Decision Making Using Excel

1. Describe the use of the IF function.

2. Compare the functions of Goal Seek and Solver.

3. List the advantages of using the Scenario Manager.

Introduction

Most of the decision-analysis tools on the market focus on one specific analytical technique, like simulation or decision trees. They may be tailored to a specific industry need, such as insurance claims modeling. Furthermore, the cost of these tools can run into the tens of thou-sands, even millions, of dollars. Microsoft Excel is an integrated set of tools that combines the best analytical methods, can be applied to different problems, and is reasonably priced.

The measure of any business intelligence solution is its ability to derive knowledge from data. This classwork exercise will examine a few of the advanced business-analysis tools that have the capability to identify patterns, trends, and rules and create "what-if" analyses.

This classwork exercise covers four topics:

1. Using the *IF* function to conduct conditional tests on values and formulas.

2. Using *Goal Seek* to find an unknown value to produce a desired result

3. Calculating an optimum solution using the *Solver* function.

4. Using *Scenario Manager* to create and evaluate a collection of "what-if" scenarios containing multiple input values.

Creating Formulas Using the IF Function

The *IF* logical function will return one value if a condition is TRUE and another value if the condition is FALSE. Use the IF function when you want to compare two items in your workbook. The IF function looks like this:

=IF(logical_test,value_if_true,value_if_false)

Logical operators are used to compare numbers in two or more cells to a constant.	
=	Equal to
<	Less than
>	Greater than
<=	Less than or equal to
>=	Greater than or equal to
<>	Not equal to
NOT	Logical Not
AND	Logical And
OR	Logical Or

Figure 4.3.1

Logical Operators

- **Logical_test** is any value or expression that can be evaluated to TRUE or FALSE. For example, A10 = 100 is a logical expression; if the value in cell A10 is equal to 100, the expression evaluates to TRUE. Otherwise, the expression evaluates to FALSE. This argument can use any comparison calculation operator.
- **Value_if_true** is the value that is returned if the logical_test is TRUE. For example, if this argument is the text string "Within budget" and the logical_test argument evaluates to TRUE, then the IF function displays the text "Within budget." **Note:** Value_if_true can be another formula.
- **Value_if_false** is the value that is returned if the logical_test is FALSE. For example, if this argument is the text string "Over budget" and the logical_test argument evaluates to FALSE, then the IF function displays the text "Over budget." **Note:** Value_if_false can be another formula.

To use the IF function:

1. Select the cell in which you want to enter the function.
2. Click the **Formulas** tab, and then click the **Insert Function** button.
3. Click **IF** from the list of **Logical** functions, and then click **OK.**
4. In the **Function Arguments** dialog box that opens, enter the logical_test argument. This argument states the condition you want to test for. Use cell references and/or values with logical operators. Figure 4.3.1 displays the list of logical operators.
5. Enter the **Value_if_true** argument. This is the text string or value that will be displayed if the logical_test argument is true.
6. Enter the **Value_if_false** argument. This is the text string or value that will be displayed if the logical_test argument is false.
7. Click **OK.**

For example, in a loan analysis worksheet, you want to write a conditional expression that examines the ratio of a loan amount to a purchase price. The logic for solving this is if the ratio is greater than 0.8, then there is an assessment fee of $300. Otherwise, the assessment fee is $0.

To create a conditional expression:

1. Open the workbook **4.3_LoanAnalysis_Data.xlsx** that accompanies this textbook.
2. Click cell **B14,** the cell that will display **Assessment** if the ratio of loan amount to purchase price is greater than 0.8—the same criteria for displaying (or not) an assessment fee of $300.
3. Type **=IF(B13/B4 > 0.8, 300, 0)** and press **Enter.** The cell displays **300** because the loan-to-price ratio is 0.875.

When you are unsure of a function and want help writing it, you can use the Insert Function command. Executing the Insert Function command opens a dialog box that lists functions by categories and helps you build the function.

To write an IF function using the Insert Function command:

1. Click cell **B16** to make it active.
2. Click the **Formulas** tab, and then click the **Logical** button and select **IF.** The **Function Arguments** dialog box opens (see Figure 4.3.2).
3. Click the **Logical_test** box and type **B13/B4>0.8** (there are no spaces in this line). Notice that the moment you type 0.8, the label TRUE appears to the right of the value. That indicates the current value of the expression based on the condition you just completed.

4. Click the **Value-if-true** box and type **300,** which is the value to return if the condition is true.

5. Click the **Value-if-false** box and type **0,** which is the value to return if the condition is false (see Figure 4.3.3).

6. Click **OK** to complete the function. Excel places the completed IF function into cell B16, calculates the value of the function, and displays 300 because the ratio of the down payment to the purchase price is greater than 0.8.
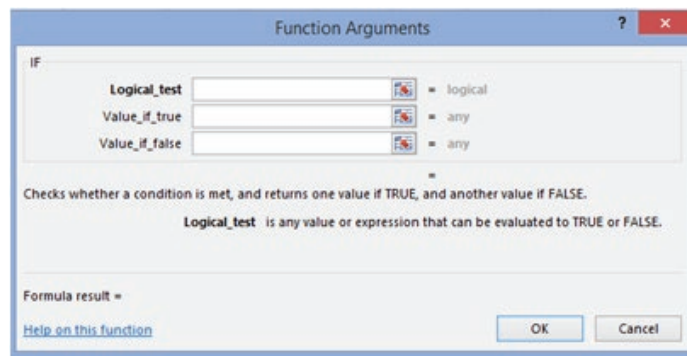
Goal Seek

Goal Seek is an analytical function that allows a value in a formula to be adjusted to reach a desired result or answer. Goal Seek can eliminate unnecessary calculations that can be used to determine a single variable value in a formula. For example, a salesperson might participate in a bonus program that pays 3 percent of all sales dollars. The salesperson wants to receive a bonus of at least $2,500 and needs to know the target sales dollar amount needed.

Create a worksheet with the following information (see Figure 4.3.4 for a layout design):

Label	Cell Address	Value
Sale Dollars	B1	(unknown—leave blank)
Bonus Percentage	B2	3%
Bonus Amount	B3	=B1*B2

When the Goal Seek command starts to run, it repeatedly tries new values in the variable cell to find a solution to the problem. This process is called *iteration,* and it continues until Excel has run the problem 100 times or has found an answer within .001 of the target value specified. The iteration settings can be adjusted by clicking the **Office** button, then clicking **Excel Options,** clicking the **Formulas** button, and adjusting the **Maximum Iteration** options. It calculates so fast, the Goal Seek command can save significant time and effort over the brute force method of trying one number after another in a formula.

USING THE GOAL SEEK COMMAND

The Goal Seek feature is used to fill in the target value of the cell containing the *Sales Dollars* amount. In our example, the Goal Seek values should read Set cell = B3, To value = 2500, By changing cell = B1.

To use the Goal Seek command:

1. Click the **Data** tab. In the **Data Tools** group, click **What-If Analysis,** and then click **Goal Seek.**

2. In the **Goal Seek** dialog box, specify the cell that contains the desired value in the **Set cell:** box. Type in or select **B3.**

3. Enter the desired value or answer in the **To value:** box. Type in **2500.**

4. Enter the cell whose value will be changed in the **By changing cell:** box. Type in or select **B1.**

Figure 4.3.4

Goal Seek
Worksheet
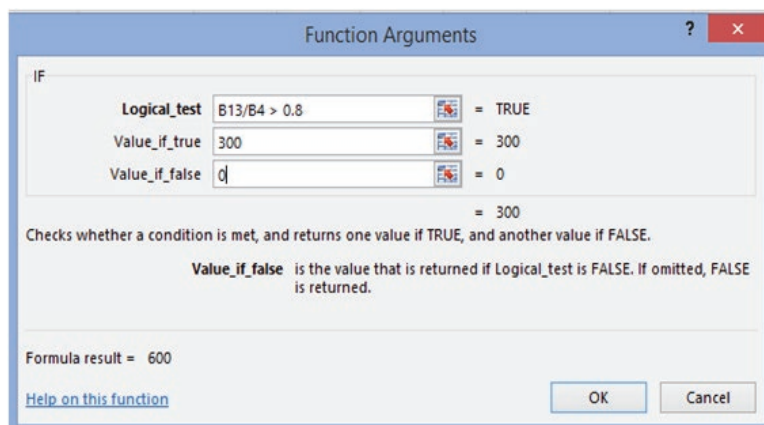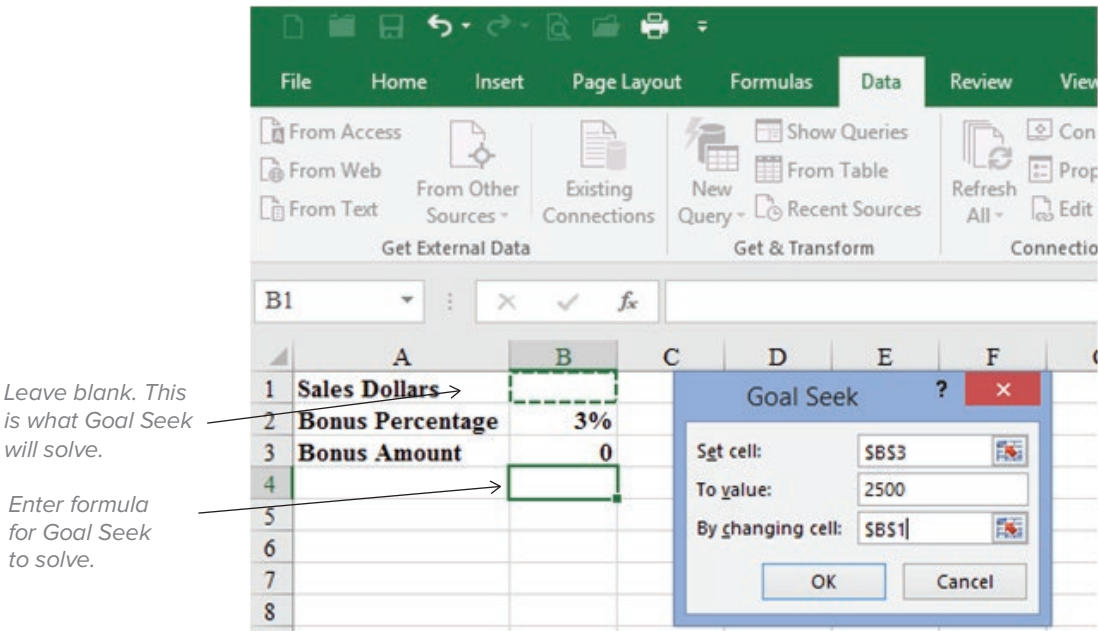
Leave blank. This
is what Goal Seek
will solve.

Enter formula
for Goal Seek
to solve.

5. The Goal Seek dialog box should look like Figure 4.3.4.

6. Choose **OK.**

   a. If a solution is found, the **Goal Seek Status** dialog box appears.

   b. The results are shown in Figure 4.3.5.

7. Select **OK.**

   Goal Seek is used to adjust a single variable in a formula. Use the Solver feature to adjust multiple variables in a formula, as described in the next section.

FIGURE 4.3.5 Goal
Seek Results
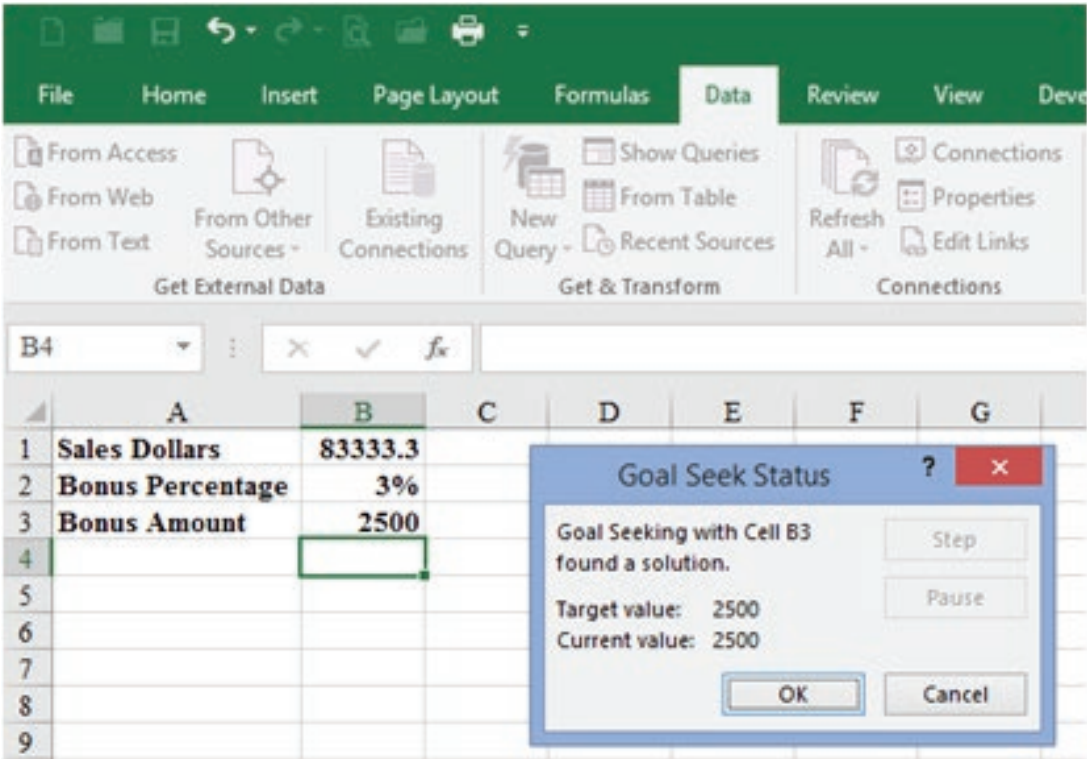
Solver

Solver is part of a suite of functions sometimes called *what-if analysis tools* used for optimizing problems that contain more than one variable. The Solver add-in utility is needed to analyze the scenarios in decision-making situations that involve consideration of values and constraints for several variables simultaneously. This powerful function uses multiple changing variables and constraints to find the optimal solution to solve a problem.

For example, consider a coffee shop that currently sells three beverages: (1) regular fresh-brewed coffee, (2) premium caffe latte, and (3) premium caffe mocha. The current price for regular coffee is set at $1.25, caffe latte at $2.00, and caffe mocha at $2.25, but the revenue potential is uncertain. What special emphasis (or marketing) should be given to each of the beverages to maximize revenue? Although the premium coffees bring in more money, their ingredients are more expensive and they take more time to make than regular coffee. Making some basic calculations by hand is easy, but there needs to be some structure to the sales data in a worksheet so that periodic changes can be made and analyzed.

INSTALLING SOLVER

Solver comes with the standard Excel package, but it has to be installed. To install Solver:
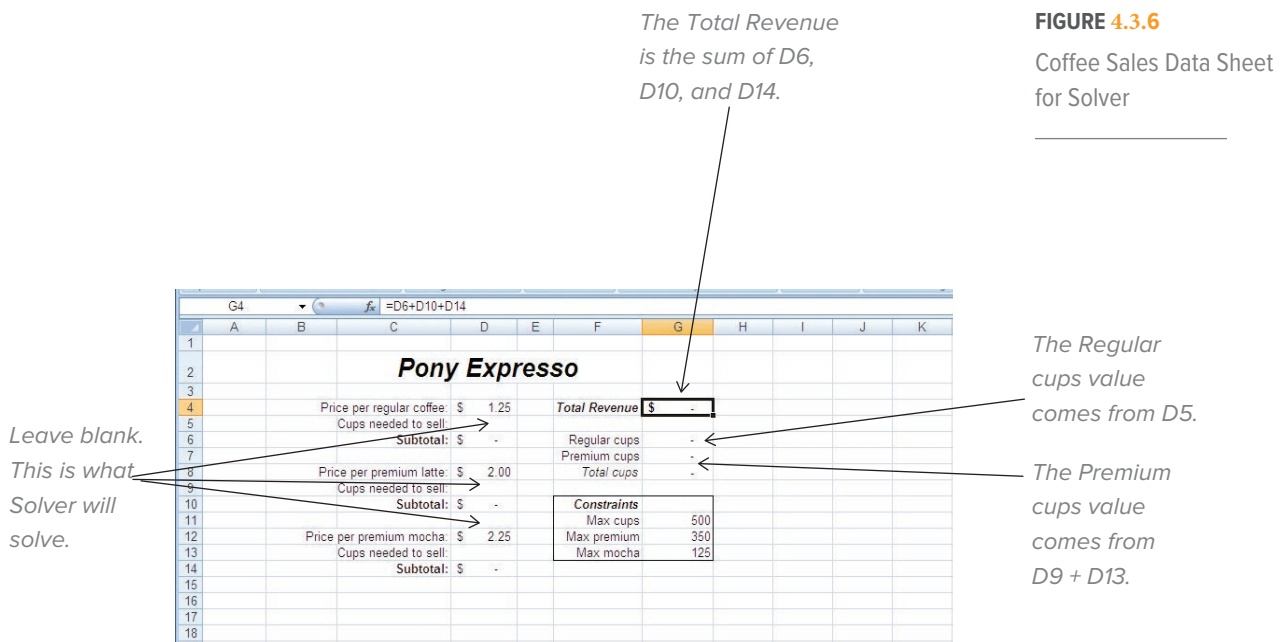
1. Click the **File** tab, and then click **Options.**
2. Click **Add-Ins,** and then, in the **Manage** box, select **Excel Add-ins.** Click **Go.**
3. In the **Add-Ins Available** box, select the **Solver Add-in** check box, and then click **OK.**
4. After you load the Solver Add-in, the Solver command is available from the Data tab.

SETTING UP THE PROBLEM

The first step in using the Solver command is to build a "Solver-friendly" worksheet. This involves creating a target cell to be the goal of your problem-for example, a formula that calculates total revenue-and assigning one or more variable cells that the Solver can change to reach the goal.

To use Solver:

1. Set up a worksheet similar to Figure 4.3.6 (this will follow the scenario presented above).
2. The three variable cells in the worksheet are cells **D5, D9,** and **D13.** These are the cells whose values Solver needs to determine to maximize the weekly revenue.

The Total Revenue is the sum of D6, D10, and D14.

FIGURE 4.3.6

Coffee Sales Data Sheet for Solver

Leave blank. This is what Solver will solve.

The Regular cups value comes from D5.

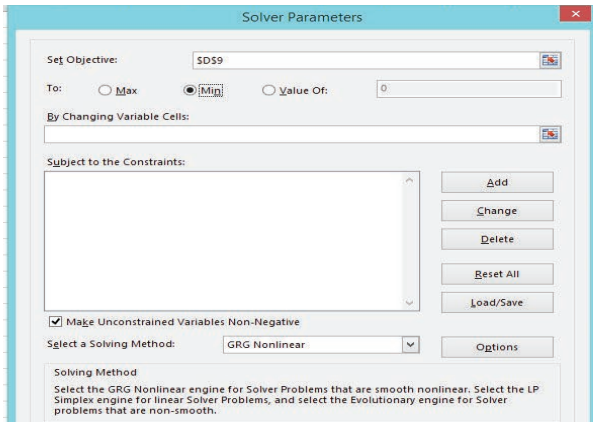*The Premium cups value comes from D9 + D13.*

FIGURE 4.3.7

Solver Parameters Dialog
Box

3. In the bottom-right corner of the table is a list of constraints to use for forecasting.

4. The worksheet must contain cells (**G6 through G8**) that include the formulas used as constraints. The limiting values for the constraints are listed in cells **G11 through G13**:

   - No more than **500** total cups of coffee (both regular and premium).
   - No more than **350** cups of premium coffee (both caffe latte and caffe mocha).
   - No more than **125** caffe mochas.

5. The subtotals for cells **D6, D10, D14** need to be calculated, as well as the **Total Revenue** (sum of D6, D10, and D14) in **G4.**

6. The value for cell **G6** should equal the value that will be calculated for D5, and the value for cell **G7** will be the sum of the values from D9 and D13. The calculation of **G8** equals the sum of D5, D9, and D13.

7. Click the target cell **G4**—the one containing the formula that is based on the variable cells you want Solver to determine.

8. Click on the **Data** tab, and then click the **Solver** button. The Solver Parameters dialog box opens, as shown in Figure 4.3.7. Select the **Set Target Cell:** box (unless it already contains the correct reference), and then click cell **G4** to insert **G4** as the target cell. The **Equal To:** option button, **Max,** is already selected. Do not change this since the problem requests the maximum value for the target cell.

9. Select the **By Changing Cells:** box. Click the **Collapse Dialog** button to the right of the box to collapse the dialog box. Select each of the variable cells by holding down the **CTRL** key and clicking **D5, D9,** and **D13.** This places commas between the three cell entries in the box: **D5, D9, D13** (see Figure 4.3.8).

10. This problem has three constraints. Click **Add,** in the **Subject to the Constraints:** section, to add the first constraint in the **Add Constraint** dialog box.
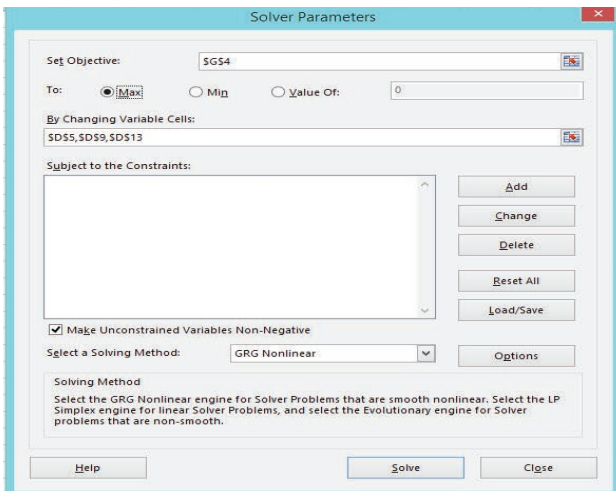
   a. The first constraint is the coffee shop can sell only 500 cups of coffee in one week. To enter this constraint, after clicking in the **Cell Reference:** box, click cell **G8,** click **<=** in the operator drop-down list, and with the insertion point in the **Constraint:** box, type or click cell **G11.**

   b. Click **Add** to enter the first constraint and begin the second constraint—the coffee shop can sell only 350 premium coffees in one week. With the insertion point in the **Cell Reference:** box, click cell **G7,** click **<=** in the operator drop-down list, and in the **Constraint:** box, type or click cell **G12.**

   c. Click **Add** to enter the second constraint and begin the third—the coffee shop can sell only 125 caffe mochas in one week. Click cell **D13,** click **<=** in the operator drop-down list, and in the **Constraint:** box, type or click cell **G13.**

   d. Click **OK** to add all three constraints to the Solver Parameters dialog box as shown in Figure 4.3.9.

FIGURE 4.3.8

By Changing Cells Values in
Solver Parameters Dialog
Box

11. Click **Solve** to calculate the result.

12. Solver displays a dialog box describing the results of the analysis. If Solver runs into a problem, an error message will be displayed. If Solver finds a solution, a Solver Results dialog box will appear.

13. To display the new solution in the worksheet, click the **Keep Solver Solution** option button in the Solver Results dialog box, and then click **OK.** Solver places an optimum value in the target cell and fills the variable cells with the solutions that satisfy the constraints specified and provide the optimal result, as shown in Figure 4.3.10.

EDITING A SOLVER FORECAST

The Solver tool is very useful in modifying the constraints to evaluate new goals and possibilities. For example, if a coffee shop wants to earn exactly $800 per week from coffee drinks, use Solver to "solve" for the optimum combination of drinks. Setting a target value in Solver is a little like using the Goal Seek command to determine a value for an unknown variable, although Solver can use more than one variable.

To edit the Solver forecast to find the variables to reach a specific goal:

1. Select the **Data** tab then select **Solver.** The Solver Parameters dialog box appears, still displaying the variables and constraints of the last Solver problem. These will be adjusted to compute a new forecasting goal.

2. Click the **Value of:** option button and type **800** in the box to the right. The Value of: option button sets the target cell to a particular goal to determine the variable mix needed to reach the milestone. The dialog box should look similar to Figure 4.3.11.

3. Click **Solve** to find a solution to the problem. When Solver has finished, click **OK** to display the new solution.

4. Figure 4.3.12 shows the new solution that Solver generates. (**Note:** The results presented in Figure 4.3.12 are one possible solution that Solver may return.)
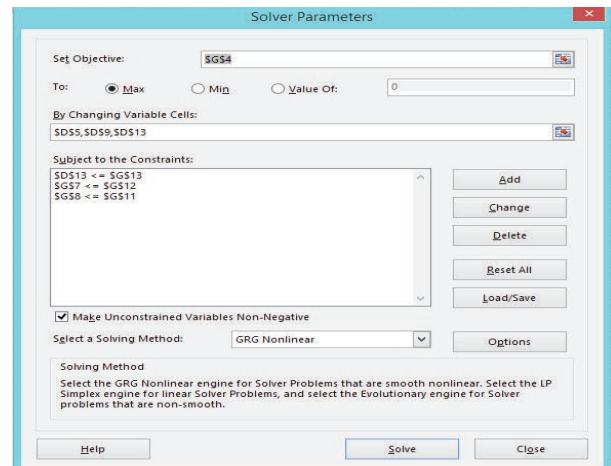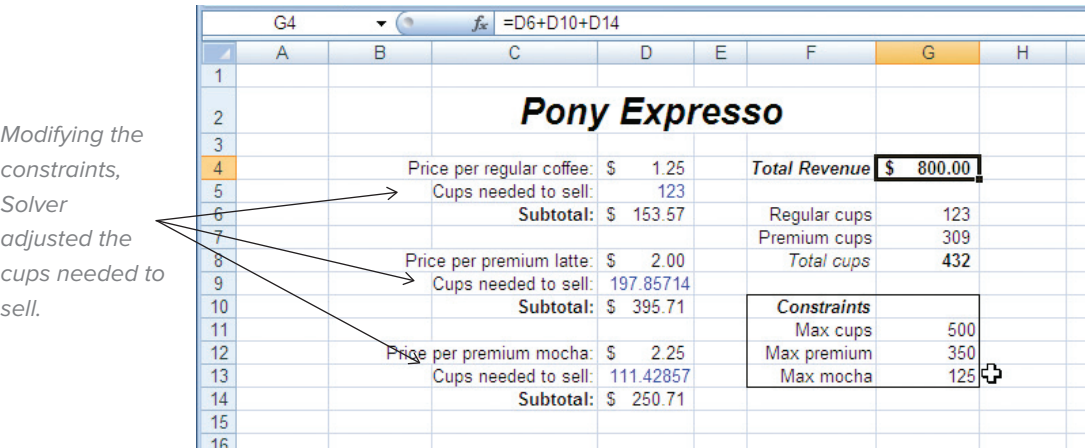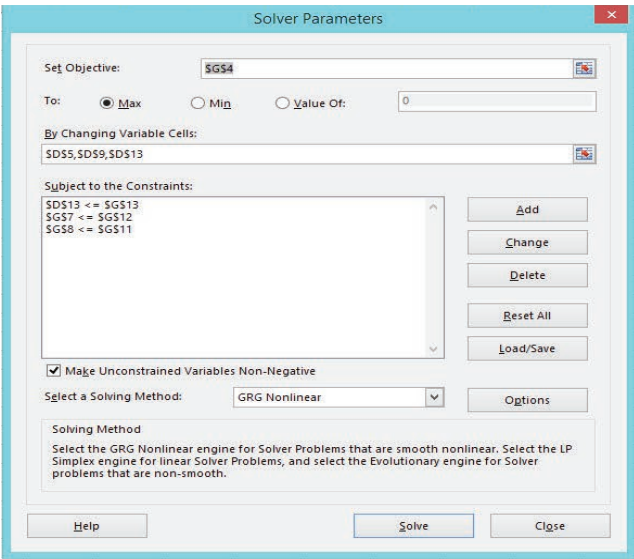

FIGURE 4.3.9

Solver Parameters with Constraints

FIGURE 4.3.10

Optimum Revenue for Solver Results

Given the constraints, Solver determined the cups needed to sell.

	A	B	C	D	E	F	G	H	I
G4			fx	=D6+D10+D14					
1									
2									
3									
4			Price per regular coffee:	$ 1.25		Total Revenue	$ 918.75		
5			Cups needed to sell:	150					
6			Subtotal:	$ 187.50		Regular cups	150		
7						Premium cups	350		
8			Price per premium latte:	$ 2.00		Total cups	500		
9			Cups needed to sell:	225					
10			Subtotal:	$ 450.00		Constraints			
11						Max cups	500		
12			Price per premium mocha:	$ 2.25		Max premium	350		
13			Cups needed to sell:	125		Max mocha	125		
14			Subtotal:	$ 281.25					
15									

FIGURE 4.3.11

Editing Solver Forecast

FIGURE 4.3.12

Solver Solution

Modifying the constraints, Solver adjusted the cups needed to sell.

Scenario Manager

A *scenario* is a set of input values and corresponding results from calculations that Excel can save and report as needed. A worksheet can be used to conduct a "what-if" analysis on a particular set of data. Several input values in a worksheet might change depending on different situations or circumstances. Values that produce different results can be stored as scenarios.

Excel's *Scenario Manager* allows 32 different scenarios or groups of values to be defined. The Scenario Manager can then be used to selectively display the desired values or scenario in the worksheet. The Scenario Manager eliminates the need to have multiple copies of the same worksheet representing different situations.

SETTING UP SCENARIOS

Each group of input values or scenarios must be named and stored before it can be used. Scenarios are stored with the worksheet.
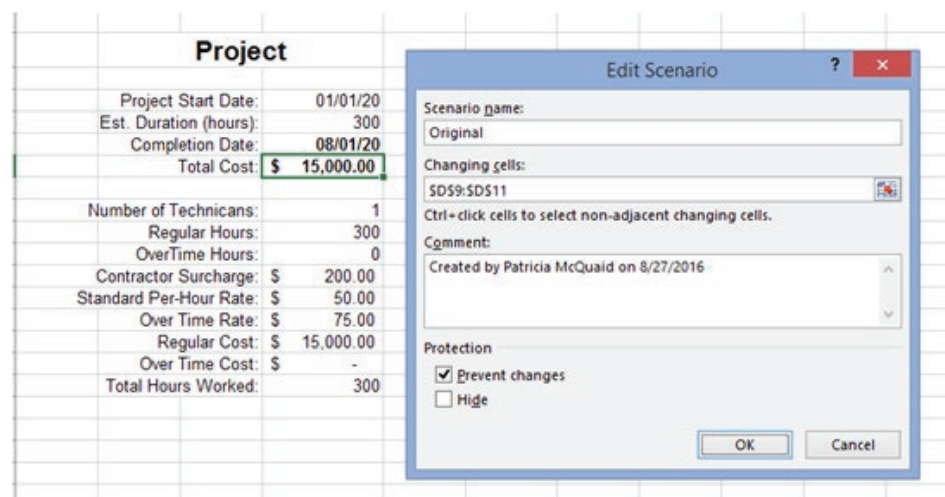
To set up a scenario:

1. Open the file **4.3_Scenario_Data.xlsx** that accompanies this text (see Figure 4.3.13).
2. Click on the **Data** tab, click the **What-If Analysis** button, and then select **Scenario Manager.**
3. Click **Add** to display the **Add Scenario** dialog box.
4. Enter **Original** in the **Scenario name:** box.
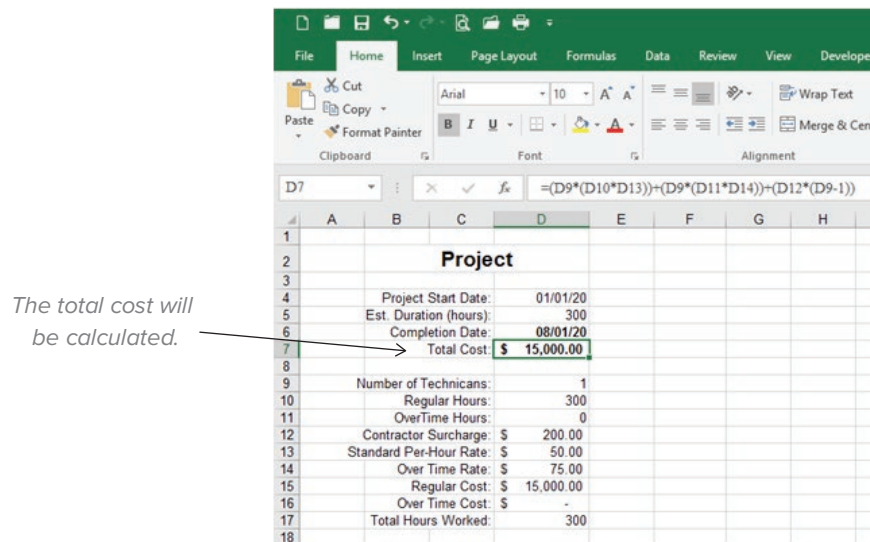
FIGURE **4.3.13**

Scenario Data Template
Example

FIGURE **4.3.14**

Scenario Values Dialog Box
Values

5. In the **Changing cells:** box, type **D9:D11** or use the **Collapse Dialog** button at the right side of the box to manually select the cells that hold the Number of **Technicians, Regular Hours,** and **OverTime Hours** values (see Figure 4.3.14).

6. Choose **OK.** The **Scenario Values** dialog box appears.

7. The Scenario Values dialog box will display the values for cells **D9, D10,** and **D11** as **1, 300,** and **0,** respectively, as shown in Figure 4.3.14. Click **OK.** You will return to the **Scenario Manager** dialog box. (The result should be $15,000.) See Figure 4.3.15.

8. Once the original values have been saved, the what-if scenarios need to be created.

9. Click Add. In the **Add Scenario** dialog box, type **Single Contractor Overtime.**

10. In the Scenario Values dialog box for cell **D11,** enter **40.** The values in cells **D9** and **D10** remain at **1** and **300,** respectively.

11. Click OK. Ensure that the **Single Contractor Overtime** scenario is selected, and click **Show.** Excel reports that this project will need an additional $3,000, as shown in Figure 4.3.16. (The result should be $18,000.)

FIGURE **4.3.15**

Scenario Values to Input
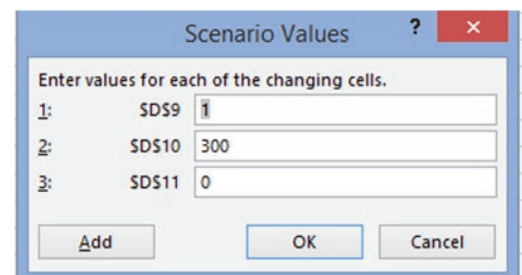
FIGURE 4.3.16

Single Contractor Overtime
Scenario
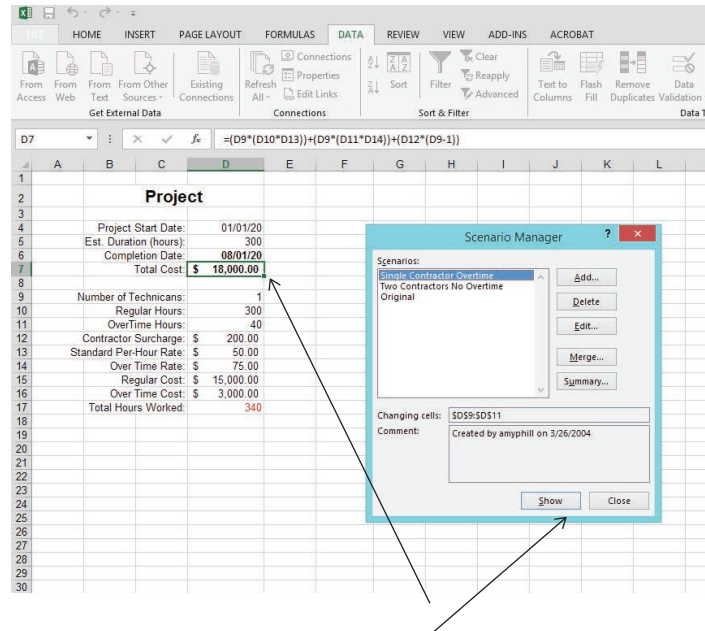
Click Show to see the different scenario.

12. Create one more scenario. In the **Scenario Manager** dialog box, click **Add** again.

13. The **Add Scenario** dialog box appears. In the **Scenario name:** box type **Two Contractors No Overtime.**

14. The **Changing cells: (D9:D11)** should already appear in the proper boxes; if not, enter that range. Click **OK** to invoke the **Scenario Values** dialog box.

15. Two outside contractors are brought in (by charging $200 for each additional technician). Enter **2** in the box for cell **D9** and **0** in the box for cell **D11.** In cell **D10's** box, type **=300/2** since there will be two technicians to split the time. Click **OK.**

16. Click **OK** to dismiss the message, and Excel returns you to the **Scenario Manager** dialog box.

17. Select **Two Contractors No Overtime,** and then click **Show.** Excel displays **150** in cell **D10** even though the total hours are 300. This scenario gives a completion cost of $15,200.

Compare the Scenarios

Compare each scenario to determine the best solution, such as:

Scenario	Cost
Original	$15,000
Single Contractor Overtime	$18,000
Two Contractors No Overtime	$15,200

MODIFYING A SCENARIO

Once scenarios have been defined, the data values in the scenarios can be modified, as needed. To modify a scenario:

1. Click on the **Data** tab, click the **What-If Analysis** button, and then select **Scenario Manager.**

2. Select the desired scenario name.

3. Click the **Edit** button.

4. Modify the scenario information as desired.

5. Close the Scenario Manager dialog box.

CREATING A SCENARIO SUMMARY REPORT

Included in the Scenario Manager is a feature called the *Summary Report* that creates a report that summarizes the result cells that are affected by a scenario. The Summary Report appears in the form of a summary table that is placed on a new worksheet, which can be printed.

To create a Scenario Summary Report:

1. Click on the **Data** tab, click the **What-If Analysis** button, and then select **Scenario Manager.**

2. Click the **Summary . . .** button. The **Scenario Summary** dialog box appears.

3. Choose **Scenario summary** in the **Report type** group box.

4. In the **Result cells:** box, type in **D7, D12, D15, D16, D17.** Result cells are the cells affected by the specified scenario.

5. Choose **OK.**

6. Excel produces a Scenario Summary Report, as shown in Figure 4.3.17.

All three constraints you defined are represented here.

Depends on the last values you ran

FIGURE 4.3.17

Scenario Summary Report

Technology can and does play a vitally important role in both supporting decision making and, in some instances, actually making decisions or recommendations. Microsoft Excel spreadsheet software has an integrated set of tools combining analytical methods that can be applied to different problems.

The If function, Goal Seek, Solver, and Scenario Manager analysis tools have the capability to identify patterns, trends, and rules and to create "what-if" analyses.

✳ **MAKING BUSINESS DECISIONS**

1. Spotlight Video Rentals

Spotlight Video is a company which uses automated retail kiosks to rent the latest selections of DVDs, and Blu-ray. After they have been viewed a certain number of times, their quality deteriorates to the point that Spotlight Video considers them to be defective. Furthermore, some customers own media players that are defective and can ruin Spotlight Video's merchandise.

Spotlight Video wants to maintain an inventory of DVDs and Blu-ray media that are at least 85 percent acceptable, although 95 percent is preferable. However, since it can't keep customers' machines from damaging the rentals, Spotlight Video has had to relax its criterion a little. You have been hired to create a spreadsheet that will evaluate each rental, based on the following criteria:

Number of times each title has been rented.

Number of defects that have been reported.

The percent acceptable must be above 85 percent based on usage. If the percentage

reported is below 85 percent, then Spotlight Video wants to flag this video as "REPLACE."

Spotlight Video has provided you with the data file 4.3_SpotlightVideo_Data.xlsx

You will want to create an IF function to write a conditional expression that examines the criteria mentioned above. Figure 4.3.18 displays a sample of the output that Spotlight Video needs.

2. Scheduling Solver

AirPlains Airline is a new airline company that maintains a schedule of two daily flights each way between Salt Lake City, Denver, and Chicago. AirPlains Airline must strategically position itself as a low-cost provider in a volatile industry. Therefore, it must work toward finding a minimum cost for assigning flight crews to a given flight schedule while satisfying restrictions dictated by the Federal Aviation Administration.

Using Excel Solver, determine all the possible crew rotations based on the flight schedule below. You will want to find an approximate expected cost of each combination and then solve the original crew scheduling problem by using these costs. Second, you will want to calculate the crew constraints to determine the decision variables, constraints, and objectives.

FIGURE 4.3.18

Spotlight Video
Report Sample

The spreadsheet shows a Spotlight Video Defect Report:

	ID	MOVIE TITLE	# OF RENTALS	# OF DEFECTS	STATUS
5	1	Walk the Line (2005)	114	5	
6	2	Yours, Mine and Ours (2005)	53	5	
7	3	The Weather Man (2005)	112	54	
8	4	North Country (2005)	23	12	
9	5	Domino (2005)	100	12	
10	6	Saw II (2005)	44	19	
11	7	Rent (2005)	53	12	
12	8	Just Like Heaven (2005)	42	26	
13	9	Elizabethtown (2005)	92	26	
14	10	Zathura: A Space Adventure (2005)	20	19	REPLACE
15	11	Flightplan (2005)	44	40	REPLACE
16	12	Waiting... (2005/I)	88	26	
17	13	In Her Shoes (2005)	34	33	REPLACE
18	14	Corpse Bride (2005)	99	33	
19	15	The Legend of Zorro (2005)	62	33	
20	16	Proof (2005)	24	19	
21	17	Lord of War (2005)	50	47	REPLACE
22	18	The Ice Harvest (2005)	9	5	
23	19	Pride & Prejudice (2005)	34	5	
24	20	Transporter 2 (2005)	74	54	
25	21	Red Eye (2005/I)	55	54	REPLACE
26	22	Wallace & Gromit in The Curse of the Were-Ra	29	26	REPLACE
27	23	Doom (2005)	78	26	
28	24	Wedding Crashers (2005)	66	61	REPLACE
29	25	The Man (2005)	51	47	REPLACE

The AirPlains Airline flight schedule is as follows:

From	To	Departure	Arrival
Salt Lake City	Denver	9:00 AM	12:00 PM
Salt Lake City	Denver	2:00 PM	5:00 PM
Salt Lake City	Chicago	10:00 AM	2:00 PM
Salt Lake City	Chicago	3:00 PM	7:00 PM
Denver	Salt Lake City	8:00 AM	11:00 AM
Denver	Salt Lake City	2:00 PM	5:00 PM
Denver	Chicago	9:00 AM	11:00 AM
Denver	Chicago	3:00 PM	5:00 PM
Chicago	Salt Lake City	8:00 AM	12:00 PM
Chicago	Salt Lake City	2:00 PM	6:00 PM
Chicago	Denver	10:00 AM	12:00 PM
Chicago	Denver	4:00 PM	6:00 PM

Apply the following business rules (constraints) to your model:

1. A crew that leaves a city in the morning has to return to the same city at night.

2. The crew can return on another airplane. There are six airplanes in use.

3. When a crew is flying, the cost is $200 per hour.

4. When a crew is waiting or returning, the cost is $75 per hour.

3. DVD Sales

Hans Hultgren, the sales manager for DVD Sales, wants to maximize his profit on the sale of portable DVD players. He already has two portable models he plans to sell:

Products	Retail Price	Wholesale Cost
Panasonic DVD–LS50	$349.95	$192.47
Mintek MDP–1810	$199.95	$109.99

Hans needs your help in calculating his maximum profit. First, he would like you to use the web to locate the retail price of two other portable DVD players not listed in the table above. The wholesale price of each unit is 55 percent of the retail price for both units you find. Hans has two constraints:

1. Hans has $200,000 to purchase new DVD players. The total wholesale cost of the four types of DVD units must be less than $200,000.

2. Hans must purchase a minimum of 100 units of each player from his wholesaler.

You want to use Excel Solver to maximize the total profit for Hans with the constraints mentioned above and limiting the number of units to positive integers.

4. Maximizing Profit

HotSprings Spas manufactures and sells two spa models: the Steamboat and the Classic. HotSprings Spas receives spa bodies from another manufacturer and then adds a pump and tubing to circulate the water. The Steamboat model demands 15.5 hours of labor and 14.5 feet of tubing. The Classic model requires 10.5 hours of labor and uses 20 feet of tubing. Based on selling patterns, the owner, Deborah Liebson, has determined that the Steamboat model generates a profit of $400 per unit, and each Classic model generates $345 profit. Although Deborah would like a large labor capacity and sufficient tubing and motors to build any number of spas, her resources are limited. For the next production period, Deborah has 2,650 labor hours, 3,450 feet of tubing, and 231 pumps available. Deborah needs assistance in figuring out how many Steamboat and Classic models to build in order to maximize her profit. Given the constraints above, use Solver to assist Deborah in her what-if analysis.

Deborah has provided you with a screen shot of a template you can use to get started (see Figure 4.3.19).

FIGURE 4.3.19

HotSprings Spa Template

5. Budget Constraints

Joanne Krol wants to purchase a newer model automobile to replace her rusty 1989 car. The bank where Joanne has a checking account, US Bank, is advertising an annual interest rate of 6.75 percent for a three-year loan on used cars. By selling her old car and using some cash she has accumulated, Joanne has $3,000 available as a down payment. Under her current budget, Joanne figures that the maximum monthly loan payment she can afford is $300. She wants to find out the maximum car price she can afford and keep the monthly payment no higher than $300. She cannot alter the interest rate or the three-year term. Use the Excel Goal Seek command to figure out the highest purchase price Joanne can afford.