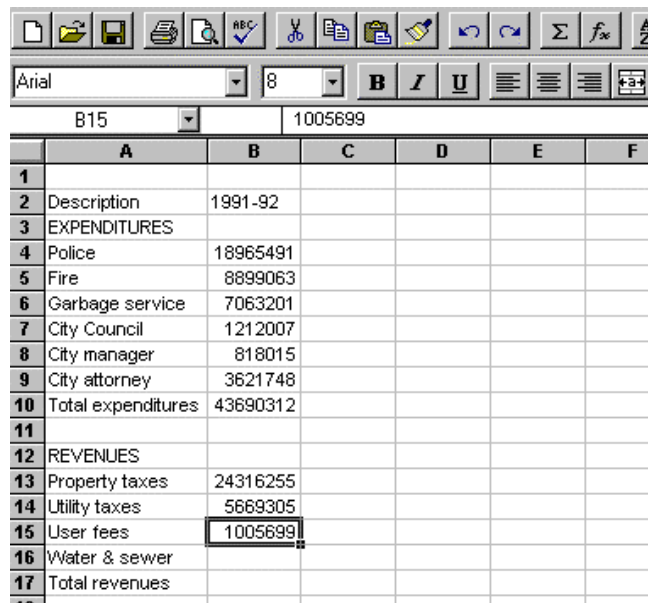## Typing numbers into the spreadsheet

For appearance's sake, leave the first row blank. With the mouse, move to cell A2 and type the word Description. (After filling out a cell, you can press <Enter> or simply use the mouse to move to the next cell you wish to fill out.)

Then, in cell B2, type 1991-92.

Now another problem: The word "Description" is partially obscured by the contents of cell B2. You'll need to widen the first column. To widen it, use the mouse to move the mouse to the vertical line separating column A from column B. You'll see a symbol that looks something like this: **<-|->**. Now click and drag the vertical line to the right (hold down the left mouse button and move the mouse) until the column width is adequate -- you may want to drag it far enough that there's room in the column for the "City Manager's Office" line from the budget.

Now enter the budget categories in column A, the '91-'92 budget figures in column B and the '92-'93 budget figures in column C.

Midway through your data entry process, your spreadsheet should look something like this:

	A	B	C	D	E	F
1						
2	Description	1991-92				
3	EXPENDITURES					
4	Police	18965491				
5	Fire	8899063				
6	Garbage service	7063201				
7	City Council	1212007				
8	City manager	818015				
9	City attorney	3621748				
10	Total expenditures	43690312				
11						
12	REVENUES					
13	Property taxes	24316255				
14	Utility taxes	5669305				
15	User fees	1005699				
16	Water & sewer					
17	Total revenues					

When you enter the numbers, do NOT include dollar signs, commas, percent signs, etc. You should format the cells after you have typed in all the budget numbers.

To format the numbers as dollars, first "select" all the cells that should be in currency format. Here's how: move the mouse to one corner of the block of cells, click with your left mouse button and hold down the button as you drag the mouse to the far corner of the block. All the cells will turn dark, with light type (instead of the reverse). Now, move the mouse to the big **$** button in the upper right of your Toolbar. (You should see "Currency Style" pop up.) Click on the button.

Oops! Something has happened to your cells. Instead of numbers, you now see a bunch of ######## signs. That's because your columns aren't wide enough. Widen the columns (click and drag on the | separating the column headers).

Since there's no reason to show cents, let's remove the zeroes to the right of the decimal point. Move the mouse to the "Decrease Decimal" button in the Toolbar. (It's at the far end of the bank of buttons that includes the **$** or "Currency Style" button we used earlier.) Click on the button twice to remove the two decimal places.

Saving your spreadsheet

All commands to save or call up a spreadsheet are contained within the **File** menu. You can **Save** (write to disk while leaving the spreadsheet on your screen); **Close** (in which case you'll be prompted whether you want to save your changes); or **Save As.**

You want to save your property tax spreadsheet and give it a name that you'll remember. Here's how:

Go to the **Edit** menu and choose **Save As**.(note that the single letter to type is A)**;** to revise the filename, just type in the proper name -- say, PROP plus your initials. Then click on the **OK** button.

Calculating expenditure increases

It's time to examine the budget. The first logical question: How much did total expenditures rise? Let's start by looking at dollars only. In cell D10, type **=C10-B10**. You have to enter the = sign because otherwise the spreadsheet thinks you're typing a label. You see all those ####### signs.

Description	1991-92	1992-93	Change	
EXPENDITURES				
Police	$18,965,491	$19,533,115		
Fire	$8,899,063	$10,499,501		
Garbage service	$7,063,201	$7,801,356		
City Council	$1,212,007	$1,921,055		
City manager	$818,015	$1,573,216		
City attorney	$3,621,748	$4,950,713		
Total expenditures	$43,690,312	$48,125,201	########	

Widen the column. Now you're getting somewhere: overall, city expenditures have risen about $4.4 million.

Let's examine the categories of expenditures. And here's the beauty of the spreadsheet. Instead of typing **=C??-B??** in every cell, you can COPY the formula. The spreadsheet is smart enough to understand which cells you want to subtract.

To copy a formula, you will once again click and drag. First click on cell D10. Now, look at the small square in the lower right corner of the cell border. This is known as the "Fill Handle." Move the mouse to that corner, and the pointer changes to a cross. Now, click and drag the fill handle upward to cell D4 (the first row of expenditures). Release the mouse button.

Description	1991-92	1992-93	Change	
EXPENDITURES				
Police	$18,965,491	$19,533,115		
Fire	$8,899,063	$10,499,501		
Garbage service	$7,063,201	$7,801,356		
City Council	$1,212,007	$1,921,055		
City manager	$818,015	$1,573,216		
City attorney	$3,621,748	$4,950,713		
Total expenditures	$43,690,312	$48,125,201	$4,434,889	

As you can see, there are now numbers in cells D4 to D9. If you move your cursor into the cells, you can see how the formulas were copied. In cell D7, for example, the formula shows **=C7-B7.** The answer: $709,048.

	=C7-B7		
B	**C**	**D**	**E**
92	1992-93	Change	
65,491	$19,533,115	$ 567,624	
99,063	$10,499,501	$1,600,438	
63,201	$ 7,801,356	$ 738,155	
12,007	$ 1,921,055	$ 709,048	
18,015	$ 1,573,216	$ 755,201	
21,748	$ 4,950,713	$1,328,965	

This is a good time to point out that the power of the spreadsheet can cause real problems if you make a mistake in your thinking. For example, if you compute a percentage incorrectly, you can very easy turn one error into dozens of errors by copying that formula over and over and over again. So check and double check your work.

Excel is also smart enough to realize that all these cells should be in currency format with zero digits to the right of the decimal. Type the word Change in cell D2 to indicate what the column represents.

Again, some things are looking interesting. On the screen, note the categories with the biggest dollar growth in expenditures (Fire and City attorney). And note the formula in cell D7 (=C7-B7).

Description	1991-92	1992-93	Change
EXPENDITURES			
Police	$18,965,491	$19,533,115	$567,624
Fire	$8,899,063	$10,499,501	**$1,600,438**
Garbage service	$7,063,201	$7,801,356	$738,155
City Council	$1,212,007	$1,921,055	$709,048
City manager	$818,015	$1,573,216	$755,201
City attorney	$3,621,748	$4,950,713	**$1,328,965**
Total expenditures	$43,690,312	$48,125,201	$4,434,889
REVENUES			
Property taxes	$24,316,255	$27,996,305	
Utility taxes	$5,669,305	$5,901,165	
User fees	$1,005,699	$1,733,922	
Water & sewer	$10,559,300	$11,215,883	
Total revenues	$43,690,312	$48,125,201	

Calculating percentage change

Now let's look at the same information as a percentage change instead of a dollar change. Type *Pct. change* in cell E2. Then, in cell E10, type **=D10/B10.**

> *Remember the formula for percentage change between X and Y:*
> **(Y-X) divided by X.**
> *Because column D already is the result of subtracting column C minus column B, all you need to do is divide by column B to get your percentage change.*

You'll see that the number registers as a decimal rather than as a percentage. Let's format it properly. If it's not already selected, select cell E10. Move the pointer to the big **%** button in the Toolbar and click on it. Now move to the "Increase Decimal" button and click once so you get one digit to the right of the decimal. In cell E10, you see that expenditures overall have risen 10.2%.

Copying formulas

Now, copy the contents of cell E10 to the range E4 to E9. Voila! Some interesting stuff!

	A	B	C	D	E	F
1						
2	Description	1991-92	1992-93	Change	Pct Change	
3	EXPENDITURES					
4	Police	$18,965,491	$19,533,115	$ 567,624	3.0%	
5	Fire	$ 8,899,063	$10,499,501	$1,600,438	18.0%	
6	Garbage service	$ 7,063,201	$ 7,801,356	$ 738,155	10.5%	
7	City Council	$ 1,212,007	$ 1,921,055	$ 709,048	58.5%	
8	City manager	$ 818,015	$ 1,573,216	$ 755,201	92.3%	
9	City attorney	$ 3,621,748	$ 4,950,713	$1,328,965	36.7%	
10	Total expenditures	$43,690,312	$48,125,201	$4,434,889	10.2%	

While police expenditures are going up only 3 percent, the Fire Department is getting 18 percent more, the City Council 58.5% more and the city manager's office 92 percent more. Aren't these some things to ask that city manager about?

Having made sense out of the expenditures, let's turn our attention to the revenues. Again, here's the beauty of the spreadsheet. Since we want to do the same thing with the revenues as we did with the expenditures, all we have to do is copy the formulas in cells D10 and E10 into columns D and E of the revenue rows. Select D10 and E10 by clicking and dragging with your mouse. Then drag the fill handle downward to the last revenue row, and release the mouse button.

Again, some interesting stuff. Property tax revenue is up 15 percent, while "User fees" are up 72 percent. What does that mean?

	A	B	C	D	E
1					
2	Description	1991-92	1992-93	Change	Pct Change
3	EXPENDITURES				
4	Police	$18,965,491	$19,533,115	$ 567,624	3.0%
5	Fire	$ 8,899,063	$10,499,501	$1,600,438	18.0%
6	Garbage service	$ 7,063,201	$ 7,801,356	$ 738,155	10.5%
7	City Council	$ 1,212,007	$ 1,921,055	$ 709,048	58.5%
8	City manager	$ 818,015	$ 1,573,216	$ 755,201	92.3%
9	City attorney	$ 3,621,748	$ 4,950,713	$1,328,965	36.7%
10	Total expenditures	$43,690,312	$48,125,201	$4,434,889	10.2%
11				$ -	#DIV/0!
12	REVENUES			$ -	#DIV/0!
13	Property taxes	$24,316,255	$27,996,305	$3,680,050	15.1%
14	Utility taxes	$ 5,669,305	$ 5,901,165	$ 231,860	4.1%
15	User fees	$ 1,005,699	$ 1,733,922	$ 728,223	72.4%
16	Water & sewer	$10,559,300	$11,215,883	$ 656,583	6.2%
17	Total revenues	$43,690,312	$48,125,201	$4,434,889	10.2%
18					

A slight problem: Since you copied the formula into the blank row between expenditures and revenues, Excel has put formulas in places that don't really make sense. In cells E11 and E12, you see **#DIV/0!** That means you're trying to divide by zero. Let's erase, or clear, the contents of cells D11, E11, D12 and E12. Select the cells, then press the **Delete** key (usually to the right of your typewriter keyboard).
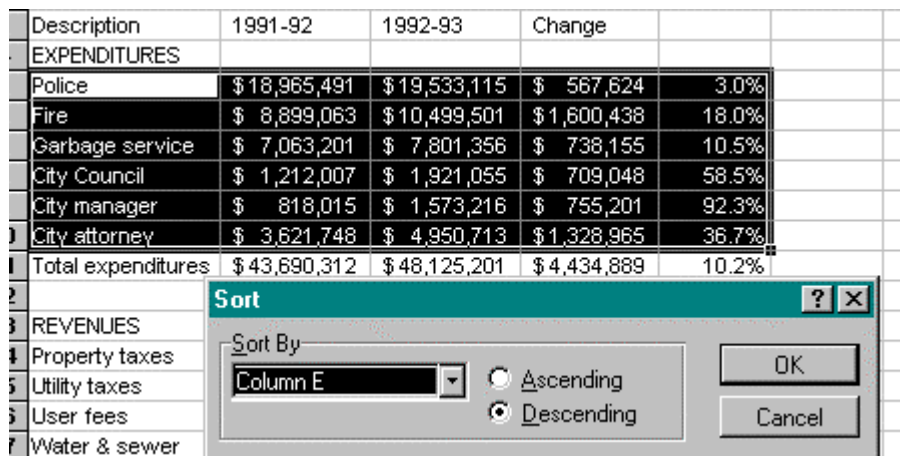
Sorting your data

Let's now demonstrate another spreadsheet tool: the sort function. This isn't real valuable on a small spreadsheet like the one you have in front of you, but it is very helpful if you're working with a large set of numbers. For an exercise, we'll sort the expenditure categories by the percentage change from one year to the next.

To sort, first select the block of cells you want. In this case, you need all of the expenditure rows except the Total row -- which we want to leave at the bottom -- and all columns. Be sure to include the text cells in the first column.

> *It is VERY important that you select the sort block correctly. For example, if there were another column of numbers in column F, and you failed to include it in your block, after you sort, those numbers would no longer be aligned properly with the numbers in the other columns.*

Move your mouse to the **Data** menu in the Menu bar and select **Sort**. The Sort dialog box will appear. You want to sort by Column E (the percent change). To change the sort column, you can type in "Column E." But the easier way is to click on the small down arrow and move your pointer down to Column E.

Description	1991-92	1992-93	Change		
EXPENDITURES					
Police	$18,965,491	$19,533,115	$ 567,624	3.0%	
Fire	$ 8,899,063	$10,499,501	$1,600,438	18.0%	
Garbage service	$ 7,063,201	$ 7,801,356	$ 738,155	10.5%	
City Council	$ 1,212,007	$ 1,921,055	$ 709,048	58.5%	
City manager	$ 818,015	$ 1,573,216	$ 755,201	92.3%	
City attorney	$ 3,621,748	$ 4,950,713	$1,328,965	36.7%	
Total expenditures	$43,690,312	$48,125,201	$4,434,889	10.2%	

Sort `? X`

Sort By
`Column E` ○ Ascending   `OK`
          ● Descending   `Cancel`

| REVENUES |
| Property taxes |
| Utility taxes |
| User fees |
| Water & sewer |

Specify that you want the sort in Descending order by clicking on the appropriate button. Click on the **OK** button to perform the sort.

Now, do the same kind of sort on the revenue category.

Inserting columns

Let's try to answer another question: What proportion of Lotsograft's revenue is coming from property taxes (and other sources)?

First, let's insert a column between columns C and D. Move the pointer anywhere in column D. Then move to the **Insert** menu in the Menu bar, and choose **Columns**. Since you only want to insert a single column, that will be enough. (If you wanted to insert several columns, you would have selected the number of columns to insert before you went to the menu.)

Note that even though a column has been added, the spreadsheet has adjusted the formulas in the columns that moved.

Go to cell D2 and type *Pct. 93total*. Then format column D as percentages by selecting the entire column and clicking on the **%** button.

Calculating percent of total

In Cell D13, type =C13/C17.

12	REVENUES			
13	Property taxes	$ 24,316,255	$ 27,996,305	=C13/C17	$ 3,680,050
14	Utility taxes	$ 5,669,305	$ 5,901,165		$ 231,860
15	User fees	$ 1,005,699	$ 1,733,922		$ 728,223
16	Water & sewer	$ 10,559,300	$ 11,215,883		$ 656,583
17	Total revenues	$ 43,690,312	$ 48,125,201		$ 4,434,889

Then copy that formula to the rest of the revenue rows. Oops! It shows an error -- three of them, in fact. Why? Look at cell D14.

The spreadsheet is trying to divide by the contents of C18, which is a blank cell. If you're dividing each of a range of cells by the contents of one unique cell, copying won't work properly. But, there is a solution:

D14		=C14/C18				
	A	**B**	**C**	**D**	**E**	**F**
1						
2	Description	1991-92	1992-93	Pct 93 total	Change	Pct Change
3	EXPENDITURES					
4	Police	$18,965,491	$19,533,115		$ 567,624	3.0%
5	Fire	$ 8,899,063	$10,499,501		$1,600,438	18.0%
6	Garbage service	$ 7,063,201	$ 7,801,356		$ 738,155	10.5%
7	City Council	$ 1,212,007	$ 1,921,055		$ 709,048	58.5%
8	City manager	$ 818,015	$ 1,573,216		$ 755,201	92.3%
9	City attorney	$ 3,621,748	$ 4,950,713		$1,328,965	36.7%
10	Total expenditures	$43,690,312	$48,125,201		$4,434,889	10.2%
11						
12	REVENUES					
13	Property taxes	$24,316,255	$27,996,305	58.2%	$3,680,050	15.1%
14	Utility taxes	$ 5,669,305	$ 5,901,165	#DIV/0!	$ 231,860	4.1%
15	User fees	$ 1,005,699	$ 1,733,922	#DIV/0!	$ 728,223	72.4%
16	Water & sewer	$10,559,300	$11,215,883	#DIV/0!	$ 656,583	6.2%
17	Total revenues	$43,690,312	$48,125,201	#DIV/0!	$4,434,889	10.2%
18						

Go back to D13. Type =C13/$C$17.

,305	=C13/$C$17	$ 3,6
165	#DIV/0!	$ 2

What you've done is tell the computer that wherever you copy this formula, it should divide by the contents of cell C17. Now copy the formula to the rest of the revenue rows. Property taxes make up 58 percent of total revenue.

REVENUES				
Property taxes	$24,316,255	$27,996,305	58.2%	$3,680,05
Utility taxes	$ 5,669,305	$ 5,901,165	12.3%	$ 231,86
User fees	$ 1,005,699	$ 1,733,922	3.6%	$ 728,22
Water & sewer	$10,559,300	$11,215,883	23.3%	$ 656,58
Total revenues	$43,690,312	$48,125,201	100.0%	$4,434,88

ON YOUR OWN: Do the same calculations for the revenues in 1991-92. And then do them for the expenditure side of the budget.

Using =SUM

There's one more concept in formula-writing for spreadsheets: the *worksheet functions*. These are shortcuts, enabling you to type in a few keystrokes something that would otherwise take a lot of typing. The most common one you will use is **=SUM**. This function allows you to add the contents of a **range** of cells. You type:

=SUM(B1:B7)

The result is the same as if you typed **=B1+B2+B3+B4+B5+B6+B7**.

Just out of curiosity, let's see if the itemized revenue figures for 1992-93 add up to the total, or whether there's some secret source of revenue in the budget. Move your cursor to C19. Type **=SUM(C13:C16)**. *(In fact, you don't need to capitalize any of these letters.)*

Hmmm.... Money appears to be missing. And by copying this formula to cell B19, you can compare the amount of missing money to the amount for the previous budget year.

Hiding columns and freezing panes

Although you can only see a screenful of information at any one time -- generally 20 rows and five to seven columns -- your spreadsheet can be as huge as you're ever likely to need. But a huge spreadsheet can be hard to use. There are two tools that make it easier: hiding columns and freezing panes.

Let's say that for the time being, you don't care about column D. To hide it, first put your pointer someplace in that column. Go to the **Format** menu, then select **Column**. One of your choices is **Hide**.

You haven't changed the original spreadsheet. But column D no longer appears on your screen. Now bring it back, by returning the the **Format | Column** menu and choosing **Unhide**.

The other tool to make a large spreadsheet readable is called **freezing panes**. Look on your screen. You can't see column H. But if you move your pointer to column H, you can no longer see the budget categories in column A.

To make them visible, move your pointer to column B, select the column as far down as your data goes. *(HINT: You can do the same thing by simply clicking on the B column header.)* Then go to the **Window** menu and choose **Freeze Panes**. Now scroll to the right; note that the first column remains in place and the other columns seem to disappear behind it. Now undo what you did. Go to the **Window** menu and choose **Unfreeze Panes**.

For a long spreadsheet, you can freeze the row of titles across the top as well. To do so, move your pointer to the row BELOW the one you want to lock and select the row.

Again, go to the **Window** menu and choose **Freeze Panes**. Once you've done that, undo it.

Now go to the **Edit** menu and choose **Close**. You are ready for the next lesson.