Introduction to Excel Basics

Knowing the fundamentals of Microsoft Excel will make you more confident in using spreadsheet templates. When you start the Excel program, it opens a blank spreadsheet. Figure 1 shows a blank spreadsheet with some of its parts identified. The title bar shows that Excel has opened a **workbook** named Book1. In Excel terminology, a workbook consists of many **worksheets**, or simply **sheets**. The figure shows three sheets with the tabs Sheet1, Sheet2, and Sheet3. Sheet1 is currently active. A sheet consists of many rows and columns. Rows are numbered 1, 2, 3, . . . , and columns are labeled A, B, C, . . . , Z, AA, AB, … A sheet may have thousands of rows and hundreds of columns. You can use the scrollbars to navigate to desired columns and rows.

In the figure, Column B and Row 4 are highlighted. The cell at the intersection of column B and row 4 is called cell B4. To select a cell, click on that cell with the mouse pointer. The cell is highlighted with heavy borders and the name of the selected cell appears in the Name box.

After you select a cell you can enter into it a text, a number, or a formula. Whatever entry you make will appear on the **formula bar**. You can also edit the entries in the formula bar as you would edit any text.

We shall walk through detailed instructions to create an invoice. If you wish, you can take a peek at the final invoice in Figure 5. We will then turn it into a template, which is shown in Figure 6. In what follows, the steps are shown as bullet points. Perform these steps on your computer as you read.

- Launch the Excel program. You can do this by double-clicking on the Excel icon. If you don't see the icon, you have to locate Excel in Program Files and launch it.
- Select cell B4 and enter the text "Description." Press Enter.

FIGURE 1 **Blank Excel Spreadsheet with Parts Labeled**

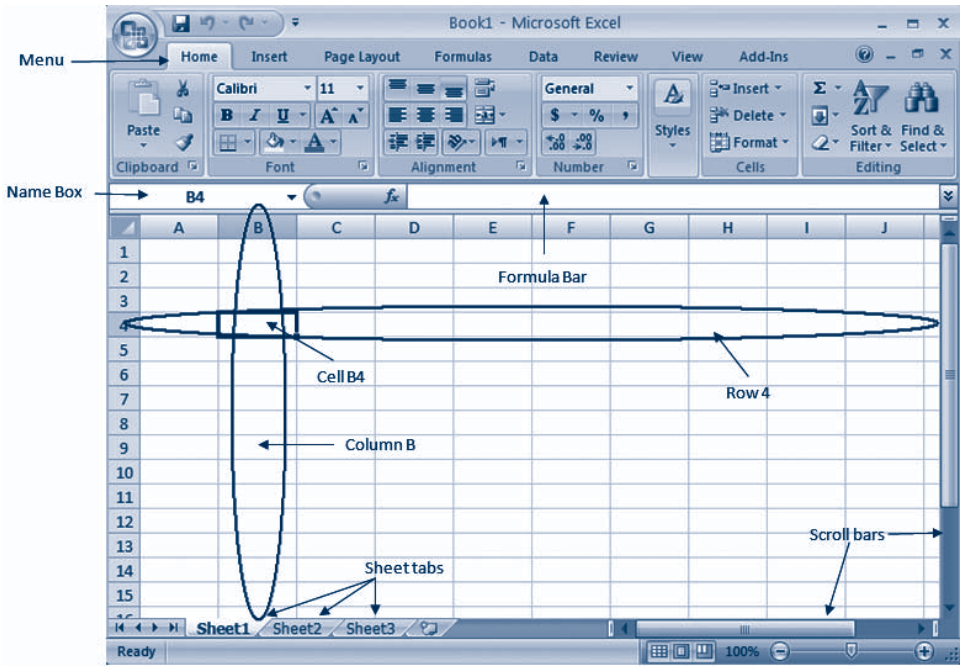
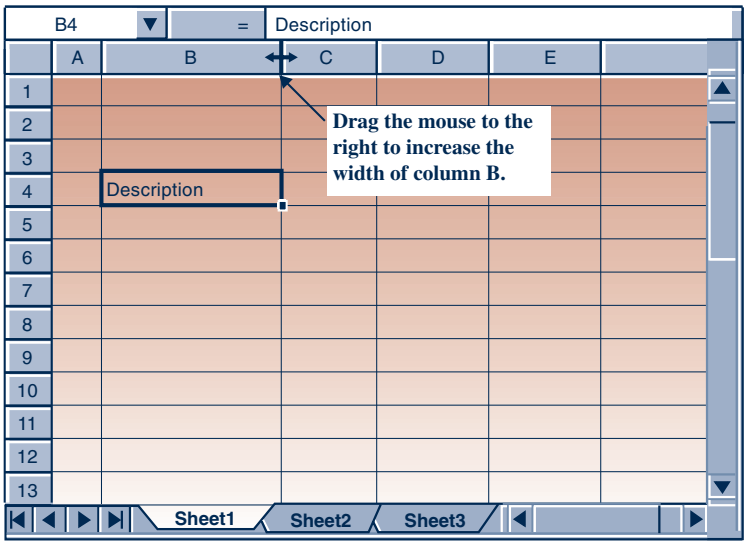


FIGURE 2 Widening Column B



We need a wider column for description. You can increase or decrease the width of a column by dragging, with the mouse pointer, the line between two column labels.

- Take the mouse pointer to the short line segment between the column labels B and C. Notice how the pointer changes its shape when it is on this line segment. It becomes a vertical line with two short arrows to the left and to the right, as seen in Figure 2. Drag the mouse to the right to widen column B to 20.00 points. (You would drag it to the left to reduce the width.)
- With cell B4 still selected, click on the Bold icon to get boldface fonts. (When you place the mouse pointer on any icon or a drop-down box, the pop-up tool tip shows its name. This should help you to identify every icon.)
- Click the Center icon to center the text inside the cell.
- Similarly enter the text "Qty" in cell C4, make it boldface, and center it.
- Reduce the width of column C to 4.00 points.
- Enter "Price" in cell D4, make it boldface, and center it.
- Enter "Invoice" in cell A1. Make it bold. Using the Font Size drop-down box, increase the font size to 14. Using the Font Color drop-down box, change the color to Blue.
- Reduce the width of column A to 2.00 points.
- See Figure 3. Make the entries shown in the figure under the Description, Qty, and Price columns. Notice how texts automatically align to the left side of the cell and numbers to the right side.

1 Excel Formulas

Consider cell E5. It should be the product of the quantity in cell C5 and the price in cell D5. If you do this multiplication yourself and enter the result in cell E5, you are probably not having much fun. You want the spreadsheet to do it for you. So, you are going to give a precise instruction to the spreadsheet.

- Enter the **formula** `=C5*D5` in cell E5. The * is the multiplication symbol in Excel formulas. Notice the = sign at the beginning of the formula. All Excel

FIGURE 3 The Entries

	A	B	C	D	E
1	**Invoice**				
2					
3					
4		**Description**	**Qty**	**Price**	**Amount**
5		Shampoo	2	3.59	
6		Conditioner	2	2.79	
7		Soap	5	0.95	
8		Kleenex	4	1.95	
9					
10					

formulas must start with the = sign. Notice how the spreadsheet evaluates the formula and displays the result of the formula in the cell and not the formula itself. The formula appears in the formula bar.

Copying Formulas

Consider cell E6. It should have the formula `=C6*D6`. But this is similar to the formula you entered in cell E5. In such cases, copying the formula from one cell into another is easier. You can use the Copy and Paste icons to do this. But there is an easier way, which helps you copy the formula into cells E6, E7, and E8 in one stroke.

- Select cell E5, if it is not already selected. The heavy border that outlines the cell has a dot at the bottom right corner. This dot is called the **fill handle**. Drag the fill handle down to fill cells E6, E7, and E8. When you fill cells in this manner, Excel will change the cell references in the formulas in a very intuitive way. For instance, click on cell E6 and look at the formula bar. It shows `=C6*D6` although the original formula in cell E5 was `=C5*D5`. In other words, Excel has changed the 5s into 6s because the formula was copied downward. (If the filling was toward the right, instead of downward, Excel would have changed the C to D and D to E. It would not have changed the 5s.) Similarly, the formulas in cells E7 and E8 are also different. These are the formulas needed in those cells, and thus the changes that Excel made in the formulas saved you some work.

More items can be added to the invoice. Let us assume that 10 items is the most allowable and leave enough space for up to 10 items. We shall get the total amount in row 15.

- Enter "Total" in cell D15.

2 Excel Functions

To get the total amount in cell E15, it appears you need to enter the formula

```
=E5+E6+E7+E8+E9+E10+E11+E12+E13+E14
```

This formula is tedious, and it would get more tedious if there are more cells to add. Indeed, we often have to add hundreds of cells. So we find a shortcut. The **function** `SUM` available in Excel can be used to add a **range** of cells with a very compact formula.

A range of cells is any rectangular array of cells. The range A1:C4, for instance, contains 4 rows and 3 columns of cells. Note the use of the : symbol in the reference to a range.

Excel contains numerous powerful functions that can compute complex quantities. Click on the Paste function icon. In the dialog box that appears, you can see a long list of Excel functions available. Close the dialog box.

- Enter the formula `=SUM(E5:E14)` in cell E15. Note that the argument of a function is entered in parentheses, as you would in algebra.

We shall next compute sales tax at 6%.

- Enter 6% in cell C16.
- Enter "Sales Tax" in cell D16.
- Enter the formula `=C16*E15` in cell E16.

Finally, we compute the total amount due.

- Enter "Total due" in cell D17.
- Enter the formula `=E15+E16` in cell E17.

Your spreadsheet should now look like the one in Figure 4. The dollar figure in cell E8 has only one decimal place and those in cells E16 and E17 have four. Also, the dollar sign is missing everywhere in the Price and Amount columns. To fix this,

- Drag the mouse from the center of cell D5 to the center of cell D14. You have selected the range D5:D14. Click on the $ icon. This formats all the prices as dollar values with two decimal places for cents.
- Select the range E5:E17 similarly, and click the $ icon. The dollar values now appear properly.

FIGURE 4 **Showing Tax and Total Due**

	A	B	C	D	E
1	**Invoice**				
2					
3					
4		**Description**	**Qty**	**Price**	**Amount**
5		Shampoo	2	3.59	7.18
6		Conditioner	2	2.79	5.58
7		Soap	5	0.95	4.75
8		Kleenex	4	1.95	7.8
9					
10					
11					
12					
13					
14					
15				Total	25.31
16			6%	Sales Tax	1.5186
17				Total due	26.8286

We realize that although no items appear in rows 9 though 14, some items may be entered there in the future and therefore we need formulas in the range E9:E14.

- Select cell E8. Drag the fill handle downward to cell E14. The formulas are copied.

But the range E9:E14 contains the distracting display of "$ − " for zero dollars. One way to get rid of this distraction is to instruct the computer to display the amount only when there is an entry in the Price column.[1] This can be done using the `IF` function. The `IF` function displays one of two specified results depending on whether a specified condition is true or false. For instance, the formula `=IF(A1=5,10,20)` would display 10 if cell A1 contains 5, and 20 if cell A1 contains anything else.

- Click on cell E5. Change the formula to `=IF(D5<>"",C5*D5,"")`. The symbol `<>` means "not equal to." The symbol `""` contains nothing in quotes, and signifies an empty text. The formula as a whole tells the spreadsheet to display the amount only if cell D5 is not empty.
- Using the fill handle, copy the formula in cell E5 downward to cell E14. This updates all the formulas.

Next we shall add borders.

- Select the range B4:E14. Click the down arrow of the Borders drop-down box, and select the All Borders icon.
- Select the range E15:E17 and click on the Borders icon. Note that the All Borders option stays selected and therefore you need not select it again. Just click on the Borders icon.

Now that we have borders for the rows and columns, we don't need the gridlines of the spreadsheet.

- On the Page Layout tab, in the Sheet Options group, uncheck the View box under Gridlines.

You now have the complete invoice, and it should look like the one in Figure 5.

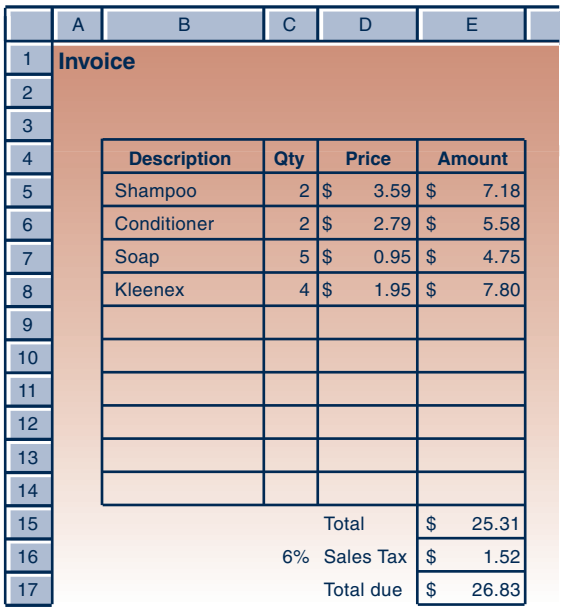
3 The Need for Templates

If you need to create another invoice, you wouldn't want to go through all these steps all over again. You would use a copy of this spreadsheet. But what if your friends or co-workers wanted to create an invoice? A copy of your spreadsheet would be unfamiliar to them. In particular, they would not know that some important formulas had been used in column E. The solution is to turn your spreadsheet into a template. A well-designed template with necessary notes and instructions included in the template itself is usable by anyone.

Also, the rigamarole of the steps can get extremely tedious for more complex problems. An average statistical problem you see in this textbook is more complex than creating an invoice. It would require complicated formulas and maybe some charts. Therefore, for every technique in this book, a template has been provided

[1] Actually, we should check that both Qty and Price are available. It can be done using the AND function. For simplicity, we shall check only the Price entry.

FIGURE 5 The Final Invoice



Invoice

Description	Qty	Price	Amount
Shampoo	2	$ 3.59	$ 7.18
Conditioner	2	$ 2.79	$ 5.58
Soap	5	$ 0.95	$ 4.75
Kleenex	4	$ 1.95	$ 7.80
		Total	$ 25.31
	6%	Sales Tax	$ 1.52
		Total due	$ 26.83

rather than detailed steps for solving the problem. The templates can also help the user to conduct sensitivity and decision analyses using Goal Seek and Solver facilities.

Creating the Template

We shall see how to turn the Invoice spreadsheet into a template.

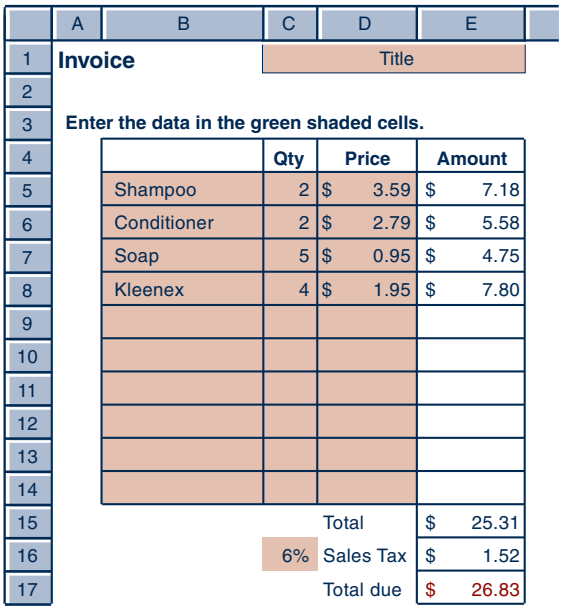
In any template, the user will input some data. For an invoice, the user needs to enter Description, Qty, and Price of each item. The user also may want to change the sales tax rate. Accordingly, we should leave the range B5:D14 and cell C16 unlocked and shaded in green. The rest of the spreadsheet should be locked, especially the formulas in column E.

- Select the range B5:D14.
- With the Control (Ctrl) key pressed, click on cell C16. Using the Control key in this manner you can select multiple ranges at once.
- On the Home tab, in the Cells group, select Format and then choose Format Cells.
- Click the Protection tab and uncheck the Locked box.
- Using the Fill color drop-down box, shade the ranges in green.
- Select cell E17. Make the font bold and red. Any result is shown in bold red font in the templates.

The user may want a title for the invoice. So we provide an area at the top for a title.

- Select the range C1:E1. Click the Merge and Center icon. Merging turns three cells into one cell.
- Use the Format cells command under the Format menu to unlock the cell and shade it green. Enter "Title."
- Enter "Enter the data in green shaded cells" in cell A3 and color the font magenta. Instructions are in the magenta font in the templates.

FIGURE 6 The Template



	A	B	C	D	E
1	**Invoice**		Title		
2					
3	**Enter the data in the green shaded cells.**				
4		**Qty**	**Price**	**Amount**	
5	Shampoo	2	$ 3.59	$ 7.18	
6	Conditioner	2	$ 2.79	$ 5.58	
7	Soap	5	$ 0.95	$ 4.75	
8	Kleenex	4	$ 1.95	$ 7.80	
9					
10					
11					
12					
13					
14					
15			Total	$ 25.31	
16		6%	Sales Tax	$ 1.52	
17			Total due	$ 26.83	

Now you are ready to protect the sheet so that locked cells cannot be altered.

- Click the Protect Sheet in the Changes group on the Review tab. In the dialog box that appears, click the OK button. Avoid using any password, since the user may want to unprotect the sheet for some reason. All the templates in this textbook are protected without password.

Your template should look like the one in Figure 6. Save the template as MyInvoice.xls. You can share this template with your friends.

Limitations of the Template

Some limitations of the template are:

1. The template can accommodate up to 10 items only.
2. The user may enter a text where a number is expected. If the text "Two" is entered as quantity, the template will not calculate the amount. At times a number may be too large for Excel to handle. In general, the user may input something unacceptable in some cell, which can make the template produce error messages rather than results.
3. The user may accidentally enter, say, a negative number for quantity. The template will accept negative values and will calculate some result. Unaware of the accidental error, the user may report a wrong total amount due. An undetected accidental error is a serious problem common to all types of computer applications.
4. If there are additional items such as shipping and handling charges, the user may not know what to do.

With some patience and effort, fixing or alleviating these limitations is possible. But some limitations will always be found.

Exercise

Consider a restaurant check for a meal, to which you want to add your tip. Create a template that calculates the tip amount as a user-defined percentage of the check amount. The template should also compute the total amount including the tip. When you are finished, look up the template Tip Amount.xls and compare.