STEP 1: PROBLEM DEFINITION

Teez wants to know the following:

1. How will a change in the quantity sold affect his profit?
2. At what level of sales does he break even?
3. If he estimates sales of five bundles during the rainy season, should he rent the stand?

Mr. T's revenue is determined by the price and quantity of T-shirts sold. His costs include the fixed cost of renting the stand, the hourly cost of hiring Sam, and the number of hours he works, as well as the cost of producing a T-shirt. His profit is determined by deducting total costs from his revenue.

The input variables are:

Price of a bundle of 5 T-shirts = $20
Quantity sold = 15
Stand rental per day = $100
Hourly labor rate = $7; hours worked = 8
Cost per T-shirt Bundle = $1.50

The formulas used are:

$$\text{Revenue} = \text{price} \times \text{number of T-shirt bundles sold}$$

$$\text{Total cost} = \text{rental} + (\text{hourly labor rate} \times \text{hours worked}) + \text{Cost per T-shirt Bundle} \times \text{number of T-shirt bundles sold}$$

$$\text{Profit} = \text{revenue} - \text{total cost}$$

STEP 2: FORMULATE THE MODEL

Enter the various variables identified earlier. For a more logical presentation of your model, inputs may be grouped and individual cells are named. We first begin with revenue inputs, which consist of the price and the quantity sold (see Figure 2.4).

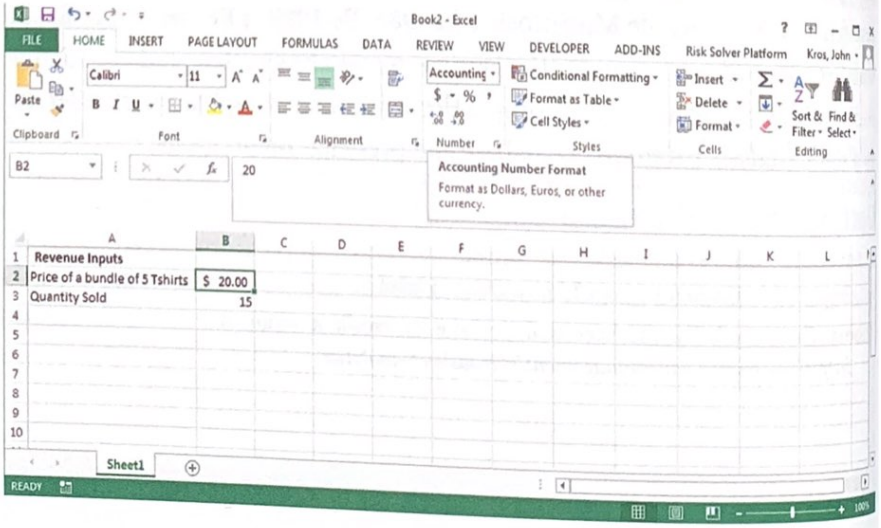


FIGURE 2.4
Spreadsheet Example for Revenue Calculation

Applying Number Format to Cell

The $ shortcut button formats cells into dollars and cents.

Note that after entering 20 in the cell, you may format the input into a dollar format by clicking on the $ shortcut button (indicated by the pull down menu) in Figure 2.4.

Alternatively you may use the drop-down menu of Format (found on the Menu bar) and point at Cells, after which you will be shown the dialog box in Figure 2.5. You may choose the appropriate format from the left column.

Naming Cells

To name a cell, click on the cell to be named, and then click in the Name box and type in the name of the cell.

Notice that a cell is defined by its location within the columns and rows, In the case of the $20.00 entry, the cell is defined in the spreadsheet as B2, i.e., column B and row 2. Generally it is good practice to name cells that contain formulas or global variables (price, hourly costs, etc.), as it allows the user to more easily identify the concept being modeled within the cells.

To name a cell you have to first click on the cell you wish to name. For the T-shirt example, we wish to name the T-shirt bundle price, cell B2. Therefore, click on cell B2 and then click on the Name box (see Figure 2.6). Type a name for the cell and press Enter. Spaces are unacceptable in a named cell; instead you should use an underscore to indicate a space. For example, the name of B2 should be entered as "Price_of_bundle_of_5_T_shirts" instead of "Price of bundle" (see Figure 2.6).

Alternatively, to name a cell, first click on the cell you wish to name. Right click on the cell and choose the Name a Range option. You will see the dialog box in

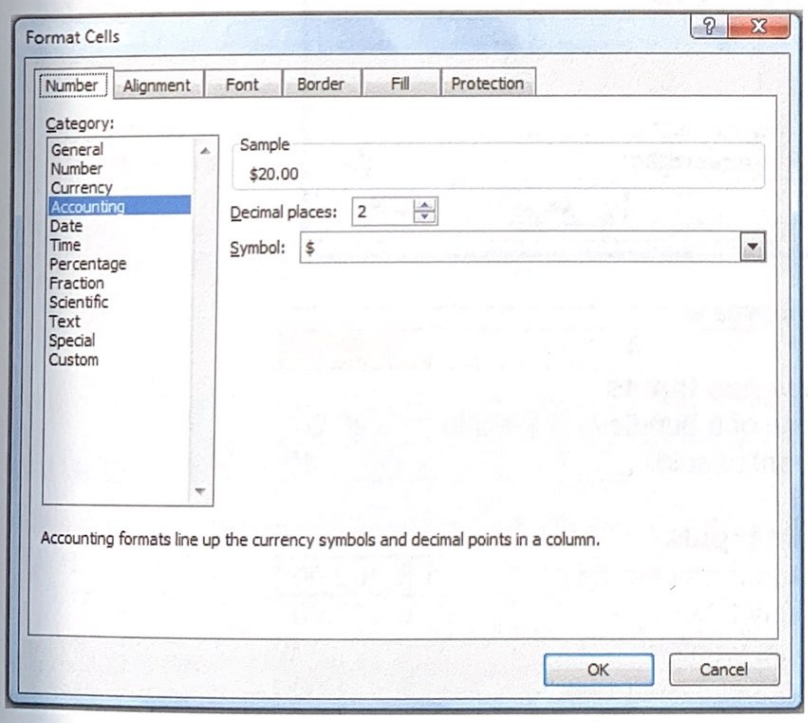


FIGURE 2.5
Example of Number Formatting in Excel

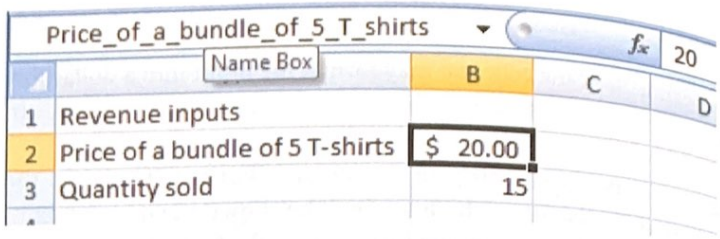


FIGURE 2.6
Example of Naming a Cell in Excel

Figure 2.7. You may choose to renam
cell in a simpler form. The cell refers to =Sheet1!B2; this should correspond
cell you initially clicked on and wished to name.

Continue with naming and formatting the rest of the revenue and cost in
The spreadsheet should look similar to Figure 2.8. Again, it is good practi
group inputs and outputs separately.

Next we model the revenue, costs and profits. In the Revenue cell, ente
formula (see Figure 2.9):

=Price_of_bundle_of_5_T_shirts*Quantity_sold

You may manually type in the cell names or first type =, followed by cli
on the cells you need in the formula. Remember to press Enter to comple

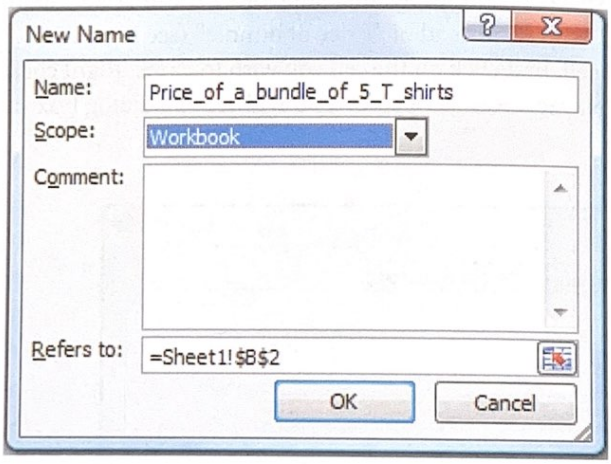


FIGURE 2.7
Defining a Name in Excel

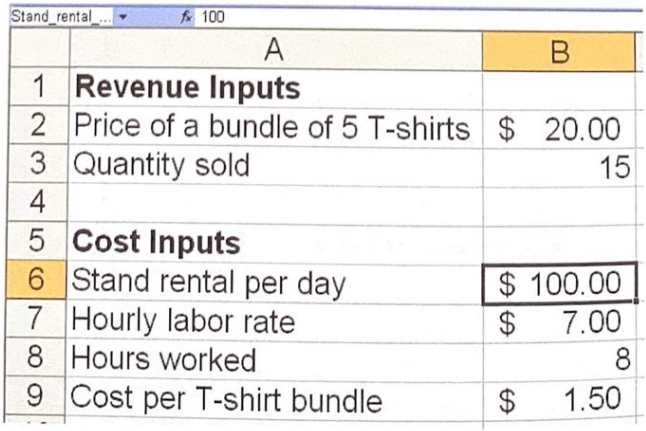


FIGURE 2.8
Example of a Formatted Excel Spreadsheet

formula. If you do type the formula, you have to type the exact names you used for the relevant cells.

In the Total Cost cell, enter the formula:

```
=Rental_cost+(Hourly_labor_cost*Hours_worked)
  +(Cost_per_Tshirt_bundle*Quantity_sold)
```

and in the Profit cell, enter the formula:

```
=Revenue–Total_cost
```

Take note that it is much more efficient to click on the relevant cells to complete the formulas. You will see from our model that for 15 bundles of T-shirts sold, Teez makes a profit of $121.50 (see Figure 2.10).

SUM =Price_of_a_bundle_of_5_T_shirts*Quantity_sold

	A	B	C	D	E
1	**Revenue Inputs**			**Revenue Outputs**	
2	Price of a bundle of 5 T-shirts	$ 20.00		Revenue	=Price_of_
3	Quantity sold	15			
4					
5	**Cost Inputs**			**Cost Ouput**	
6	Stand rental per day	$ 100.00		Total cost	$ 178.50
7	Hourly labor rate	$ 7.00			
8	Hours worked	8		**Profit Output**	
9	Cost per T-shirt bundle	$ 1.50		Profit	$ 121.50

FIGURE 2.9
Example of a Spreadsheet Displaying Revenue

SUM =Stand_rental_per_day+Hourly_labor_rate*Hours_worked+Cost_per_Tshirt_bundle*Quantity_sold

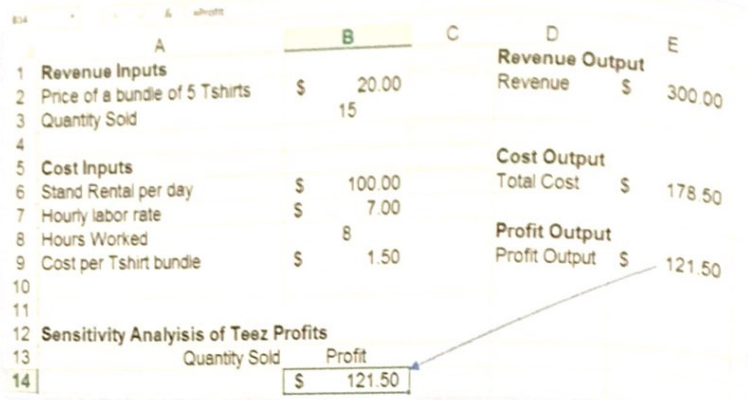
	A	B	C	D	E
1	**Revenue Inputs**			**Revenue Outputs**	
2	Price of a bundle of 5 T-shirts	$ 20.00		Revenue	$ 300.00
3	Quantity sold	15			
4					
5	**Cost Inputs**			**Cost Ouput**	
6	Stand rental per day	$ 100.00		Total cost	=Stand_re
7	Hourly labor rate	$ 7.00			
8	Hours worked	8		**Profit Output**	
9	Cost per T-shirt bundle	$ 1.50		Profit	$ 121.50

FIGURE 2.10
Example of a Spreadsheet for Profit Calculation

Creating Data Tables in Excel

To conduct a sensitivity analysis to see how profits vary with the values of quantity sold, we use the Data Table function in Excel (see Figure 2.12).

To start the process, type in cell A12 "Sensitivity analysis of Teez profits," in cell A13 type "Quantity sold," and in cell B13 type "Profit." Then in cell B14, we enter a link to the profit model by clicking on cell E9 or entering =Profit. Next, enter the trial values of the quantity sold that you wish to vary in column A. In



	A	B	C	D	E
1	**Revenue Inputs**			**Revenue Output**	
2	Price of a bundle of 5 Tshirts	$ 20.00		Revenue	$ 300.00
3	Quantity Sold	15			
4				**Cost Output**	
5	**Cost Inputs**			Total Cost	$ 178.50
6	Stand Rental per day	$ 100.00			
7	Hourly labor rate	$ 7.00		**Profit Output**	
8	Hours Worked	8		Profit Output	$ 121.50
9	Cost per Tshirt bundle	$ 1.50			
10					
11					
12	**Sensitivity Analysis of Teez Profits**				
13		Quantity Sold	Profit		
14			$ 121.50		

FIGURE 2.11
Example Spreadsheet for Profit Calculation

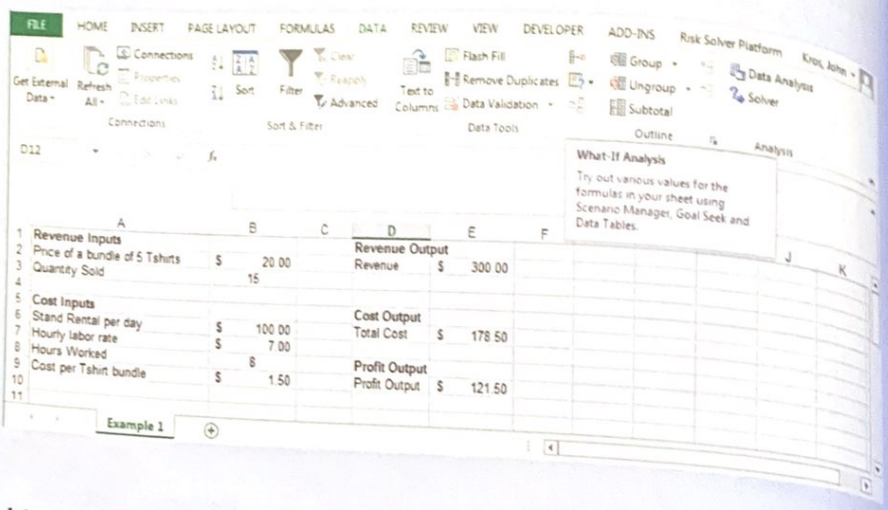


FIGURE 2.12
What-If Analysis Icon in the Data Tools Menu Excel

this example, we chose values from 5 to 20 bundles. This can be as much or as little as you wish; however, the quantity chosen should be sufficient to reflect the changes in profit in order to conduct a reasonable sensitivity analysis.

The trial values of quantity sold in are entered in cells A15 to A30—values 5 to 20 (see Figure 2.14). Finally, we highlight the entire table range, A14:B30, and click on the What-If Analysis icon in the Data Tools group (see Figure 2.12). From the What-If Analysis icon select Data Table option to bring up the Table dialog box (see Figure 2.13). Here we fill in Quantity_sold in the column input cell to indicate that only the input quantity sold is listed along a column.

When you click on OK, Excel substitutes each value of quantity sold to provide the corresponding profit values and reports it in the table (see Figure 2.14).

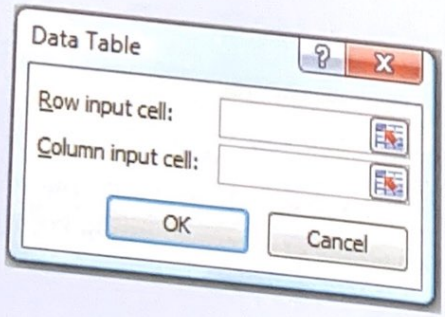


FIGURE 2.13
Data Table Input Menu in Excel

Creating Charts Using Excel

To create a chart, click on the Insert tab on the Menu bar and select from the Charts group; the Scatter option (see Figure 2.21). At the bottom of the Scatter pull-down menu select More Scatter Charts. A figure resembling Figure 2.22 will appear. Here we choose XY (Scatter) with straight lines and markers (the fourth icon in from the left); this will graph your table in a scatter plot format. Then click on OK button and the graph will appear within your spreadsheet as in Figure 2.23.

The final data table and the chart, side by side, make it easier for the manager to analyze the results of the data and intuitively understand that profit has a linear relationship with quantity sold. That is, profit increases linearly as more T-shirts are sold. The output is shown in Figure 2.23.

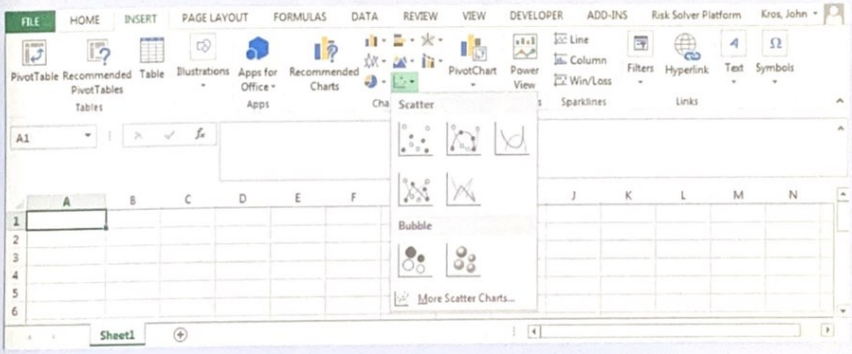


FIGURE 2.21
Insert Scatter Chart Menu in Excel

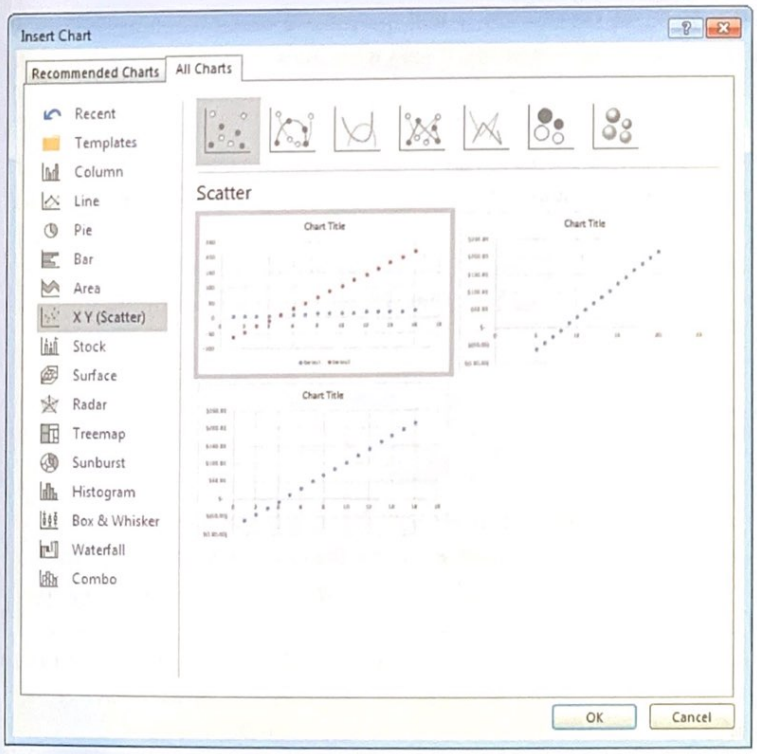


FIGURE 2.22
Insert Chart Menu in Excel