

## important

### Feel free to skip this lesson

Most of the business people that take my courses have no use for Solver.

The tiny percentage that do often get wildly excited about the potential of this tool.

Because Solver is really an external tool (installed as an add-in) rather than a core part of Excel, this book doesn't explore some of the more exotic features of this remarkable tool.

There are a huge number of tutorials covering some extremely advanced uses of Solver at:

<http://www.solver.com>

You'll find all you could ever want to know about Solver there.

# Lesson 7-6: Use Solver

## What is Solver?

Conceptually, Solver is similar to Goal Seek. While Goal Seek can only change one input cell to set a value in one result cell, Solver can change any number of input cells. This makes the tool a lot more complex.

You can also define a set of rules (called constraints) that Solver needs to observe when finding a solution.

### 1 Open *Bicycle Manufacturing Schedule-1* from your sample files folder.

This worksheet models a bicycle manufacturing company. The company manufactures four different types of bicycle but has a limited number of parts available.

- Cells B4:E4 are the input cells (or changing cells) for the worksheet. They define how many bicycles of each model will be manufactured.
- The parts needed to manufacture each type of bicycle are shown in cells B7:E11. For example, a *Street Bike* needs 2 wheels, 1 steel chassis and 1 set of derailleur gears.
- Column I shows how many parts are available.
- Cells B14:F14 show the profit for each bicycle type along with the total profit for all bicycle types.

	A	B	C	D	E	F	G	H	I
3		Mountain Bike	Street Bike	Racing Bike	Commuter Bike				
4	Qty To Manufacture	20	20	20	20				
5							Constraints		
6	Parts List						Parts needed	Operator	Parts Available
7	Wheels	2	2	2	2		160	<=	180
8	Alloy Chassis	1		1			40	<=	40
9	Steel Chassis		1		1		40	<=	60
10	Hub Gears	1			1		40	<=	50
11	Derailleur Gears		1	1			40	<=	40
12									
13	Profit Analysis					Total Profit			
14		\$ 45	\$ 60	\$ 55	\$ 50	\$ 4,200			

Your challenge is to maximize profit by manufacturing the optimum number of each type of bicycle.

### 2 Install the Solver add-in (if it is not already installed).

1. Click: File→Options→Add-ins→ Solver Add-In.
2. Click the GO button.
3. Check the *Solver Add-in* check box and click the OK button.

**Bicycle Manufacturing Schedule-1**

## note

### The SUMPRODUCT function

This worksheet uses the SUMPRODUCT function to calculate the *Parts Needed* in column G and the *Total Profit* in cell F14.

SUMPRODUCT is an array function. Array functions accept ranges as arguments and then perform calculations using each value in the range.

In cell G7 you will find the function:

**= SUMPRODUCT(\$B\$4:\$E\$4,  
B7:E7)**

This will perform the calculation:

**B4\*B7+C4\*C7+D4\*D7+E4\*E7**

## trivia

### Solver wasn't developed by Microsoft

Solver is a product developed by Frontline Systems who have now distributed over 500 million copies of their product to users. That's a lot of software!

As well as Excel's Solver, Frontline also developed the solvers included in Lotus 1-2-3 and Quattro Pro.

Every copy of Excel sold since 1990 has included Frontline's Solver.

Frontline also produce a more advanced version of Solver (available at extra cost) called *Premium Solver*. There's also a *Risk Solver* product that enables Excel to model Monte Carlo simulations.

Solver now appears on the Ribbon's *Data* tab in a new *Analysis* group.

### 3 Open Solver.

Click: Data → Analysis → Solver.

Solver appears.

### 4 Let Solver know which are the *Changing* (Input) cells and which is the *Objective* (Result) cell.

Complete the dialog as follows:

You are telling Solver to maximize the profit (shown in cell F14) by changing the *Input Cells* (or *Changing Cells*) B4:E4.

### 5 Define the constraints for the problem.

1. Click the *Add* button next to the *Subject to the Constraints* list box.
2. Complete the dialog as follows:

This tells Solver that it cannot manufacture a negative number of bicycles.

3. Click *Add*.
4. Set up a second constraint as follows:

This tells Solver that it cannot use more parts than are available.

5. Click *OK*.

### 6 Solve the problem.

1. Click the *Solve* button.
2. Click the *OK* button.

Solver has solved the problem.

	A	B	C	D	E
3		Mountain Bike	Street Bike	Racing Bike	Commuter Bike
4	Qty To Manufacture	25	35	5	25

This mix of bicycles maximizes profits to \$4,750.

### 7 Save your work as *Bicycle Manufacturing Schedule-2*.