Define and solve a problem by using Solver

Solver is part of a suite of commands sometimes called what-if analysis tools. With Solver, you can find an optimal (maximum or minimum) value for a formula in one cell — called the objective cell — subject to constraints, or limits, on the values of other formula cells on a worksheet. Solver works with a group of cells, called decision variables or simply variable cells, that participate in computing the formulas in the objective and constraint cells. Solver adjusts the values in the decision variable cells to satisfy the limits on constraint cells and produce the result you want for the objective cell.

Note Earlier versions of Solver referred to the objective cell as the "target cell," and the decision variable cells as "changing cells" or "adjustable cells."

In this article

- Overview
- Define and solve a problem
- Step through Solver trial solutions
- Change how Solver finds solutions
- Save or load a problem model
- Solving methods used by Solver
- More help on using Solver

Overview

Use Solver to determine the maximum or minimum value of one cell by changing other cells. For example, you can change the amount of your projected advertising budget and see the effect on your projected profit amount.

Example of a Solver evaluation

In the following example, the level of advertising in each quarter affects the number of units sold, indirectly determining the amount of sales revenue, the associated expenses, and the profit. Solver can change the quarterly budgets for advertising (decision variable cells B5:C5), up to a total budget constraint of $20,000 (cell F5), until the total profit (objective cell F7) reaches the maximum possible amount. The values in the variable cells are used to calculate the profit for each quarter, so they are related to the formula objective cell F7, =SUM(Q1 Profit:Q2 Profit).
Define and solve a problem

1. On the Data tab, in the Analysis group, click Solver.

If the Solver command or the Analysis group is not available, you need to load the Solver Add-in program.

2. In the Set Objective box, enter a cell reference or name for the objective cell. The objective cell must contain a formula.

3. Do one of the following:

   - If you want the value of the objective cell to be as large as possible, click Max.
   - If you want the value of the objective cell to be as small as possible, click Min.
   - If you want the objective cell to be a certain value, click Value of, and then type the value in the box.

1. In the By Changing Variable Cells box, enter a name or reference for each decision variable cell range. Separate the nonadjacent references with commas. The variable cells
must be related directly or indirectly to the objective cell. You can specify up to 200 variable cells.

2. In the **Subject to the Constraints** box, enter any constraints that you want to apply by doing the following:

1. In the **Solver Parameters** dialog box, click **Add**.
2. In the **Cell Reference** box, enter the cell reference or name of the cell range for which you want to constrain the value.
3. Click the relationship (\(\leq\), \(=\), \(\geq\), **int**, **bin**, or **dif**) that you want between the referenced cell and the constraint.

If you click **int**, **integer** appears in the **Constraint** box. If you click **bin**, **binary** appears in the **Constraint** box. If you click **dif**, **alldifferent** appears in the **Constraint** box.

4. If you choose \(\leq\), \(=\), or \(\geq\) for the relationship in the **Constraint** box, type a number, a cell reference or name, or a formula.
5. Do one of the following:
   - To accept the constraint and add another, click **Add**.
   - To accept the constraint and return to the **Solver Parameters** dialog box, click **OK**.

**Note** You can apply the **int**, **bin**, and **dif** relationships only in constraints on decision variable cells.

You can change or delete an existing constraint by doing the following:

1. In the **Solver Parameters** dialog box, click the constraint that you want to change or delete.
2. Click **Change** and then make your changes, or click **Delete**.

1. Click **Solve** and do one of the following:

   - To keep the solution values on the worksheet, in the **Solver Results** dialog box, click **Keep Solver Solution**.
   - To restore the original values before you clicked **Solve**, click **Restore Original Values**.

**Notes**

- You can interrupt the solution process by pressing ESC. Microsoft Excel recalculates the worksheet with the last values that are found for the decision variable cells.
- To create a report that is based on your solution after Solver finds a solution, you can click a report type in the **Reports** box and then click **OK**. The report is created on a new worksheet in your workbook. If Solver doesn’t find a solution, only certain reports or no reports are available.
To save your decision variable cell values as a scenario that you can display later, click **Save Scenario** in the **Solver Results** dialog box, and then type a name for the scenario in the **Scenario Name** box.