

Chapter 1: Introduction to Microsoft Excel: Some Exercises

Objectives

This chapter introduces you to the Microsoft Excel spreadsheet by doing some exercises. You should gain an understanding of the following topics:

- How to develop a simple spreadsheet of your own
- Use of formulas to calculate values
- Create a chart

Preparation

In order to complete this chapter in 3 hours it is necessary for you to have a clear idea of your objectives. You will also be led step by step through the development of a new Excel spreadsheet. It will not be enough for you to just 'follow the steps'. The ideas and techniques introduced here are building blocks for future exercises and you should make every effort to understand what you are doing and why you are doing it, rather than just following the steps.

• Read the whole of this chapter carefully

Exercise 1 - Making a New Spreadsheet

This exercise will walk you through the development of a simple budget spreadsheet. Any similarity to your real budget is purely coincidental!

Assuming you have Excel running, close any open workbooks. To open a new, blank workbook, click on the File tab, then click New and under Available Templates, doubleclick Blank Workbook. (Or exit Excel entirely and restart it.) You should see a window similar to Figure 0.1 in Chapter 0.

First, change the names of the worksheets. Double click on the **Sheet1** tab to highlight the word **Sheet1** and then type the new name – **Comments** in this case. Do the same with **Sheet2** renaming it **MonthlyBudget**. You should delete the third worksheet by first selecting it and then clicking on the Home tab, followed by clicking on Delete in the Cells group and then finally clicking on Delete Sheet.



The Comments Worksheet

A Comments sheet is **essential to any well designed Excel model**. It should include a brief description of the model you are about to create. You will probably want to revise the comments worksheet after you have written the monthly budget worksheet – but it is important to be able to write part of the comments worksheet first so that it serves as a plan that you can follow in writing the rest of the model.

The aim of this model is to list your sources of income and subtotal them, to list your expenses and subtotal them, and finally to calculate the surplus (or deficit). This is to be done for the months May to August. The end result, without actual dollar amounts entered, is shown in Figure 1.1.

The Monthly Budget Worksheet

Figure 1.1 – the Monthly Budget worksheet

	А	В	С	D	E	F	-
1			Мау	June	July	August	
2							
3	Income:						
4		Pay					
5		Student Allowance					
6		Other Income 1					
7		Other Income 2					
8		Total Income:	0	0	0	0	
9							
10	Expense	s:					
11		Tuition					=
12		Room and Board					
13		Clothing					
14		Car					
15		Insurance					
16		Books					
17		Recreation					
18		Credit Cards					
19		Total Expenses:	0	0	0	0	
20							
21							
22	Monthly Su	irplus (Deficit):	0	0	0	0	
23							_
14 4	► ► Commer	nts MonthlyBudget 🤇 💱	/				▶ []

Entering and Formatting the Month Names

Enter the month names in the first row of the MonthlyBudget worksheet. A simple way to do this is to type just the first month in the appropriate cell (C1). Then click on the lower right corner of the cell border and drag it to the right across the other 3 cells. You must



carefully point to the corner of the cell containing May. You'll see the cursor change shape to a cross (+) when it's in the right position. You should see the other month names appear as you drag. Figure 1.2 shows how this should look as you start.

	🖹 🛃 🄊 🕶 🖓 🖛 🖓 🖛 🖃 🖾 🖿 🖻 🖾											
F	File Home Insert Page Layout Formulas Data Review View Team 🛆 🕜 📼 🗟 🔀											
Pas	ste 🖋	Calibri B Z U Calibri For	• 11 • • A A • A • t	Ali	≣ gnment	% Number	A Styles	Cells	Σ → Ž	7- 4-		
	C1	•	· (=	f_{x}	May							~
	А	В	С		D	E		F	G		Н	
1			May									
2					June							
3												

Now you should format the month names – select the four cells (by dragging across them) and then use the **Font**, **Alignment** and **Number** groups in the **Home** tab to change the font size and/or type, and to make the text bold or italicized, etc. The font type is currently Calibri. Click on the arrow to the right of the font name and select a different font if you want to. The size, currently 11, can be changed in the same way. Clicking on the other icons once will cause the formatting changes indicated.

You might also need to change the width of the columns if the words exceed the default. To do this, carefully position the cursor over the boundary between two columns (the cursor will change shape to a vertical line intersected by a horizontal line with double arrows: \checkmark) and drag the column boundary to make it wider. If you select all four columns containing the month names their widths can be changed at the same time.

Income and Expense Items

Type all the Income and Expense headings as indicated in Figure 1.1. You can include other types of income and expense if you want. Format the data to enhance its clarity and readability and also adjust the column widths appropriately.

Creating the Formulas

The three rows Total Income:, Total Expenses:, and Monthly Surplus (Deficit): are the only ones, which contain calculated data. You must enter the rest of the data – it being the "raw data" of the model.



The total income for each month is just the sum of the income amounts for that month. You should use the SUM function with the argument being the range of cells in the column above. To do this, select the cell for total income for May and then click on the function icon in the formula bar.

The function icon: f_{\ast}

A window displaying the list of functions available in Excel appears and you should select the Math & Trig collection of functions amongst which you'll find the SUM function (see Figure 1.3).

Note that in later versions of Excel, such as Excel 2016 or 365, this produces a "Formula Builder" window on the right and interacting with it is somewhat different.

Figure 1.3 – the Insert Function window

Insert Function	? X
Search for a function:	
Type a brief description of what you want to do and then click Go	Go
Or select a category: Math & Trig	
Select a function:	
SINH SQRT SQRTPI SUBTOTAL	
SUM SUMIF	
SUMIPS SUM(number1,number2,) Adds all the numbers in a range of cells.	
Help on this function OK	Cancel

Click on the OK button and the function is entered in the formula bar and a panel appears that helps you fill in the argument (Figure 1.11). In this panel the text box labeled Number1 should have the cursor in it indicating that this is where text will appear. The argument (i.e. the cell range representing the values you want to sum) should be the column of income amounts for May. Drag the panel out of the way if you have to so that you can select the cells containing income amounts for May (by dragging over the cells). Notice that the range you select appears in the Number1 text box. Click OK once you have done this.

Function Arguments				<u>? ×</u>
SUM Number1 Number2		= number		
Adds all the numbers in a ran	one of cells	=		
	Number1: number1,numb are ignored in	per2, are 1 to 255 num cells, included if typed as	bers to sum. Logical values and arguments.	text
Formula result =				
Help on this function			OK Cancel	

Figure 1.4 – the SUM function argument window

The next step is to replicate this formula for the other months. This is easily done by dragging the fill handle across the three rows just as you did when entering the month names. This time, however, as the formula is filled across the row it is changed to specify the correct column letter for each column.

The formula for the Total Expenses: row is created in the same way.

To create the formula for the Monthly Surplus (Deficit) row you should first select the cell for the May column, type an = symbol, then click on the total income cell for May, type a - (subtraction) symbol and then click on the total expenses cell for May. As you do these various operations observe that the cell references are entered into the formula. Pointing and clicking is probably the easiest way of specifying the formula although you could also type it yourself if you were familiar enough with the syntax of Excel.

Note: You will find that Point-and-Click is generally the safest and most efficient way to build a formula.

Entering and Formatting Data

At the moment there are no amounts entered for any income or expenses. The values calculated by formulas will therefore be zeroes. You should now enter any sensible values for income and expense amounts and perform any remaining formatting to make your worksheet resemble Figure 1.1. You'll have to explore the various possibilities represented by the icons in the formatting tool bar (Home tab and Font, Alignment and Number cells within it) – but you have the basis for discovering these possibilities for yourself now. Remember that the numbers in this worksheet are all dollar amounts and should therefore be formatted as such. **Make sure you do this.** Close the workbook making sure that you save it - you might first want to create a folder called Ch1, say, in which to save the work you do in this lab.



Exercise 2

Create the following spreadsheet in which the values of the Sum and Product columns are calculated by formulas. The first value in the Sum column is the sum of 4, 7 and 8 for example. Make sure you do it in such a way that if you were to add a fourth or fifth column of numbers the formulas still calculate the correct values – use a function that does for multiplication what Sum does for addition. Figure out how to center the title Test Values across the columns.

	А	В	С	D	E	
1	Te	est Values				
2	Test1	Test2	Test3	Sum	Product	
3	4	7	8	19	224	
4	3	2	4	9	24	
5						
<u>с</u> 4 4	► ► Sheet1	2/	1	◀		▶]

Exercise 3

Create the spreadsheet shown in Figure 1.5. This spreadsheet calculates the graph of the cosine function. There is a column of at least 50 values for the angle (in degrees) and a column for the value of the cosine of the angle.

Figure 1.5 – the cosine function model





Filling with a Series

There are at least 50 values for the angle and you should not enter them by hand. Neither can you enter them using the fill handle as you did for the month names and the formulas in the budget model. In this case you must enter the first value and then select the column range, including the first value you just entered, that you want to fill with the other values for the angle – making sure it is at least 50 cells. Select the Home tab, and then click on the arrow (triangle) next to the Fill command, which is located in the Editing group at the right end of the command ribbon, and select the Series... option. Examine the choices you can make in this window carefully. Except for the Step value: box you don't need to change any of the choices, but you should at least try to remember what options the series fill provides. Change the step value to 10 and click OK. Observe how the column of values for the angle is filled.

Figure 1.6 - the Series fill dialogue panel

Series		? ×
Series in	Туре	Date unit
C <u>R</u> ows	🖲 Linear	🖸 Day
	C Growth	C Weekday
	C <u>D</u> ate	C Month
	O Auto <u>F</u> ill	C Year
Trend		
Step value:	St <u>o</u> p v	alue:
	ОК	Cancel

Calculating the Cosine

This can be done by writing the formula for the first cell and then filling down the column by dragging the fill handle (that little square in the bottom right corner of the border around the cell that is selected). Select the first cell and use the function icon to activate the Insert Function window (Figure 1.3). You'll find the COS function amongst the Math & Trig functions and you can specify the argument by clicking on the adjacent cell containing the angle value. The angle values are in degrees but the COS function expects radians so you must convert the angle value to radians by multiplying by π and dividing by 180. To do this simply type the multiplication symbol (the asterisk) and then click on the pull-down menu arrow in the name box. The name box currently displays the COS function name but a short list of other functions should appear and if you choose

COS ▼ (X √ *f* =COS(A3*)



More Functions... you'll open the Insert Function window (Figure 1.10) and be able to select the PI function from the Math and Trig group of functions. The PI function simply represents an accurate value for π (pi). You'll see this next panel:

Function Arguments	?)	×
Returns the value of Pi, 3.14159265358979, accurate	e to 15 digits.	
This functi	on takes no arguments.	
Formula result = 1		
Help on this function	OK Cancel	

Your inclination now is to click the OK button. Do *not* click the OK button! At this point you have a function (PI) inside another function (COS). What should happen when you click OK is a return to COS so you can complete that function. That does not happen. Clicking OK in PI closes not only PI but also COS, which is still incomplete. Rather than clicking OK in PI move the cursor back up to the formula bar and position it anywhere within the name COS in the expression in the formula bar and click the left mouse button.

The name box and formula har after		
The name box and formula bar after		
inserting the PI function:	PI	▼ (∧ ♥ Jx =CUS(A3*PI())

The Function Arguments window for COS now reappears:

Function Arguments	?×
CO5 Number A3*PI()	= 0
Returns the cosine of an angle.	= 1
Numbe	r is the angle in radians for which you want the cosine.
Formula result = 1	
Help on this function	OK Cancel



You can now finish the formula by including the division by 180. The Function Arguments window now looks like this:

Function Ar	guments				? ×
rcos					
Number	A3*PI()/180	=	0		
		=	1		
Returns the	cosine of an angle.				
	Numbe	r is the angle in r	adians for which	n you want	the cosine.
Formula resu	ult = 1				
Help on this	function		ОК		Cancel

The formula is now finished so click OK and fill the formula down the column. You should get the results shown in Figure 1.12. Format the Cosine column to display only 4 decimal positions.

Later versions of Excel have a RADIANS function to convert degrees into radians. In this case the formula will look like =COS(RADIANS(A3)) . Nesting RADIANS inside COS is done in the same way as PI() was nested inside COS.

Creating a Graph

Click on the **Insert** tab and select the Line command from the **Charts** cell and then select "All Chart types...".



The Insert Chart window shown in Figure 1.7 should appear. Observe the possible chart types carefully (select each of them to see all of the possibilities) but then make the selection shown in the figure -i.e. the first entry in the Line row - before clicking OK.





Figure 1.7 – the Insert Chart window

Insert Chart		<u>? ×</u>
🚞 Templates	Column	^
Column		มก
🖄 Line		
🕒 Pie		
🗾 Bar		
🖄 Area		
X Y (Scatter)	A LAA LAA	
Stock		
👼 Surface		
Oughnut		
🔐 Bubble		
🙊 Radar	Pie	
		-
Manage Templates	Set as Default Chart OK	Cancel

An object in the form of an empty rectangle is placed on the current worksheet. When complete the graph will appear in this space, as shown in Figure 1.5.

The next step in the chart creation is to select the data. Notice that the Design tab in Chart Tools is now showing.

🔟 🛃 🤘	- (°= -	Ŧ								Chart Tools		Book
File	Home	Insert	Page Layout	Formulas	Data	Review	View	Team	Design	Layout	Format	
Change Chart Type	Save As Template	Switch Row/Colum	Select Data									

When you click on Select Data the Select Data Source window appears:

Select Data Source		<u> </u>	×
Chart <u>d</u> ata range:		Ē	
	Switch F	Row/Column	
Legend Entries (Series)		Horizontal (Category) Axis Labels	
Add Edit	🗙 <u>R</u> emove 🔺 💌	Edi <u>t</u>	
Hidden and Empty Cells		OK Cancel	



In the language of Excel Legend Entries (Series) are the values on the Y-axis, i.e. the curve in our case, and the Horizontal (Category) Axis is the X-axis.

To create the cosine curve, select Add under Legend Entries and click OK. The following window appears:

Edit Series	<u>?</u> ×
Series <u>n</u> ame:	
	🚺 Select Range
Series <u>v</u> alues:	
={1}	= 1
	OK Cancel

You can give the curve a name, but that is not necessary. Erase the phrase = $\{1\}$ in Series values and highlight cells B3 to B52 (or to the last cell containing a value) on the worksheet and click OK.



Notice that the horizontal axis seems to bear no relation to the angles from which you calculated the cosine function value. In fact the horizontal axis seems to simply count how many values there are in the data. The next step allows you to specify which data to use on the horizontal axis of the graph.

Click on the Edit button below Horizontal (Category) Axis Labels and select the angle data on your worksheet.

Axis Labels		? ×
Axis label range:		
=Sheet1!\$A\$3:\$A\$52	<u> </u>	0, 10, 20, 30,
	OK	Cancel



The next step is to specify a chart title, labels for the axes, and the legend, amongst other possibilities. A legend is useful if more than one line (series) is being plotted since the legend would identify the lines.

In the Design tab, select the appropriate layout of titles (Chart Title across the top and Axis title along both the X- and Y- axis) from the Chart Layouts cell.



You won't find exactly what you are looking for, so choose one that has more than you need. You can later delete the unwanted parts. Click on each of these and change them to the titles shown in Figure 1.5.

To delete an unwanted part, such as Legend, select the desired entry in the Labels cell in Layout within Chart Tools:

🗶 🛃 🍠	• (° • -	-											Chart	Tools	
File	Home	Inser	t P	age Layo	ut F	ormulas	Data	a Re	view	View	Team	Design	Lay	out	Format
Legend	Selection	Ŧ		P	Α	in	l da	din 💷	<u>tini</u>		dn		dn	, dbj	
Reset to	Match Styl	le	Picture	Shapes	Text Box	Chart Title ▼	Axis Titles *	Legend *	Data Labels ▼	Data Table ≭	Axes *	Gridlines *	Plot Area ≁	Chart Wall ™	Chart Floor ∞ Ro
Curren	t Selection			Insert				Labels			A	xes		Back	ground

Rather than use the pre-defined Chart Layouts you can also build the Labels one-by-one, if you prefer.

Note: In later versions of Excel "Chart Tools" has only two tabs: "Chart Design" and "Format". The "Labels" and "Axes" groups are found in "Add Chart Element" and the "Chart Layouts" are found in "Quick Layout".

Further Adjustments to the Chart

The chart now needs some tidying up. For example, the numbers on the horizontal axis would be better if they were oriented normally, and there are too many of them. In addition, there are too many values on the vertical axis and those values certainly do not need to have such decimal figure precision.



To further fine-tune the presentation of the plot you can select various features of it in order to make adjustments. For example, select a component in the chart by clicking once within its border ("handles" should appear on its border). You can resize it or move it.

Double-click on any of the values along the horizontal axis and the Format Axis window appears:

Format Axis	<u>?</u> ×
Axis Options	Axis Options
Number	Interval <u>b</u> etween tick marks: 4
Fill	Interval between labels: C Automatic
Line Color	 Specify interval unit: 10
Line Style	Categories in reverse order
Shadow	Label distance from axis: 100
Glow and Soft Edges	Axis Type: Automatically select based on data
3-D Format	O Text axis
Alignment	O Date a <u>x</u> is
	Major tick mark type: Outside Minor tick mark type: Outside Axis labels: Next to Axis
	Vertical axis crosses: Automatic
	O At category number: 1
	C At maximum category
	On tick marks
	O Between tick marks
	Close

Figure 1.8 – the format Axis window for the X-axis

Type in the values shown in the figure and change other settings whenever they differ from the initial values and settings. Make sure you understand why these values were chosen. In fact, you would be well advised to experiment with different values to see the effects and make the changes one at a time and examine the graph after each one.





Next, double-click on any value on the vertical axis of the graph and adjust the parameters displayed in the Format Axis window, see if you can make your graph look like that shown in Figure 1.5.

Format Axis		<u>? ×</u>
Format Axis Axis Options Number Fill Line Color Line Style Shadow Glow and Soft Edges 3-D Format Alignment	Axis Options Minimum: O Auto O Eixed -1.0 Maximum: O Auto O Fixed 1.0 Major unit: O Auto O Fixed 0.5 Minor unit: O Auto O Fixed 0.1 Values in reverse order Values in reverse order Show display units label on chart Major tick mark type: Outside Minor tick mark type: None Axis labels: None Horizontal axis crosses: Automatic	?×
	C Axis value: 10.0 C <u>M</u> aximum axis value	
	Clo	ose

Figure 1.9 – the Format Axis window for the Y-axis

Summary

This chapter has given you an introduction to Excel spreadsheets. The techniques for creating a spreadsheet model and building formulas are fundamental to your future work with spreadsheets of any type. You must take the opportunity now to ensure that you are totally familiar with the principles discussed in this chapter, so please review the work and experiment with the many capabilities of the spreadsheet that have been introduced.