Calc

LibreOffice

DATA PROCESSING USING ADVANCED TOOLS

Learning Contents

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Data Filtering

Filtering

A filter is a list of conditions that each entry has to meet to be displayed. Calc provides three types of filter:

Standard – specifies the logical conditions to filter your data.

AutoFilter – filters data according to a specific value or string. Automatically filters the selected cell range and creates one-row list boxes where you can choose the items that you want to display.

Advanced – uses filter criteria from specified cells.

Applying a standard filter

A standard filter is more complex than AutoFilter. You can set as many as eight conditions as a filter, combining them with the operators *AND* or *OR.* Standard filters are mostly useful for numbers, although a few of the conditional operators can also be used for text.

Select a cell range in your spreadsheet.

Go to **Data > Filter > Standard Filter** on the menu bar to open the Standard Filter dialog (Figure 52).

Specify the filter criteria and filtering options that you want to use.

Click **OK** to carry out standard filtering and close the dialog. Any records that match the filter criteria and options that you specified are shown.

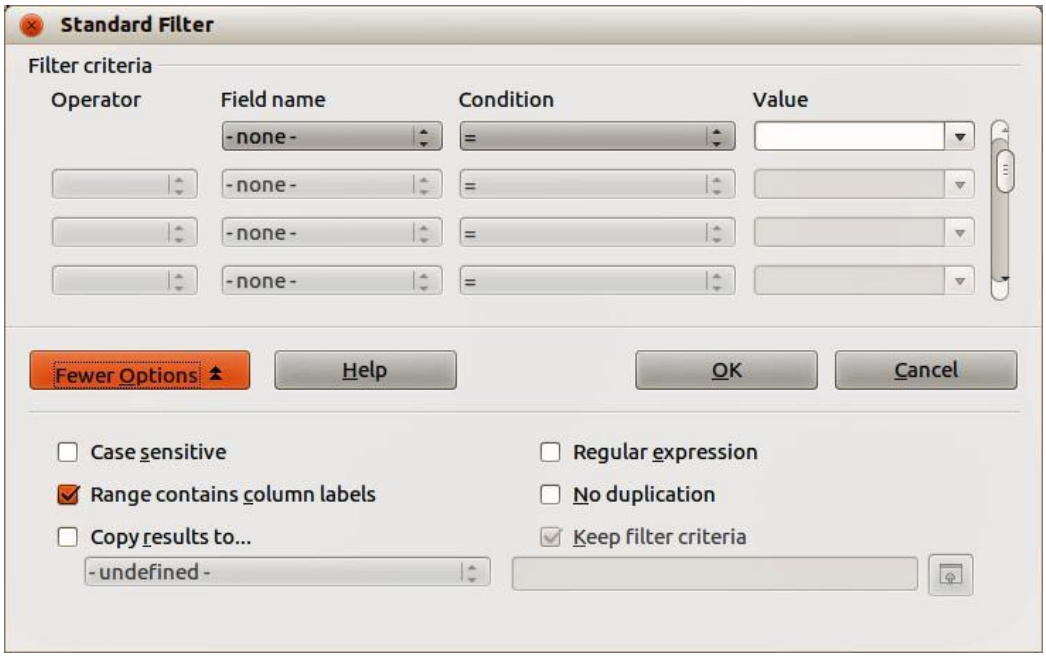


Figure 52: Standard Filter dialog

The filter criteria used in standard filtering defines a filter by indicating the type of line, the name of the field, a logical condition and a value or a combination of arguments.

Operator – for the following arguments, you can choose between the logical operators AND / OR.

Field name – specifies the field names from the current table to set them in the argument. You will see the column identifiers if no text is available for the field names.

Condition – specifies the comparative operators through which the entries in the **Field name** and **Value** fields can be linked.

Value – specifies a value to filter the field. The **Value** list box contains all possible values for the specified **Field name**. Select a value to be used in the filter, including *Empty* and *Not Empty* entries.

Case sensitive – distinguishes between uppercase and lowercase letters when filtering the data.

Range contains column labels – includes the column labels in the first row of a cell range.

Copy results to – select the check box and then select the cell range where you want to display the filter results. You can also select a named range from the list.

Regular expression – select to use wildcards in the filter definition. See LibreOffice Help for a list of the regular expressions that LibreOffice supports. If selected, you can use regular expressions in the **Value** field if the **Condition** list box is set to '=' EQUAL or '<>' UNEQUAL. This also applies to the respective cells that you reference for an advanced filter.

No duplication – excludes duplicate rows from the list of filtered data.

Keep filter criteria – select **Copy results to** and then specify the destination range where you want to display the filtered data. If this box is checked, the destination range remains linked to the source range. You must have defined the source range under **Data > Define range** as a database range. You can also reapply the defined filter at any time by clicking into the source range and then go to **Data > Refresh Range**.

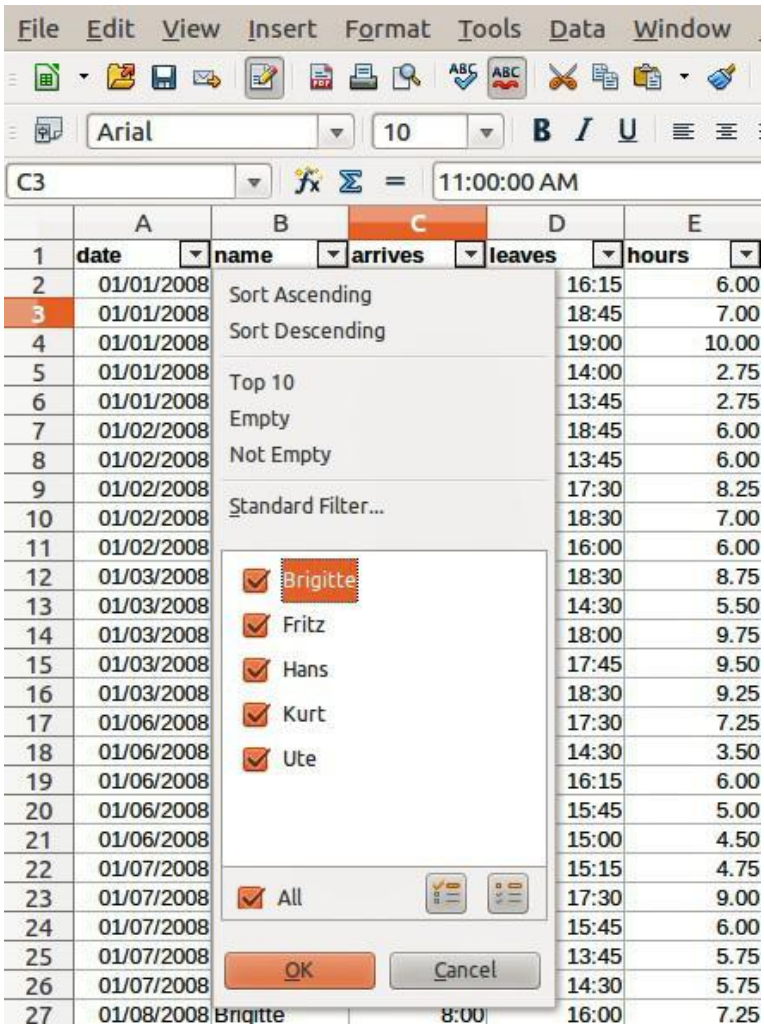


Figure 53: AutoFilter example

Applying an AutoFilter

An AutoFilter adds a drop-down list to the top row of one or more data columns which lets you select the rows to be displayed. The list includes every unique entry in the selected cells sorted into lexical order (see http://sheepsystems.com/bookdog/HelpBook/LexicalOrder.html for an

explanation of lexical order). AutoFilter can be used on multiple sheets without first defining a database range.

Click in a cell range on your spreadsheet. If you want to apply multiple AutoFilters to the same sheet, you must first define database ranges, then apply the AutoFilters to the database ranges.
Go to **Data > Filter > AutoFilter** on the menu bar. An arrow button is added to the head of each column in the database range.
Click the arrow or small triangle in the column that contains the value or string that you want to set as the filter criteria (shown in Figure 53).
Select the value or string that you want to use as the filter criteria. The records that match the filter criteria that you selected are then shown.

Applying an advanced filter

An advanced filter has a structure similar to a standard filter. The difference is that the Advanced Filter arguments are not entered in a dialog. Instead, filters can be entered in a blank area of a spreadsheet, then referenced by the filter dialog to apply the filters.

Select a cell range in your spreadsheet.
Go to **Data > Filter > Advanced Filter** on the menu bar to open the Advanced Filter dialog (Figure 54).
In *Read filter criteria from*, select the named range, or enter the cell range that contains the filter criteria that you want to use
Click **OK** to carry out advanced filtering and close the dialog. Any records that match the filter criteria and options that you specified are shown.

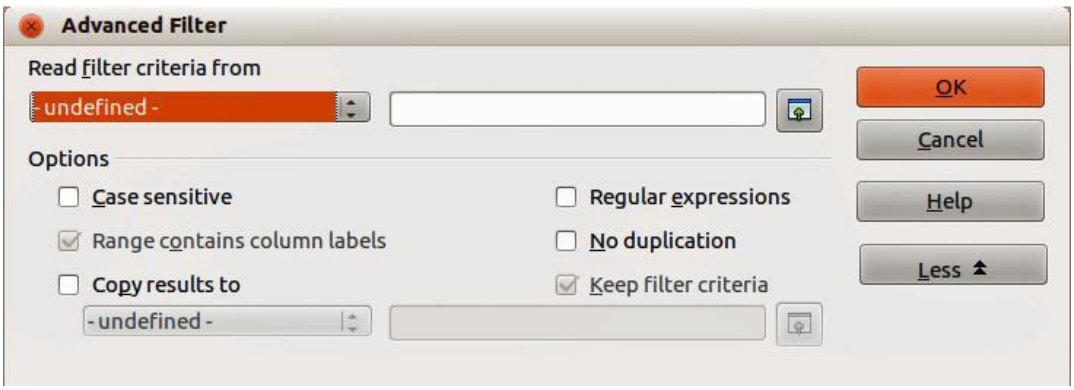


Figure 54: Advanced Filter dialog

Note	The options for advanced filtering are the same as those used for standard filtering, see “Applying a standard filter” on page 73 for more information.

Caution

When a cell is moved during a sort operation, external references to that cell are not updated. If a cell that contains a relative reference to another cell is moved, the reference is relative to the new position when sorting is finished. Know the behavior of references during sorting and do not be alarmed; this is almost always what you want—because the reference is to the right or left in the same row. Also, we have not found a spreadsheet program that exhibits a different behavior for references while sorting.

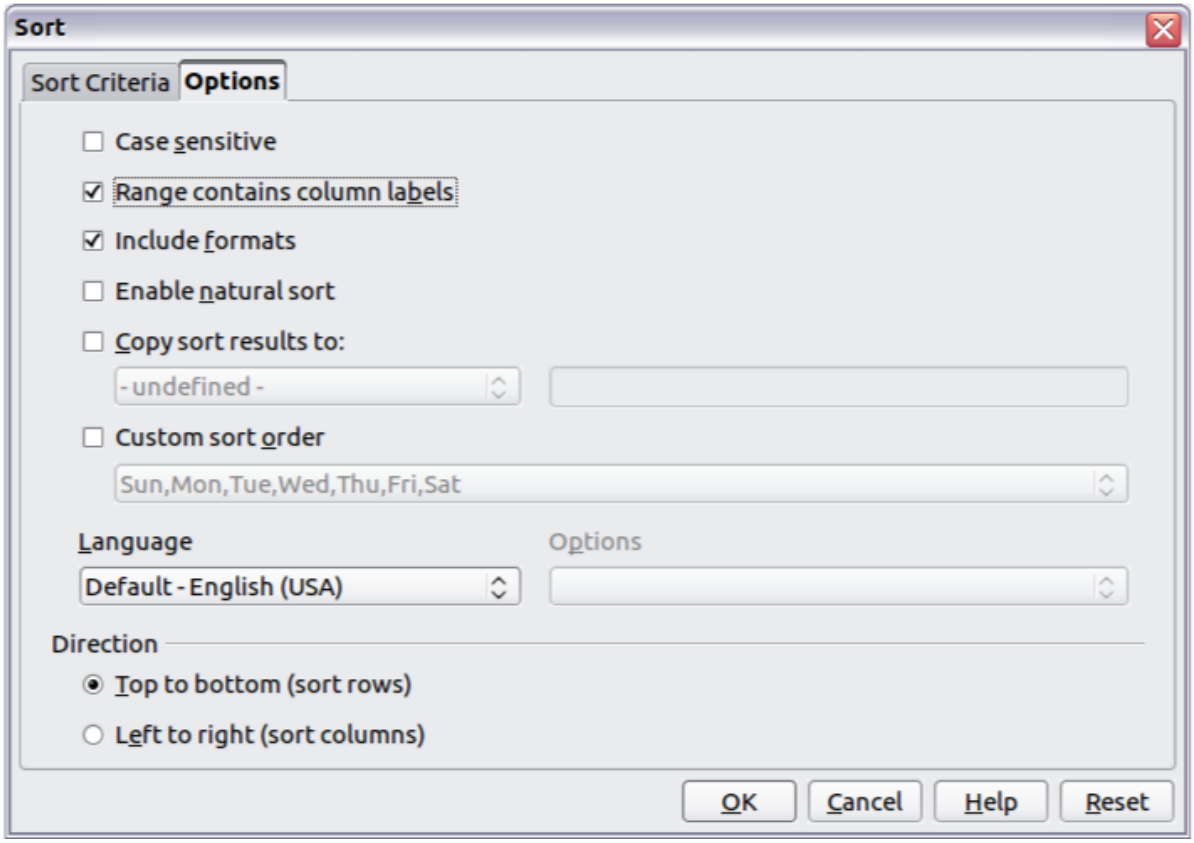


Figure 306: Set sort options

Filters

Use filters to limit the visible rows in a spreadsheet. Generic filters, common to all sorts of data manipulations, are automatically provided by the auto filter capability. You can also define your own filters.

Caution

After applying a filter, some rows are visible and some rows are not. If you select multiple rows in one operation, you will also select the invisible rows contained between the selected visible rows. Operations, such as delete, act on all of the selected rows. To avoid this problem, you must individually select each of the filtered rows using the control key.

Data Sorting

Sorting records

Sorting within Calc arranges the cells in a sheet using the sort criteria that you specify. Several criteria can be used and a sort applies each criteria consecutively. Sorts are useful when you are searching for a particular item and become even more useful after you have filtered data.

Also, sorting is useful when you add new information to a spreadsheet. When a spreadsheet is long, it is usually easier to add new information at the bottom of the sheet, rather than adding rows in their correct place. After you have added information, you can then sort the records to update the spreadsheet.

Sort dialog

To sort cells in a spreadsheet using the Sort dialog (Figure 55):

Select the cells to be sorted.

Go to **Data > Sort** on the menu bar to open the Sort dialog. Make sure the **Sort Criteria** page is open.

Select the sort criteria from the drop-down lists. The selected lists are populated from the selected cells.

Select either ascending order (A-Z, 1-9) or descending order (Z-A, 9-1).

Click **OK** and the sort is carried out on your spreadsheet.

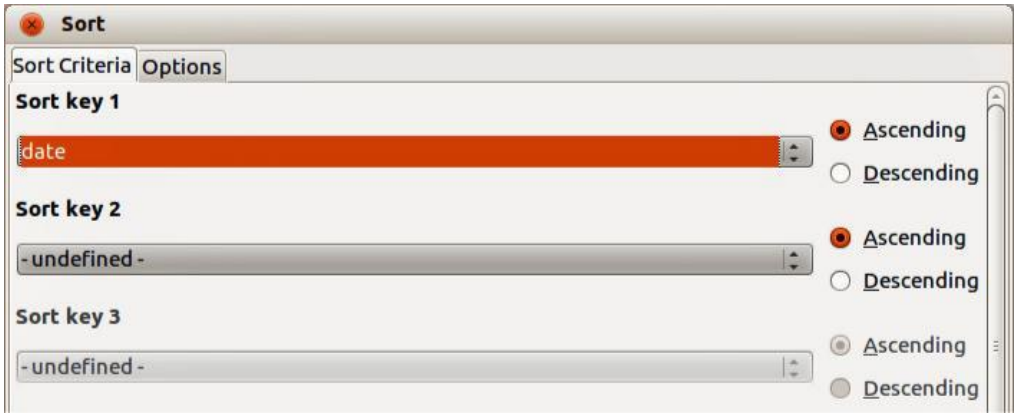


Figure 55: Sort dialog – Sort Criteria page

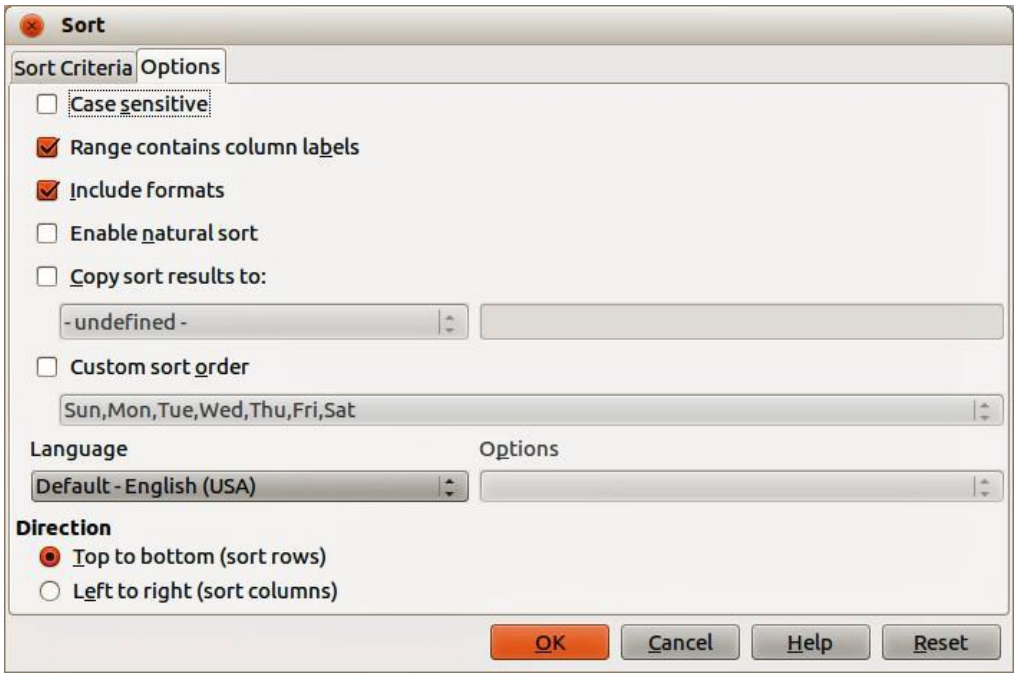


Figure 56: Sort dialog – Options page

Sort options

On the Options page of the Sort dialog (Figure 56), you can set additional options:

Case Sensitivity – sorts first by uppercase letters and then by lowercase letters. For Asian languages, special handling applies.

Note	For Asian languages, select Case Sensitivity to apply multi-level collation. With multi-level collation, entries are first compared in their primitive forms with their cases and diacritics ignored. If they evaluate as the same, their diacritics are taken into account for the second-level comparison. If they still evaluate as the same, their cases, character widths, and Japanese Kana difference are considered for the third-level comparison.

Range contains column/row labels – omits the first row or the first column in the selection from the sort. The **Direction** setting at the bottom of the dialog defines the name and function of this check box.

Include formats – preserves the current cell formatting.

Enable natural sort – natural sorting is a sort algorithm that sorts string-prefixed numbers based on the value of the numerical element in each sorted number, instead of the traditional way of sorting them as ordinary strings. For instance, assume you have a series of values such as, A1, A2, A3, A4, A5, A6, ..., A19, A20, A21. When you put these values into a range of cells and run the sort, it will become A1, A11, A12, A13, ..., A19, A2, A20, A21, A3, A4, A5, ..., A9. While this sorting behavior may make sense to those who understand the underlying sorting mechanism, to the rest of the population it seems completely bizarre, if not outright inconvenient. With natural sorting selected, values such as the ones in the above example are sorted correctly, which improves the convenience of sorting operations in general.

Copy sort results to – copies the sorted list to the cell range that you specify. Select a named cell range where you want to display the sorted list, or enter a cell range in the input box.

Custom sort order – select this option and then select the custom sort order that you want to apply. To define a custom sort order, go to **LibreOffice > Preferences > LibreOffice Calc > Sort Lists**.

Language – select the language for the sorting rules.

Options – select a sorting option for the language. For example, select the "phonebook" option for German to include the umlaut special character in the sorting.

Top to Bottom (Sort Rows) – sorts rows by the values in the active columns of the selected range.

Left to Right (Sort Columns) – sorts columns by the values in the active rows of the selected range.

Quick sort

If the columns in your spreadsheet have a header with a text format, you can use a quick sort.

Select a cell or a cell range to be sorted.

Click the **Sort Ascending** or **Sort Descending** icons on the Standard toolbar.

Find and replace

Calc has two ways to find text within a document: the Find toolbar and the Find & Replace dialog.

Figure 57: Find toolbar

Sorting

The sorting mechanism in a Calc document rearranges the data in the sheet. The first step in sorting data is to select the data that you want to sort. To sort the data in Table 9, select the cells from A1 to G16—if you include the column headers, indicate this in the sort dialog (see Figure 306). Use **Data > Sort** to open the Sort dialog (see Figure 305). You can sort by up to three columns or rows at a time.

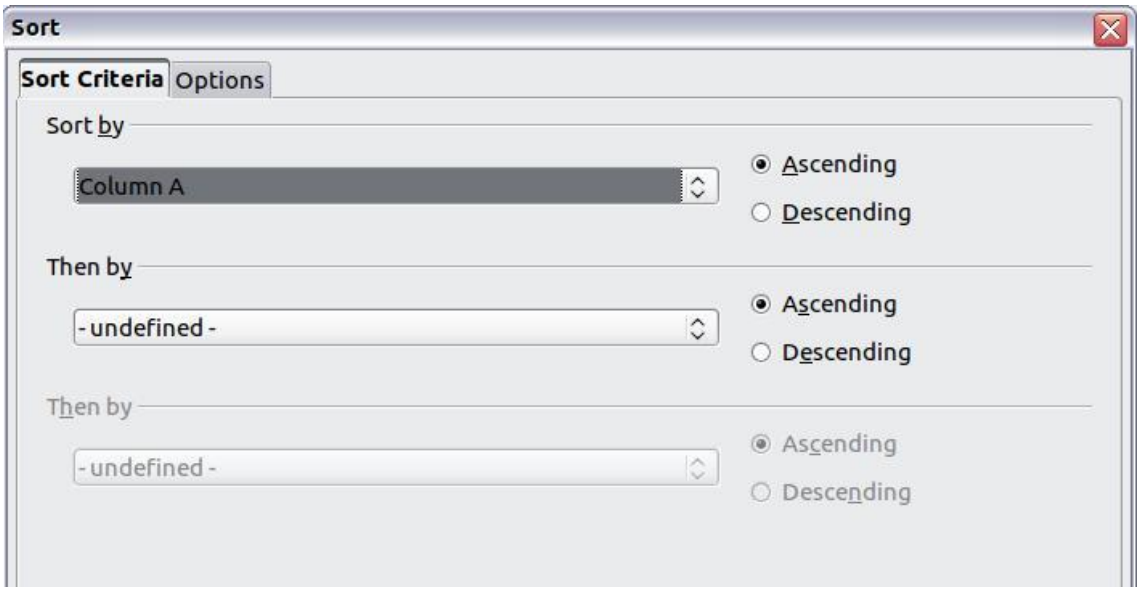


Figure 305: Sort by the Name column

Click on the Options tab (see Figure 306) to set the sort options. Check the **Range contains column labels** checkbox to prevent column headers from being sorted with the rest of the data. The Sort by list box in Figure 305 displays the columns using the column headers if the **Range contains column labels** checkbox in Figure 306 is checked. If the Range contains column labels checkbox is not checked, however, then the columns are identified by their column name; Column A, for example.

Normally, sorting the data causes the existing data to be replaced by the newly sorted data. The **Copy sort results to** checkbox, however, causes the selected data to be left unchanged and a copy of the sorted data is copied to the specified location. You can either directly enter a target address (Sheet3.A1, for example) or select a predefined range.

Check the **Custom sort order** checkbox to sort based on a predefined list of values. To set your own predefined lists, use **Tools > Options > LibreOffice Calc > Sort Lists** and then enter your own sort lists. Predefined sort lists are useful for sorting lists of data that should not be sorted alphabetically or numerically. For example, sorting days based on their name.

Pivot Table

Introduction

Many requests for spreadsheet support are the result of using complicated formulas and solutions to solve simple day-to-day problems. More efficient and effective solutions use the Pivot Table, a tool for combining, comparing, and analyzing large amounts of data easily. Using Pivot Tables, you can view different summaries of the source data, display the details of areas of interest, and create reports, whether you are a beginner or an intermediate or advanced user.

Database preconditions

The first thing needed to work with the Pivot Table is a list of raw data, similar to a database table, consisting of rows (data sets) and columns (data fields). The field names are in the first row above the list.

The data source could be an external file or database. For the simplest case, where data is contained in a Calc spreadsheet, Calc offers sorting functions that do not require the Pivot Table.

For processing data in lists, the program needs to know where in the spreadsheet the table is. The table can be anywhere in the sheet, in any position. A spreadsheet can contains several unrelated tables.

Calc recognizes your lists automatically. It uses the following logic: Starting from the cell you have selected (which must be within the list), Calc checks the surrounding cells in all 4 directions (left, right, above, below). The border is recognized if the program discovers an empty row or column, or if it hits the left or upper border of the spreadsheet.

This means that the described functions can only work correctly if there are no empty rows or columns in your list. Avoid empty lines (for example for formatting). You can format your list by using cell formats.

Rule	No empty rows or empty columns are allowed within lists.

If you select more than one single cell before you start sorting, filtering, or calling the Pivot Table, then the automatic list recognition is switched off. Calc assumes that the list matches exactly the cells you have selected.

Rule	For sorting, filtering, or using the Pivot Table, always select only *one* cell.

A relatively common source of errors is to inadvertently declare a list by mistake and then to sort that list. If you select multiple cells—for example, a whole column—then the sorting mixes up the data that should be together in one row.

In addition to these formal aspects, the logical structure of your table is also very important.

Rule	Calc lists must have the *normal form*; that is, they must have a simple linear structure.

When entering the data, do not add outlines, groups, or summaries. Here are some mistakes commonly made by inexperienced spreadsheet users:

You made several unnecessary sheets; for example, a sheet for each group of articles. In this case, analyses are then possible only within each group.

In a Sales list, instead of only one column for the amount, you made a column for the amounts for each employee. In this case, the system will have difficulty grouping data from the various columns together. Thus, an analysis with the Pivot Table would no longer be

possible. All data must be entered into the same column for the Pivot Table to be able to analyze it.

You entered the amounts in chronological order. At the end of each month, you made a sum total. In this case, sorting the list for different criteria is not possible because the Pivot Table will treat the sum totals the same as any other figure. Getting monthly results is one of the very fast and easy features of the Pivot Table.

Data sources

At this time, the possible data sources for the Pivot Table are a Calc spreadsheet or an external data source that is registered in LibreOffice.

Calc spreadsheet

Analyzing a list in a Calc spreadsheet is the simplest and most often used case. Lists might be updated regularly, or the data might be imported from a different application.

The behavior of Calc while inserting data from a different application depends on the format of the data. If the data is in a common spreadsheet format, it is copied directly into Calc. However, if the data is in plain text format, the Text Import dialog (Figure 171) appears after you select the file containing the data; see Chapter 1, Introducing Calc, for more more information about this dialog.

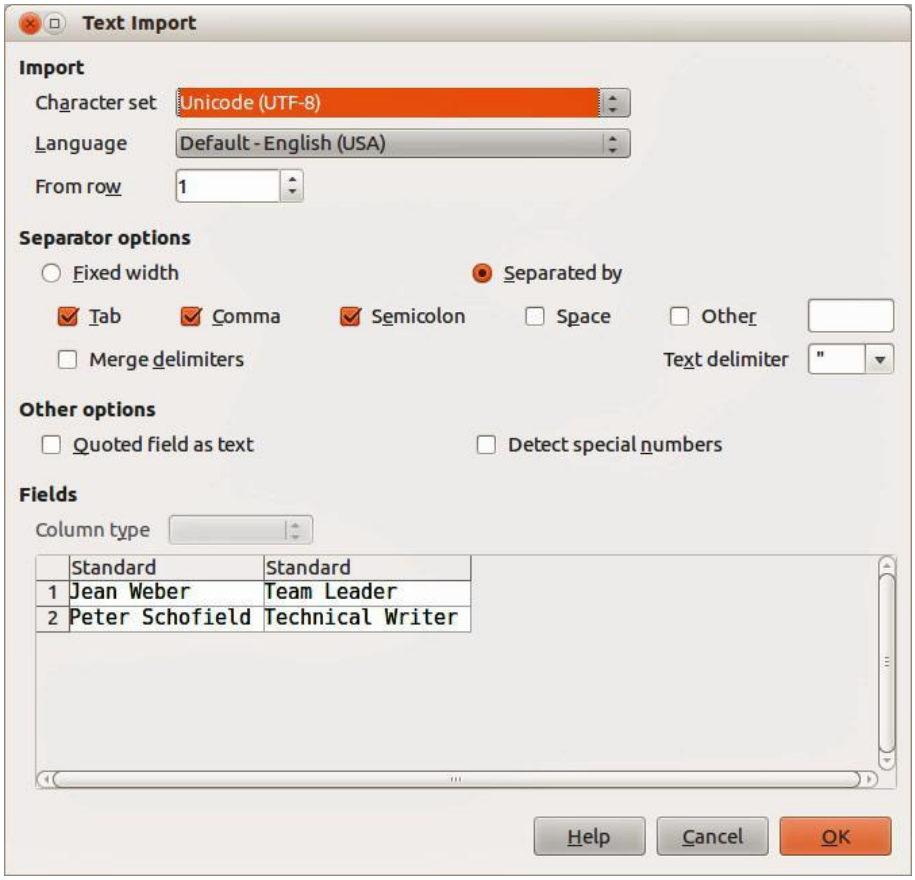


Figure 170: Text Import dialog

Calc is able to import data from a huge number of foreign data formats, such as other spreadsheets (Excel, Lotus 1, 2, 3); from databases (like dBase); and from simple text files, including CSV formats. However, in Calc, imported foreign data will not update automatically if changes are made to the source file.

In LibreOffice Calc, you can use up to 1,048,576 rows.

Registered data source

A registered data source is a connection to data held in a database outside of LibreOffice. When using a registered data source, the data to be analyzed will not be saved in Calc; Calc always uses the data from the original source. Calc is able to use many different data sources in addition to databases that are created and maintained with LibreOffice Base. For more information, see Chapter 10, Linking Calc Data.

Creating a Pivot Table

Create the Pivot Table using **Data > Pivot Table > Create** from the menu bar. If the list to be analyzed is in a spreadsheet table, select only one cell within this list. Calc recognizes and selects the list automatically for use with the Pivot Table (Figure 171).

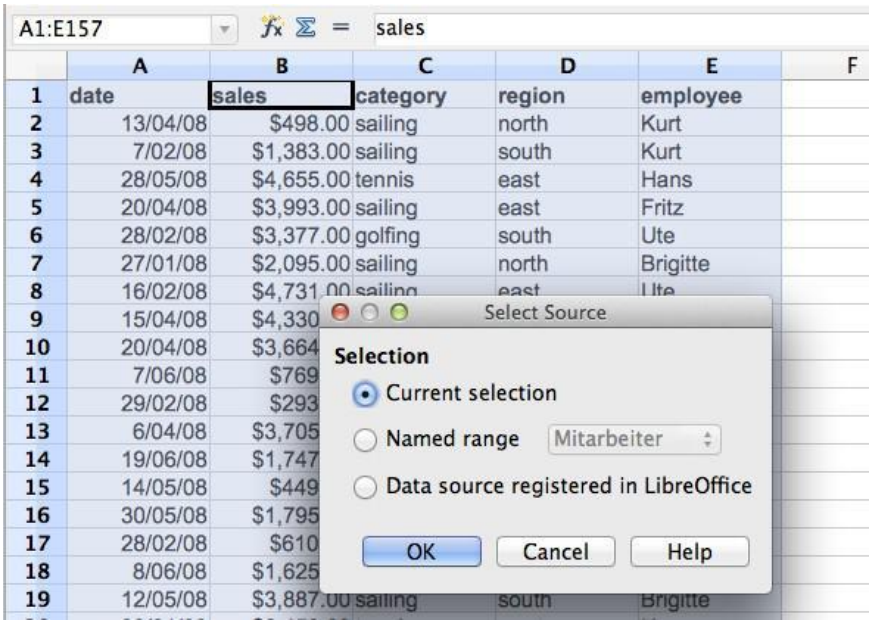


Figure 171: Selecting the source data for the Pivot Table

The Pivot Table dialog

The function of the Pivot Table is managed in two places: first, in the Pivot Table dialog, and second, through manipulations of the result in the spreadsheet. This section describes the dialog in detail.

Basic layout

In the Pivot Table dialog (Figure 172) are four white areas that show the layout of the result. Beside these white areas are buttons with the names of the fields in your data source. To choose a layout, drag and drop the field buttons into the white areas.

The *Data Fields* area in the middle must contain at least one field. Advanced users can use more than one field here. For the Data Field an aggregate function is used. For example, if you move the **sales** field into the *Data Fields* area, it appears there as **Sum – sales**.

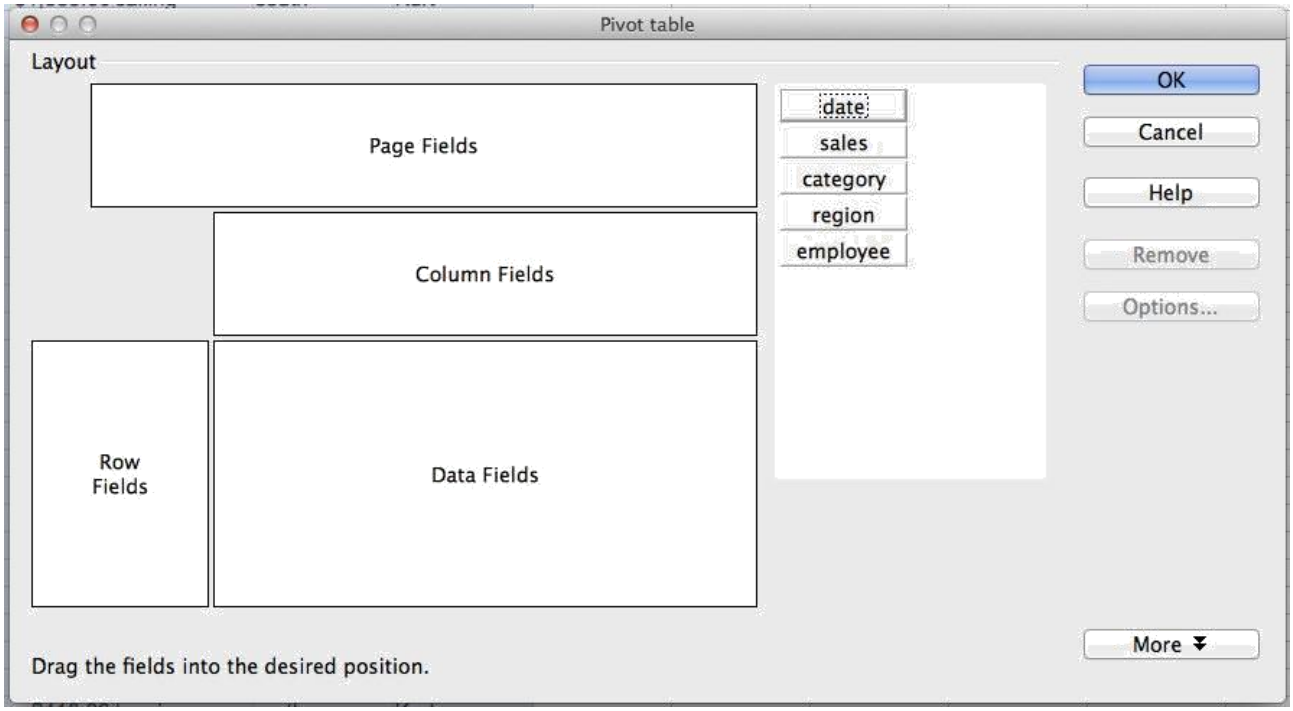


Figure 172: Pivot Table dialog

Row Fields and *Column Fields* indicate from which groups the result will be sorted. Often more than one field is used at a time to get partial sums for rows or columns. The order of the fields gives the order of the sums from overall to specific.

For example, if you drag **region** and **employee** into the *Row Fields* area, the sum will be divided into the employees. Within the employees will be the listing for the different regions (see Figure 173).

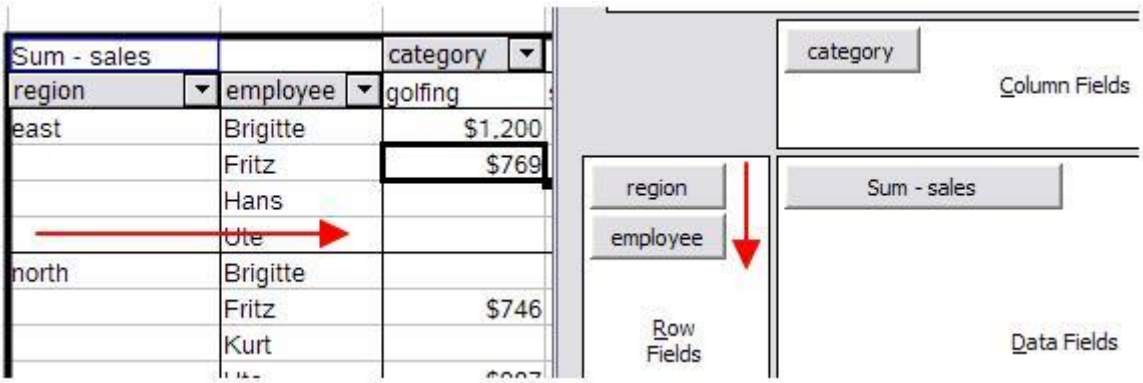


Figure 173: Pivot Table field order for analysis, and resulting layout in pivot table

Fields that are placed into the *Page Fields* area appear in the result above as a drop down list. The summary in your result takes only that part of your base data into account that you have selected. For example, if you use **employee** as a Page Field, you can filter the result shown for each employee.

To remove a field from the white layout area, just drag it past the border and drop it (the cursor will change to a crossed symbol), or select it and click the **Remove** button.

More options

To expand the Pivot Table dialog and show more options, click **More**.

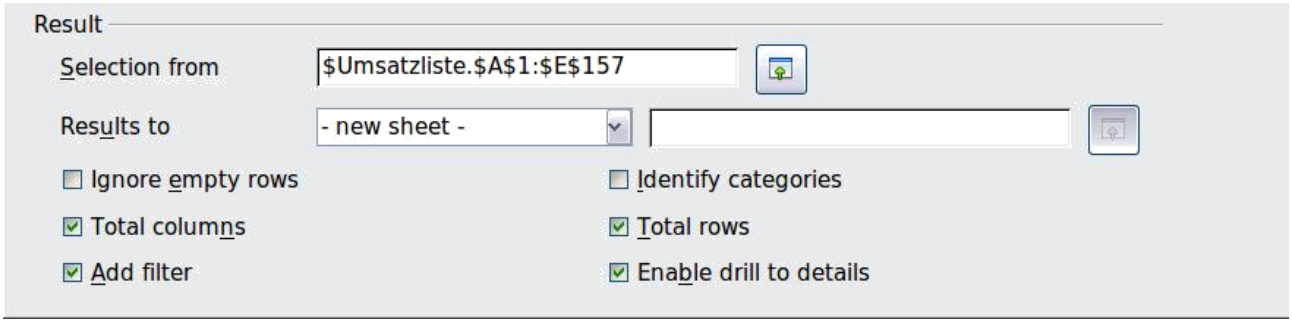


Figure 174: Expanded dialog of the Pivot Table

Selection from

Shows the sheet name and the range of cells used for the Pivot Table.

Results to

Results to defines where your result will be shown. Setting *Results to* as **– undefined –** and then entering a cell reference tells the Pivot Table where to show the results.[1] An error dialog is displayed if you fail to enter a cell reference. Selecting *Results to* as **- new sheet –** adds a new sheet to the spreadsheet file and places the results there. The new sheet is named using the format **Pivot Table_sheetname_X**; where X is the number of the table created, 1 for first, 2 for second and so on. For the source shown in Figure 3, the new sheet for the first table produced would be named **Pivot Table_sheetname_1**. Each new sheet is inserted next to the source sheet.

Ignore empty rows

If the source data is not in the recommended form, this option tells the Pivot Table to ignore empty rows.

Identify categories

With this option selected, if the source data has missing entries in a list and does not meet the recommended data structure (see Figure 175), the Pivot Table adds it to the listed category above it. If this option is not chosen, then the Pivot Table inserts *(empty)* (see Figure 177).

	A	B	C
1	Produce	Region	Quantity
2	Apples	Italy	6.2 t
3		Lake Constance	19.2 t
4		California	3.6 t
5	Pears	Italy	7.0 t
6		Lake Constance	22.0 t
7			

Figure 175: Example of data with missing entries in Column A

The option *Identify categories* ensures that in this example rows 3 and 4 are included for the product *Apples* and that row 6 is included for *Pears* (see Figure 176).

Sum - Quantity	Region			
Produce	California	Italy	Lake Constance	**Total Result**
Apples	3.6 t	6.2 t	19.2 t	**29.0 t**
Pears		7.0 t	22.0 t	**29.0 t**
Total Result	**3.6 t**	**13.2 t**	**41.2 t**	**58.0 t**

Figure 176: Pivot Table result with Identify categories selected

[1] In this case the word - *undefined* – is misleading because the output position is in fact defined.

Without category recognition, the Pivot Table shows an *(empty)* category (Figure 177).

Sum - Quantity	Region			
Product	California	Italy	Lake Constance	**Total Result**
(empty)	3.6 t		41.2 t	**44.8 t**
Apples		6.2 t		**6.2 t**
Pears		7.0 t		**7.0 t**
Total Result	**3.6 t**	**13.2 t**	**41.2 t**	**58.0 t**

Figure 177: Pivot Table result without Identify categories selected

Logically, the behavior with category recognition is better. A list showing missing entries is also less useful, because you cannot use functions such as sorting or filtering.

Total columns, Total rows

With these options you can decide if the Pivot Table shows an extra row with the sums of each column, or if it adds on the very right a column with the sums of each row. In some cases, an added total sum is meaningless, for example if your entries are accumulated or the result of comparisons.

Add filter

Use this option to add or hide the cell labeled **Filter** above the Pivot Table results. This cell is a convenient button for additional filtering options within the Pivot Table.

Enable drill to details

With this option enabled, if you double-click on a single data cell, including a cell produced from *Total columns* or *Total rows*, in the Pivot Table result, a new sheet opens giving a detailed listing of the individual entry. If you double-click on a cell in either the Row Fields or the Column Fields, then the *Show Detail* dialog open (see “Drilling (showing details)” on page 242). Taking Figure 173 as an example, if a pivot table uses more than one field (region and employee) and you double-click a left-most field (say, east), then this collapses the row, combining the totals for employees for that field and displaying the totals for *east*. If this function is disabled, the double-click will keep its usual edit function within a spreadsheet.

More settings for the fields: Field options

The options discussed in the previous section are valid for the Pivot Table in general. You can also change settings for every field that you have added to the Pivot Table layout. To do this,either select a field and click on the **Options** button in the Pivot Table dialog, or double-click on the appropriate field.

The options available for fields when put into the Data Fields differ from those when put into the Row, Column, and Page Fields of the Pivot Table.

Options for Data Fields

In the Options dialog of a Data Field, you can select the Sum function to accumulate the values from your data source. While you will often use the sum function, other functions (like standard distribution or a counting function) are also available. For example, the counting function can be useful for non-numerical data fields.

On the Data Field dialog, click **More** to see the *Displayed value* section.

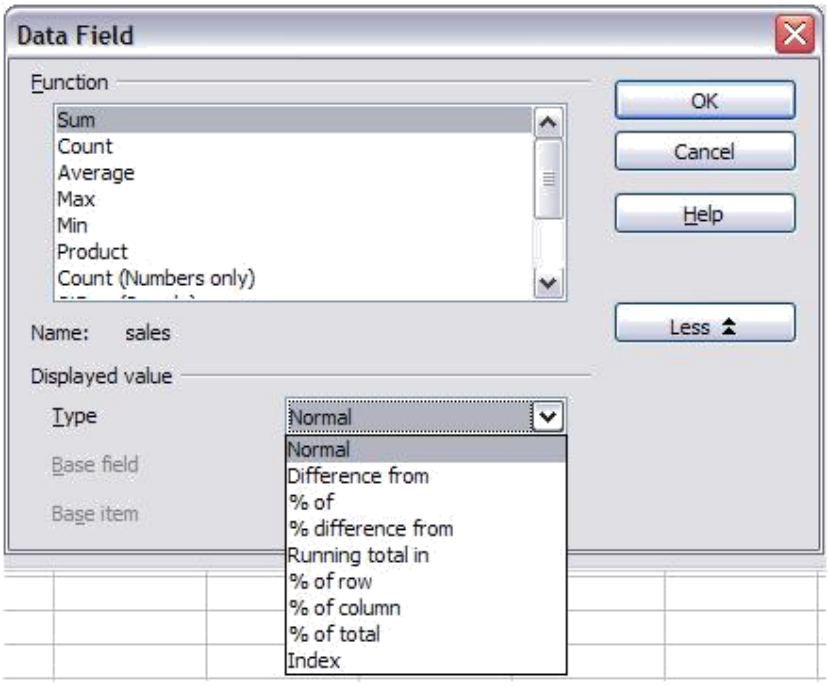


Figure 178: Expanded dialog for a Data Field

In the *Displayed value* section, you can choose other possibilities for analysis by using the aggregate function. Depending on the setting for **Type**, you may have to choose definitions for **Base field** and **Base item**.

Figure 179: Example choices for Base field and item

The table below lists the possible types of displayed value and associated base field and item, together with a note on usage.

Type	***Base field***	***Base item***	***Analysis***
Normal	—	—	Simple use of the chosen aggregate function (for example, sum).
Difference from	Selection of a field from the data source of the Pivot Table (for example, employee).	Selection of an element from the selected base field (for example, Brigitte)	The result is the difference between the result of the Base field and the Base item (for example, sales volume of the employees against the sales volume of Brigitte; see Figure 180).

Type	*Base field*	*Base item*	*Analysis*
% of	Selection of a field from the data source of the Pivot Table (for example, employee)	Selection of an element from the selected base field (for example, Brigitte)	The result is a percentage ratio of the value of the base field to the base item (for example, sales result of the employee relative to the sales result of Brigitte; see Figure 181).
difference from	Selection of a field from the data source of the Pivot Table (for example, employee)	Selection of an element from the selected base field (for example. Brigitte)	From each result, its reference value is subtracted, and the difference is divided by the reference value (for example, sales of the employees as relative difference from the sales of Brigitte; see Figure 182).
Running total in	Selection of a field from the data source of the Pivot Table (for example, date)	—	Each result is added to the sum of the results for preceding items in the base field, in the base field's sort order, and the total sum is shown. Results are always summed, even if a different summary function was used to get each result.
% of row	—	—	The result is a percentage of the value of the whole row (for example, the row sum).
% of column	—	—	The result is a percentage of the total column value (for example, the column sum).
% of total	—	—	The result is a percentage of the overall result (for example, the total sum).
Index	—	—	(Default result x total result) / (row total x column total)

3	Sum - sales	employee				
4	category	Brigitte	Fritz	Hans	Kurt	Ute
5	golfing	$2,475	$769	$1,002		$3,991
6	sailing	$2,189			$3,895	$3,454
7	tennis	$6,718	$567	$9,086	$1,598	$3,755
8	**Total Result**	**$11,382**	**$1,336**	**$10,088**	**$5,493**	**$11,200**
9						
10	Sum - sales	employee				
11	category	Brigitte	Fritz	Hans	Kurt	Ute
12	golfing		-$1,706.00	-$1,473.00	-$2,475.00	$1,516.00
13	sailing		-$2,189.00	-$2,189.00	$1,706.00	$1,265.00
14	tennis		-$6,151.00	$2,368.00	-$5,120.00	-$2,963.00
15	**Total Result**		**-$10,046.00**	**-$1,294.00**	**-$5,889.00**	**-$182.00**

*Figure 180: Original Pivot Table (top) and a **Difference from** example (below)*

Sum - sales	employee				
category	Brigitte	Fritz	Hans	Kurt	Ute
golfing	100.00%	31.07%	40.48%	0.00%	161.25%
sailing	100.00%	0.00%	0.00%	177.94%	157.79%
tennis	100.00%	8.44%	135.25%	23.79%	55.89%
Total Result	**100.00%**	**11.74%**	**88.63%**	**48.26%**	**98.40%**

*Figure 181: Example of a **% of** analysis*

Sum - sales	employee				
category	Brigitte	Fritz	Hans	Kurt	Ute
golfing		-68.93%	-59.52%	-100.00%	61.25%
sailing		-100.00%	-100.00%	77.94%	57.79%
tennis		-91.56%	35.25%	-76.21%	-44.11%
Total Result		**-88.26%**	**-11.37%**	**-51.74%**	**-1.60%**

*Figure 182: Example of **% difference from** analysis*

Options for Row and Column Fields

In the Options dialog for the Row or Column Fields, you can choose to show subtotals for each category. Subtotals are deactivated by default. Subtotals are useful only if the values in one row or column field can be divided into subtotals for another (sub)field.

Some examples are shown in the next three figures.

Sum - sales	category			
region	golfing	sailing	tennis	**Total Result**
east	$41,971.00	$22,484.00	$35,966.00	**$100,421.00**
north	$18,741.00	$22,468.00	$34,533.00	**$75,742.00**
south	$56,257.00	$44,801.00	$34,258.00	**$135,316.00**
west	$39,245.00	$20,099.00	$37,942.00	**$97,286.00**
Total Result	**$156,214.00**	**$109,852.00**	**$142,699.00**	**$408,765.00**

Figure 183: No subdivision with only one row or column field

Sum - sales		category			
region	employee	golfing	sailing	tennis	**Total Result**
east	Brigitte	$5,822.00	$2,135.00	$4,872.00	**$12,829.00**
	Fritz	$15,172.00	$5,730.00	$12,455.00	**$33,357.00**
	Hans	$5,316.00	$909.00	$12,220.00	**$18,445.00**
	Kurt	$9,707.00	$6,475.00	$2,417.00	**$18,599.00**
	Ute	$5,954.00	$7,235.00	$4,002.00	**$17,191.00**
north	Brigitte	$3,814.00	$10,151.00	$3,985.00	**$17,950.00**
	Fritz	$3,443.00	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ute	[illegible]1,939.00	$19,030.00		**$30,969.00**
west	Brigitte	$12,174.00	$7,704.00	$8,864.00	**$28,742.00**
	Fritz	$4,934.00	$6,742.00	$1,427.00	**$13,103.00**
	Hans	$5,380.00	$880.00	$9,028.00	**$15,288.00**
	Kurt	$4,744.00	$3,584.00		**$8,328.00**
	Ute	$12,013.00	$1,189.00	$18,623.00	**$31,825.00**
Total Result		**$156,214.00**	**$109,852.00**	**$142,699.00**	**$408,765.00**

Figure 184: Division of the regions for employees (two row fields) without subtotals

Sum - sales		category			
region	employee	golfing	sailing	tennis	Total Result
east	Brigitte	$5,822.00	$2,135.00	$4,872.00	$12,829.00
	Fritz	$15,172.00	$5,730.00	$12,455.00	$33,357.00
	Hans	$5,316.00	$909.00	$12,220.00	$18,445.00
	Kurt	$9,707.00	$6,475.00	$2,417.00	$18,599.00
	Ute	$5,954.00	$7,235.00	$4,002.00	$17,191.00
east Sum - sales		**$41,971.00**	**$22,484.00**	**$35,966.00**	**$100,421.00**
north	Brigitte	$3,814.00	$10,151.00	$3,985.00	$17,950.00
	Fritz	$3,443.00	$2,698.00	$9,115.00	$15,256.00
	Hans	$3,049.00	$3,008.00	$5,361.00	$11,418.00
	Kurt	$2,214.00	$3,485.00	$10,499.00	$16,198.00
	Ute	$6,221.00	$3,126.00	$5,573.00	$14,920.00
north Sum - sales		**$18,741.00**	**$22,468.00**	**$34,533.00**	**$75,742.00**
south	Brigitte	$5,151.00	$4,432.00		$9,583.00
	Fritz	$23,290.00	$4,806.00	$15,641.00	$43,737.00
	Hans	$4,196.00	$9,263.00	$3,858.00	$17,317.00
	Kurt	$11,681.00	$7,270.00	$14,759.00	$33,710.00
	Ute	$11,939.00	$19,030.00		$30,969.00
south Sum - sales		**$56,257.00**	**$44,801.00**	**$34,258.00**	**$135,316.00**
west	Brigitte	$12,174.00	$7,704.00	$8,864.00	$28,742.00
	Fritz	$4,934.00	$6,742.00	$1,427.00	$13,103.00
	Hans	$5,380.00	$880.00	$9,028.00	$15,288.00
	Kurt	$4,744.00	$3,584.00		$8,328.00
	Ute	$12,013.00	$1,189.00	$18,623.00	$31,825.00
west Sum - sales		**$39,245.00**	**$20,099.00**	**$37,942.00**	**$97,286.00**
Total Result		**$156,214.00**	**$109,852.00**	**$142,699.00**	**$408,765.00**

Figure 185: Division of the regions for employees with subtotals (by region)

To calculate subtotals that can also be used for the data fields (see above), select the **Automatic** option in the Subtotals section of the Data Field dialog.

You can choose the type of subtotal to use by selecting **User-defined** and then clicking the type of subtotal you want to calculate from the list. Functions are only available when *User-defined* is selected.

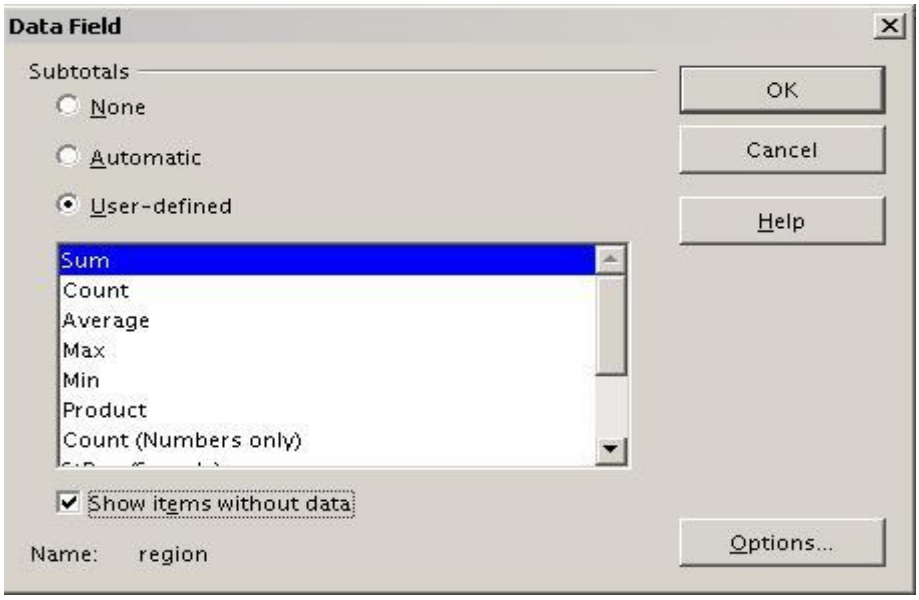


Figure 186: Preferences dialog of a row or column field

Normally, the Pivot Table does not show a row or column for categories that have no entries in the underlying database. By choosing the **Show items with no data** option, you can force this.

For illustration purposes, the data was manipulated in such a way that the employee Brigitte has no sales values for the category golfing.

employee	Brigitte		
Sum - sales	category		
region	sailing	tennis	Total Result
east	$2,135.00	$4,872.00	$7,007.00
north	$10,151.00	$3,985.00	$14,136.00
south	$4,432.00		$4,432.00
west	$7,704.00	$8,864.00	$16,568.00
Total Result	$24,422.00	$17,721.00	$42,143.00

Figure 187: Default setting

employee	Brigitte			
Sum - sales	category			
region	golfing	sailing	tennis	Total Result
east		$2,135.00	$4,872.00	$7,007.00
north		$10,151.00	$3,985.00	$14,136.00
south		$4,432.00		$4,432.00
west		$7,704.00	$8,864.00	$16,568.00
Total Result		$24,422.00	$17,721.00	$42,143.00

Figure 188: Setting "Show Items with no data"

Options for Page Fields

The Options dialog for Page Fields is the same as for Row and Column fields, even though it appears to be useless to have the same settings as described for the Row and Column fields. With the flexibility of the Pivot Table, you can switch the different fields between pages, columns, or rows. The fields keep the settings that you made for them. The Page Field has the same properties as a Row or Column field. These settings only take effect when you use the field not as a Page Field but as Row or Column field.

Working with the results of the Pivot Table

As mentioned above, the Pivot Table dialog is very flexible. A Pivot Table can be totally restructured with only a few mouse clicks. Some functions of the Pivot Table dialog can only be used with the Pivot Table.

Changing the layout

The layout of the Pivot Table can be changed quickly and easily by using drag-and-drop. With the Pivot Table open, fields can be dragged around from row, column, page and the Data Fields areas to any position you want to put them, and then dropped. Unused fields can also be added, and fields removed in error can be replaced by dragging and dropping them into the positions required.

Some manipulation can also be carried out in the pivot table view. Within the results table of the Pivot Table, move one of the page, column, or row fields to a different position. The cursor will change shape from its starting shape (horizontal or vertical block on the arrow head) to the opposite if moving to a different field, such as from row to column, and it is OK to drop.

Figure 189: Drag a column field. Note the cursor shape

Figure 190: Drag a row field. Note the cursor shape

You can remove a column, row, or page field from the Pivot Table by clicking on it and dragging it out of the table. The cursor changes to that shown in Figure 191. A field removed in error cannot be recovered, and it is necessary to return to the Pivot Table to replace it.

Figure 191: Field dragged out of the Pivot Table

Grouping rows or columns

For many analyses or summaries, the categories have to be grouped. You can merge the results in classes. You can only carry out grouping on an ungrouped Pivot Table.

You can access grouping by selecting **Data > Group and Outline > Group** from the menu bar, or by pressing *F12* after selecting the correct cell area. The type of values that have to be grouped is what mainly determines how the grouping function works. You need to distinguish between scalar values, or other values, such as text, that you want grouped.

Note	Before you can group, you have to produce a Pivot Table with ungrouped data. The time needed for creating a Pivot Table depends mostly on the number of columns and rows and not on the size of the basic data. Through grouping you can produce the Pivot Table with a small number of rows and columns. The Pivot Table can contain a lot of categories, depending on your data source.

Grouping of categories with scalar values

For grouping scalar values, select a single cell in the row or column of the category to be grouped. Choose **Data > Group and Outline > Group** from the menu bar or press *F12*; you get the Grouping dialog shown in Figure 192.

You can define in which value range (start/end) the grouping should take place. The default setting is the whole range, from the smallest to the largest value. In the field *Group by,* you can enter the class size, also known as the interval size (in the example shown in Figures 193 and 194, groups of 10 km/h each).

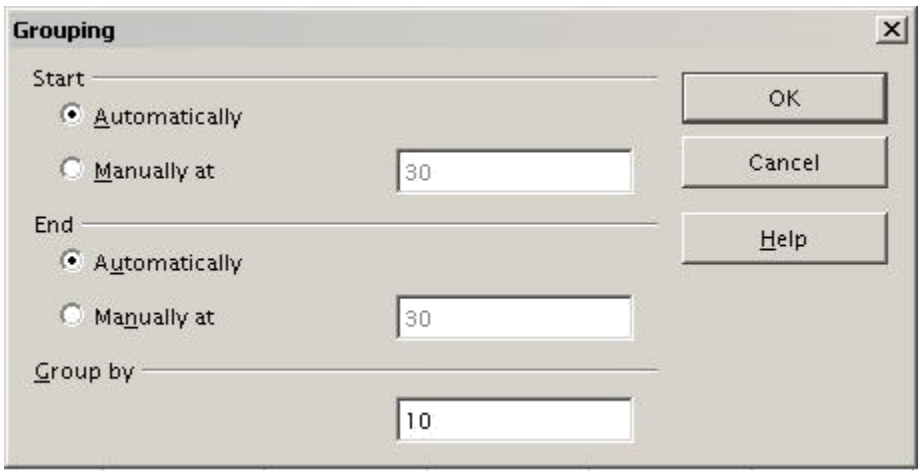


Figure 192: Grouping dialog with scalar categories

km/h	
30	2
31	1
32	5
33	4
34	5
35	2
36	2
37	1
38	6
39	1
40	1
41	4
42	2
43	3

Figure 193: Pivot Table without grouping (frequency of the km/h values of a radar control)

km/h	
30-39	29
40-49	22
50-59	23
60-69	23
70-79	18
80-89	23
90-99	18
100-109	27
110-119	35
Total Result	**218**

Figure 194: Pivot Table with grouping (classes of 10 km/h each)

Grouping without automatic creation of intervals

Categories containing text fields cannot create intervals. You can define for each field (for example, Department) which values you want to put together in one group.

With more than one cell selected, choose **Data > Group and Outline > Group** from the menu bar, or press *F12*, to group those cells. See Figures 195 and 196.

For grouping of non-scalar categories, select in the result of the Pivot Table all the individual field values that you want to put in the one group.

Tip	You can select several non-contiguous cells in one step by pressing and holding the *Control* key while left-clicking with the mouse.

Given the input data shown in Figure 195, execute the Pivot Table with Department in the Row Field and Sum (Sick Days) in the Data Field. The output should look like that in Figure 196. With the mouse, select the Departments Accounting, Purchasing and Sales.

Last name	First name	Department	Sick days
Meier	Hans	Sales	7
Muller	Karin	Accounting	7
Schuster	Josef	Purchasing	3
Huber	Erna	Purchasing	3
Aigner	Hermann	Production	7
Schulze	Josef	Production	7
Schroder	Gerhard	Production	4
Forster	Inge	Assembly	4
Meier	Gunter	Assembly	1
Gabriel	Juri	Warehouse	0
Schumacher	Helmut	Warehouse	5

Figure 195: Database with non-scalar categories (departments)

Department	
Accounting	7
Assembly	5
Production	18
Purchasing	6
Sales	7
Warehouse	5
Total Result	**48**

Figure 196: Pivot Table with non-scalar categories

Choose the **Data > Group and Outline > Group** from the Menu bar or press *F12*. The output should now look like that in Figure 197. Repeat this for all groups that you want to create from the different categories (Select Assembly, Production and Warehouse and Group again. The output should look like Figure 198.

Department2	Department	
Assembly	Assembly	5
Group1	Accounting	7
	Purchasing	6
	Sales	7
Production	Production	18
Warehouse	Warehouse	5
Total Result		**48**

Figure 197: Summary of single categories in one group

Department3	Department	
Group1	Accounting	7
	Purchasing	6
	Sales	7
Group2	Assembly	5
	Production	18
	Warehouse	5
Total Result		**48**

Figure 198: Grouping finished

You can change the default names for the groups and the newly created group field by editing the name in the input field (for example changing '*Group2*' to '*Technical*'). The Pivot Table will remember these settings, even if you change the layout later on. For the following pictures, the dialog was called again (right-click, **Edit Layout**) and by selecting the icon "**Department 2**", then **Options**, and finally from the preferences menu **Automatic** was selected. This generated the partial sum results shown in Figure 199. Double clicking **Group 1** and **Technical** collapses the entries, as shown in Figure 200.

Department2	Department	
Group1	Accounting	7
	Purchasing	6
	Sales	7
Group1 Result		**20**
Technical	Assembly	5
	Production	18
	Warehouse	5
Technical Result		**28**
Total Result		**48**

Figure 199: Renamed groups and partial results

Department2	
Group1	20
Technical	28
Total Result	**48**

Figure 200: Reduced to the new groups

Note	A well-structured database makes manual sorting within the Pivot Table obsolete. In the example shown, you could add another column with the name Department, that has the correct entry for each person based on whether the employee's department belongs to the group Office or Technical. The mapping for this (1:n relationship) can be done easily with the VLOOKUP function from Calc.

Sorting the result

The result of any Pivot Table is sorted (categories) in columns and rows in ascending order. You can change the sorting in three ways:

Select sort order from drop-down menus on each column heading.

Sort manually by using drag and drop.

Sort automatically by choosing the options in the preferences dialog of the row or column field.

Select sort order from drop-down menus on each column heading

The simplest way to sort entries is to click the arrow on the right side of the heading and check the box(es) for the desired sort order. The custom sorting dialog is shown in Figure 202. Additional options exist to show *all*, *show only the current item*, or *hide only the current item*.

Once sorting has been carried out using the drop-down list, the color of the arrow changes and a small square of matching color is added to the bottom right of the arrow button.

Sum - sales		category	
region	employee	golfing	sailing
east	Brigitte	$1,200	
north	Brigitte		
south	Brigitte	$1,275	
west	Brigitte		$2,189
Total Result		**$2,475**	**$2,189**

Figure 201: Arrow color change and indicator square on button

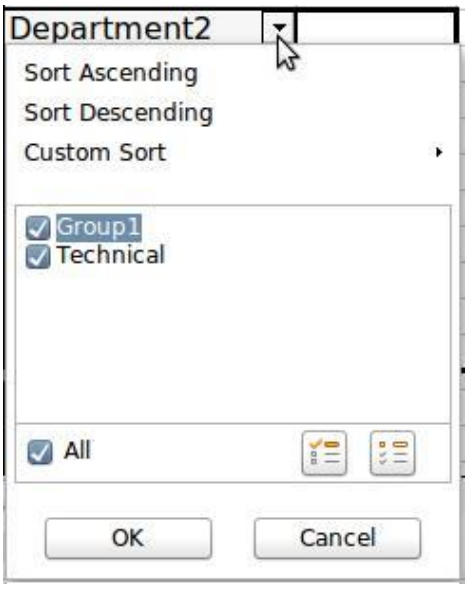


Figure 202: Custom sorting

Sort manually by using drag and drop

You can change the order within the categories by moving the cells with the category values in the result table of the Pivot Table. The cell will be inserted above the cell on which you drop it.

Be aware that in Calc, a cell must be selected. It is not enough that the cursor is in the cell. The background of a selected cell is marked with a different color. To select several cells, click in one cell with no extra key pressed, then press the *Shift* or *Ctrl* key while clicking in other cells. Another possibility is to keep the mouse button pressed on the cell you want to select, move the mouse to a neighbor cell, and then move back to the original cell before you release the mouse button.

Sort automatically

To sort automatically, right-click within the Pivot Table and choose **Edit Layout**. This will open the Pivot Table (Figure 172). Within the Layout area of the Pivot Table, double-click the row or column field you want to sort. In the Data Field dialog which opens (Figure 186), click **Options** to display the Data Field Options dialog.

For *Sort by*, choose either *Ascending* or *Descending*. On the left side is a drop-down list where you can choose the field this setting should apply to. With this method, you can specify that sorting does not happen according to the categories but according to the results of the data field.

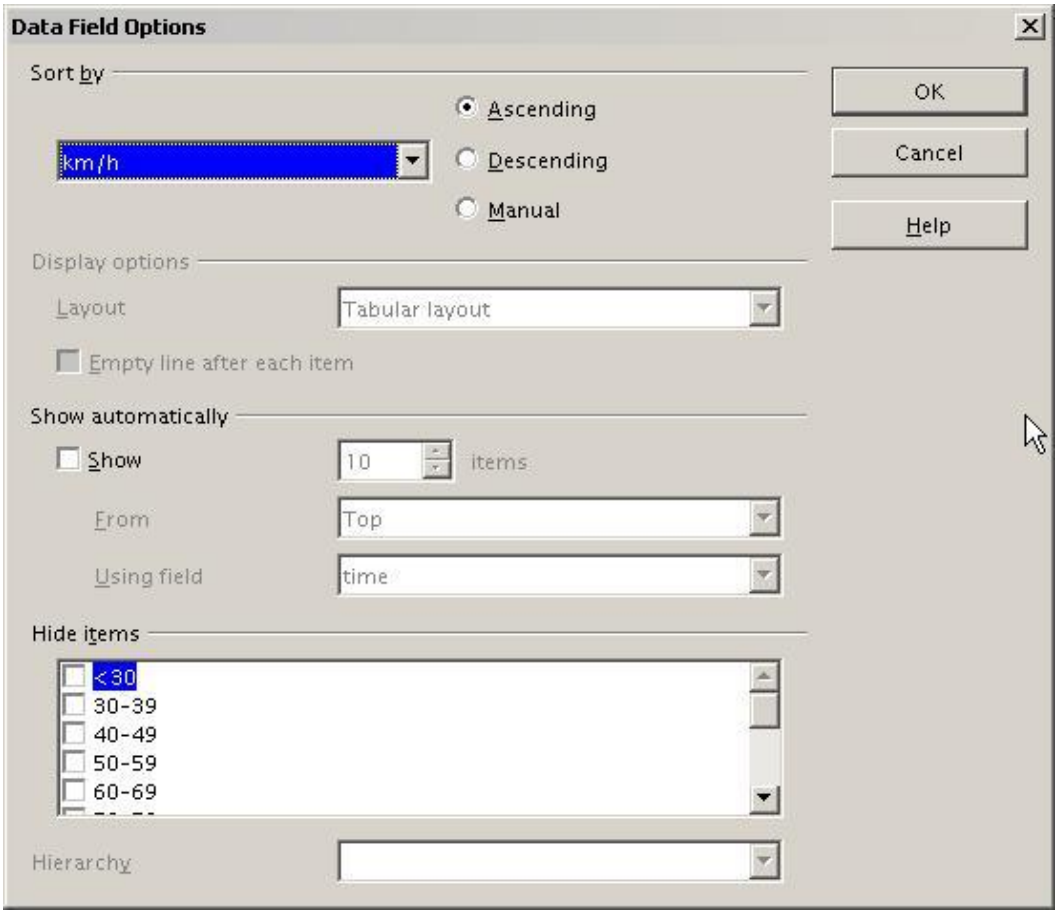


Figure 203: Options for a row or column field

Drilling (showing details)

Drill allows you to show the related detailed data for a single, compressed value in the Pivot Table result. To activate a drill, double-click on the cell or choose **Data > Group and Outline > Show Details**. There are two possibilities:

The active cell is a row or column field.

In this case, drill means an additional breakdown into the categories of another field.

For example, double-click on the cell with the value *golfing.* In this instance the values that are aggregated within *golfing* can be subdivided using another field.

Sum - sales	region				
category	east	north	south	west	Total Result
golfing	$41,971.00	$18,741.00	$56,257.00	$39,245.00	$156,214.00
sailing	$22,484.00	$22,468.00	$44,801.00	$20,099.00	$109,852.00
tennis	$35,966.00	$34,533.00	$34,258.00	$37,942.00	$142,699.00
Total Result	$100,421.00	$75,742.00	$135,316.00	$97,286.00	$408,765.00

Figure 204: Before the drill down for the category golfing

A dialog appears allowing you to select the field to use for further subdivision. In this example, **employee**.

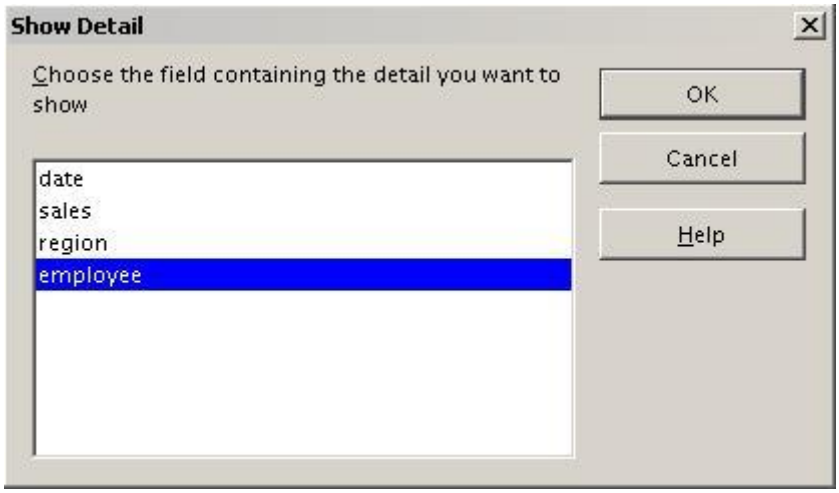


Figure 205: Selecting the field for the subdivision

Sum - sales		region				
category	employee	east	north	south	west	Total Result
golfing	Brigitte	$5,822.00	$3,814.00	$5,151.00	$12,174.00	$26,961.00
	Fritz	$15,172.00	$3,443.00	$23,290.00	$4,934.00	$46,839.00
	Hans	$5,316.00	$3,049.00	$4,196.00	$5,380.00	$17,941.00
	Kurt	$9,707.00	$2,214.00	$11,681.00	$4,744.00	$28,346.00
	Ute	$5,954.00	$6,221.00	$11,939.00	$12,013.00	$36,127.00
sailing		$22,484.00	$22,468.00	$44,801.00	$20,099.00	$109,852.00
tennis		$35,966.00	$34,533.00	$34,258.00	$37,942.00	$142,699.00
Total Result		$100,421.00	$75,742.00	$135,316.00	$97,286.00	$408,765.00

Figure 206: After the drill down

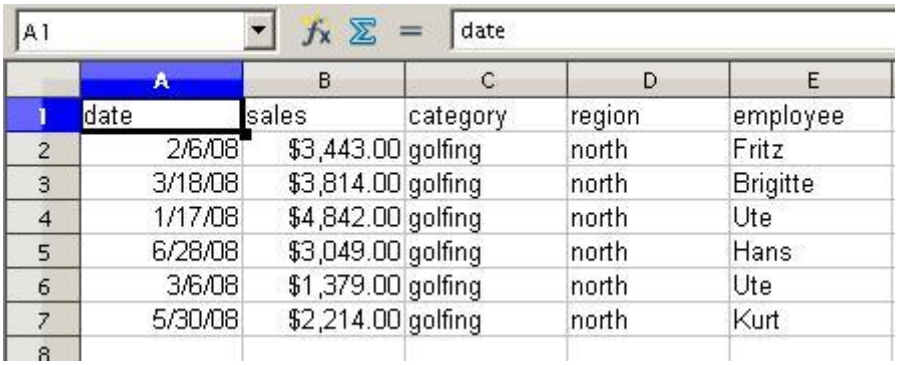
To hide the details again, double-click on the cell *golfing* or choose **Data > Group and Outline > Hide Details**.

The Pivot Table remembers your selection (in our example the field **employee**) by adding and hiding the selected field, so that for the next drill down for a category in the field **category** the dialog does not appear. To remove the selection **employee**, open the Pivot Table dialog by right-clicking and choosing **Edit Layout**, then delete the unwanted selection in the row or column field.

The active cell is a value of the Data Field.

In this case, drill down results in a listing of all data entries of the data source that aggregates to this value.

In our example, if we were to double-click on the cell with the value $18,741 from Figure 204, we would now have a new list of all data sets that are included in this value. This list is displayed in a new sheet.



	A	B	C	D	E
1	date	sales	category	region	employee
2	2/6/08	$3,443.00	golfing	north	Fritz
3	3/18/08	$3,814.00	golfing	north	Brigitte
4	1/17/08	$4,842.00	golfing	north	Ute
5	6/28/08	$3,049.00	golfing	north	Hans
6	3/6/08	$1,379.00	golfing	north	Ute
7	5/30/08	$2,214.00	golfing	north	Kurt
8					

Figure 207: New table sheet after the drill down for a value in a data field

Filtering

To limit the Pivot Table analysis to a subset of the information that is contained in the data basis, you can filter with the Pivot Table.

Note	An Autofilter or default filter used on the sheet has no effect on the Pivot Table analysis process. The Pivot Table always uses the complete list that was selected when it was started.

To do this, click **Filter** on the top left side above the results.

	A	B	C	D	E	F	G
1	Filter						
2							
3	Sum - sales	employee					
4	region	Brigitte	Fritz	Hans	Kurt	Ute	Total Result
5	east	$12,829.00	$33,357.00	$18,445.00	$18,599.00	$17,191.00	$100,421.00
6	north	$17,950.00	$15,256.00	$11,418.00	$16,198.00	$14,920.00	$75,742.00
7	south	$9,583.00	$43,737.00	$17,317.00	$33,710.00	$30,969.00	$135,316.00
8	west	$28,742.00	$13,103.00	$15,288.00	$8,328.00	$31,825.00	$97,286.00
9	Total Result	$69,104.00	$105,453.00	$62,468.00	$76,835.00	$94,905.00	$408,765.00

Figure 208: Filter field in the upper left area of the Pivot Table

In the Filter dialog, you can define up to 3 filter options that are used in the same way as Calc's default filter.

Note	Even if they are not called a filter, page fields are a practical way to filter the results. The advantage is that the filtering criteria used are clearly visible.

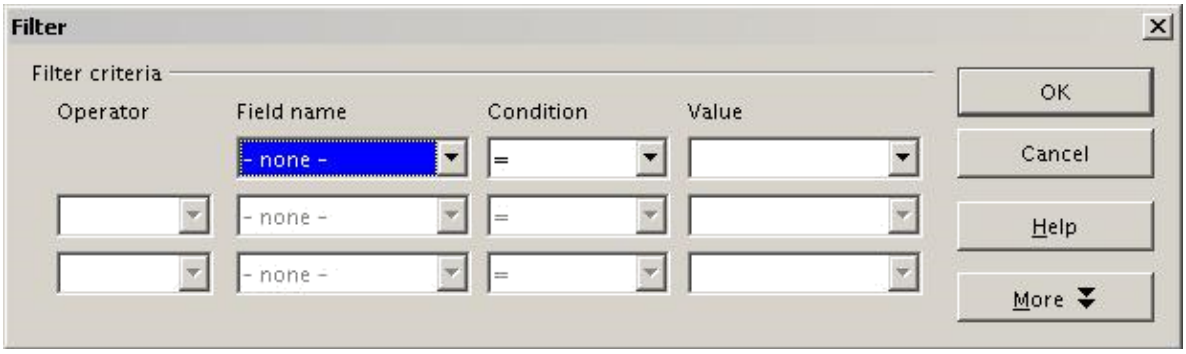


Figure 209: Dialog for defining the filter

Updating (refreshing) changed values

After you have created the Pivot Table, changes in the source data do not cause an automatic update in the resulting table. You must update (refresh) the Pivot Table manually after changing any of the underlying data values.

Changes in the source data could appear in two ways:

The content of existing data sets has been changed.

For example, you might have changed a sales value afterward. To update the Pivot Table, right-click in the result area and choose **Refresh** (or choose **Data > Pivot Table > Refresh** from the menu bar).

You have added or deleted data sets in the original list.

In this case the change means that the Pivot Table has to use a different area of the spreadsheet for its analysis. Fundamental changes to the data set collection means you must redo the Pivot Table from the beginning.

Cell formatting

The cells in the results area of the Pivot Table are automatically formatted in a simple format by Calc. You can change this formatting using all the tools in Calc, but note that if you make any change in the design of the Pivot Table or any updates, the formatting will return to the format applied automatically by Calc.

For the number format in the data field, Calc uses the number format that is used in the corresponding cell in the source list. In most cases, this is useful (for example, if the values are in the currency format, then the corresponding cell in the result area is also formatted as currency). However, if the result is a fraction or a percentage, the Pivot Table does not recognize that this might be a problem; such results must either be without a unit or be displayed as a percentage. Although you can correct the number format manually, the correction stays in effect only until the next update.

Using shortcuts

If you use the Pivot Table very often, you might find the frequent use of the menu paths (**Data > Pivot Table > Create** and **Data > Group and Outline > Group**) inconvenient.

For grouping, a shortcut is already defined: *F12*. For starting the Pivot Table, you can define your own keyboard shortcut. If you prefer to have toolbar icons instead of keyboard shortcuts, you can create a user-defined symbol and add it to either your own custom made toolbar or the Standard toolbar.

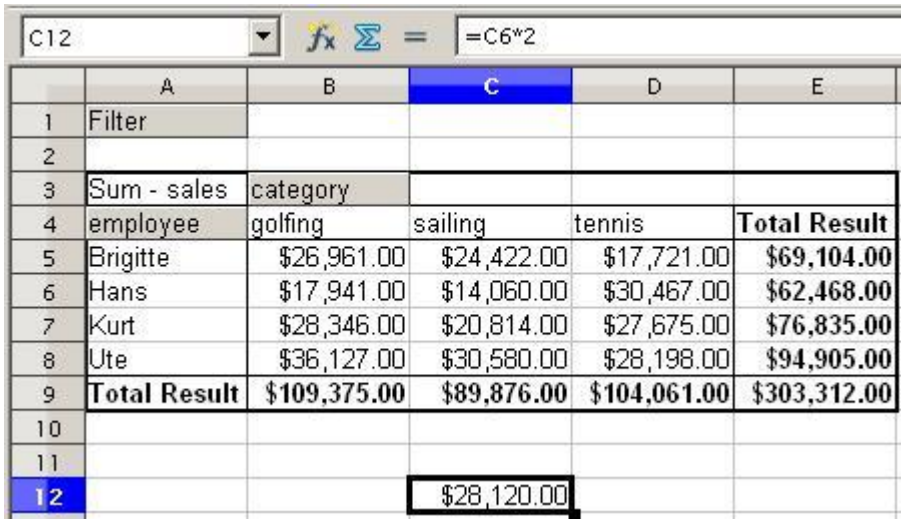
For an explanation how to create keyboard shortcuts or add icons to toolbars, see Chapter 14, Setting Up and Customizing Calc.

Using Pivot Table results elsewhere

The problem

Normally, you create a reference to a value by entering the address of the cell that contains the value. For example, the formula =C6*2 creates a reference to cell **C6** and returns the doubled value.

If this cell is located in the results area of the Pivot Table, it contains the result that was calculated by referencing specific categories of the row and column fields. In Figure 210, the cell **C6** contains the sum of the sales values of the employee Hans in the category Sailing. The formula in the cell **C12** uses this value.

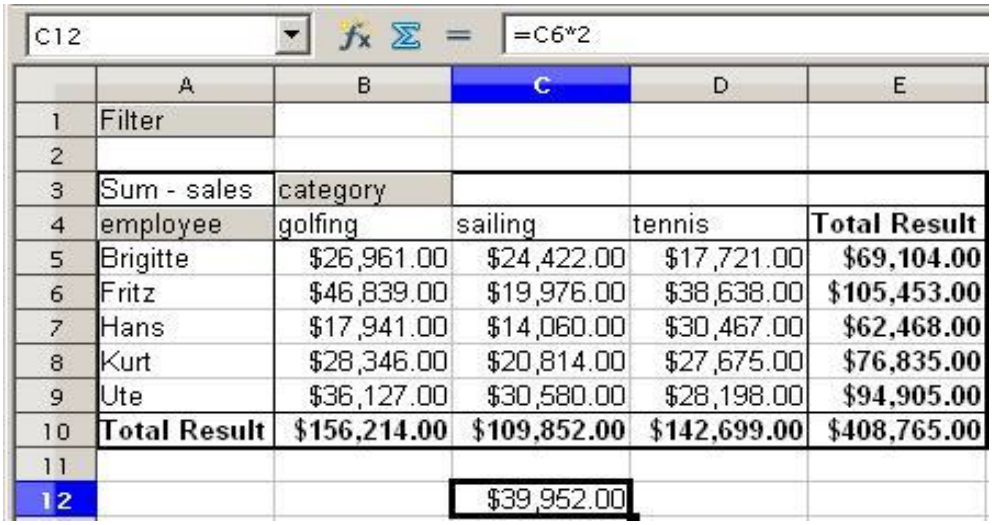


C12 | =C6*2

	A	B	C	D	E
1	Filter				
2					
3	Sum - sales	category			
4	employee	golfing	sailing	tennis	Total Result
5	Brigitte	$26,961.00	$24,422.00	$17,721.00	$69,104.00
6	Hans	$17,941.00	$14,060.00	$30,467.00	$62,468.00
7	Kurt	$28,346.00	$20,814.00	$27,675.00	$76,835.00
8	Ute	$36,127.00	$30,580.00	$28,198.00	$94,905.00
9	Total Result	$109,375.00	$89,876.00	$104,061.00	$303,312.00
10					
11					
12			$28,120.00		

Figure 210: Formula reference to a cell of the Pivot Table

If the underlying data or the layout of the Pivot Table changes, then you must take into account that the sales value for Hans might appear in a different cell. Your formula still references the cell **C6** and therefore uses a wrong value. The correct value is in a different location. For example, in Figure 211, the location is now **C7**.



C12 | =C6*2

	A	B	C	D	E
1	Filter				
2					
3	Sum - sales	category			
4	employee	golfing	sailing	tennis	Total Result
5	Brigitte	$26,961.00	$24,422.00	$17,721.00	$69,104.00
6	Fritz	$46,839.00	$19,976.00	$38,638.00	$105,453.00
7	Hans	$17,941.00	$14,060.00	$30,467.00	$62,468.00
8	Kurt	$28,346.00	$20,814.00	$27,675.00	$76,835.00
9	Ute	$36,127.00	$30,580.00	$28,198.00	$94,905.00
10	Total Result	$156,214.00	$109,852.00	$142,699.00	$408,765.00
11					
12			$39,952.00		

Figure 211: The value that you really want to use can be found now in a different location.

Data Analysis

Introduction

Once you are familiar with functions and formulas, the next step is to learn how to use Calc's automated processes to perform useful analysis of your data quickly.

Calc includes several tools to help you manipulate the information in your spreadsheets, ranging from features for copying and reusing data, to creating subtotals automatically, to varying information to help you find the answers you need. These tools are divided between the Tools and Data menus.

If you are a newcomer to spreadsheets, these tools can be overwhelming at first. However, they become simpler if you remember that they all depend on input from either a cell or a range of cells that contain the data with which you are working.

You can always enter the cells or range manually, but in many cases it is easier to select the cells with the mouse. Click the Shrink/Maximize icon beside a field to temporarily reduce the size of the tool's window, so you can see the spreadsheet underneath and select the cells required.

Sometimes, you may have to experiment to find out which data goes into which field, but then you can set a selection of options, many of which can be ignored in any given case. Just keep the basic purpose of each tool in mind, and you should have little trouble with Calc's function tools.

You don't need to learn them, especially if your spreadsheet use is simple, but as your manipulation of data becomes more sophisticated, they can save time in making calculations, especially as you start to deal with hypothetical situations. Just as importantly, they can allow you to preserve your work and to share it with other people—or yourself at a later session.

One function tool not mentioned here is Pivot Table, but it is a topic that is sufficiently complex that it requires a separate chapter: see Chapter 8 in this book.

Consolidating data

Data > Consolidate provides a way to combine data from two or more ranges of cells into a new range while running one of several functions (such as Sum or Average) on the data. During consolidation, the contents of cells from several sheets can be combined into one place. The effect is that copies of the identified ranges are stacked with their top left corners at the specified result position, and the selected operation is used in each cell to calculate the result value.

Open the document containing the cell ranges to be consolidated.

Choose **Data > Consolidate** to open the Consolidate dialog. Figure 215 shows this dialog after making the changes described below.

The **Source data range** list contains any existing named ranges (created using **Data > Define Range**) so you can quickly select one to consolidate with other areas.

If the source range is not named, click in the field to the right of the drop-down list and either type a reference for the first source data range or use the mouse to select the range on the sheet. (You may need to move the Consolidate dialog or click on the Shrink icon to reach the required cells.)

Click **Add**. The selected range is added to the *Consolidation ranges* list.

Select additional ranges and click **Add** after each selection.

Specify where you want to display the result by selecting a target range from the **Copy results to** drop-down list.

If the target range is not named, click in the field next to **Copy results to** and enter the reference of the target range or select the range using the mouse or position the cursor in the top left cell of the target range. *Copy results to* takes only the first cell of the target range instead of the entire range as is the case for *Source data range*.

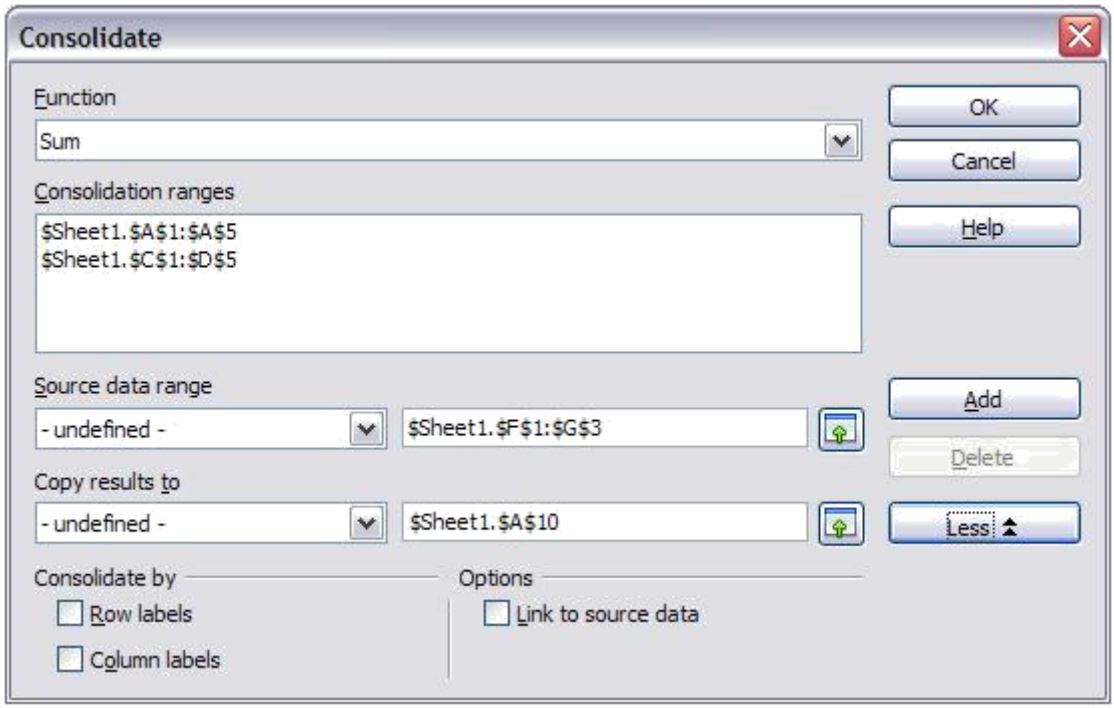


Figure 215: Defining the data to be consolidated

Select a function from the Function list. This specifies how the values of the consolidation ranges will be calculated. The default setting is Sum, which adds the corresponding cell values of the Source data range and gives the result in the target range.

Most of the available functions are statistical (such as Average, Min, Max, Stdev), and the tool is most useful when you are working with the same data over and over.

At this point you can click **More** in the Consolidate dialog to access the following additional settings:

In the *Options* section, select **Link to source data** to insert the formulas that generate the results into the target range, rather than the actual results. If you link the data, any values modified in the source range are automatically updated in the target range.

Caution

The corresponding cell references in the target range are inserted in consecutive rows, which are automatically ordered and then hidden from view. Only the final result, based on the selected function, is displayed.

In the *Consolidate by* section, select either *Row labels* or *Column labels* if the cells of the source data range are not to be consolidated corresponding to the identical position of the cell in the range, but instead according to a matching row label or column label. To consolidate by row labels or column labels, the label must be contained in the selected source ranges. The text in the labels must be identical, so that rows or columns can be accurately matched. If the row or column label of one source data range does not match any that exist in other source data ranges, it is added to the target range as a new row or column.

Click **OK** to consolidate the ranges.

Tip

If you are continually working with the same range, then you probably want to use Data > Define Range to give it a name.

The consolidation ranges and target range are saved as part of the document. If you later open a document in which consolidation has been defined, this data is still available.

Creating subtotals

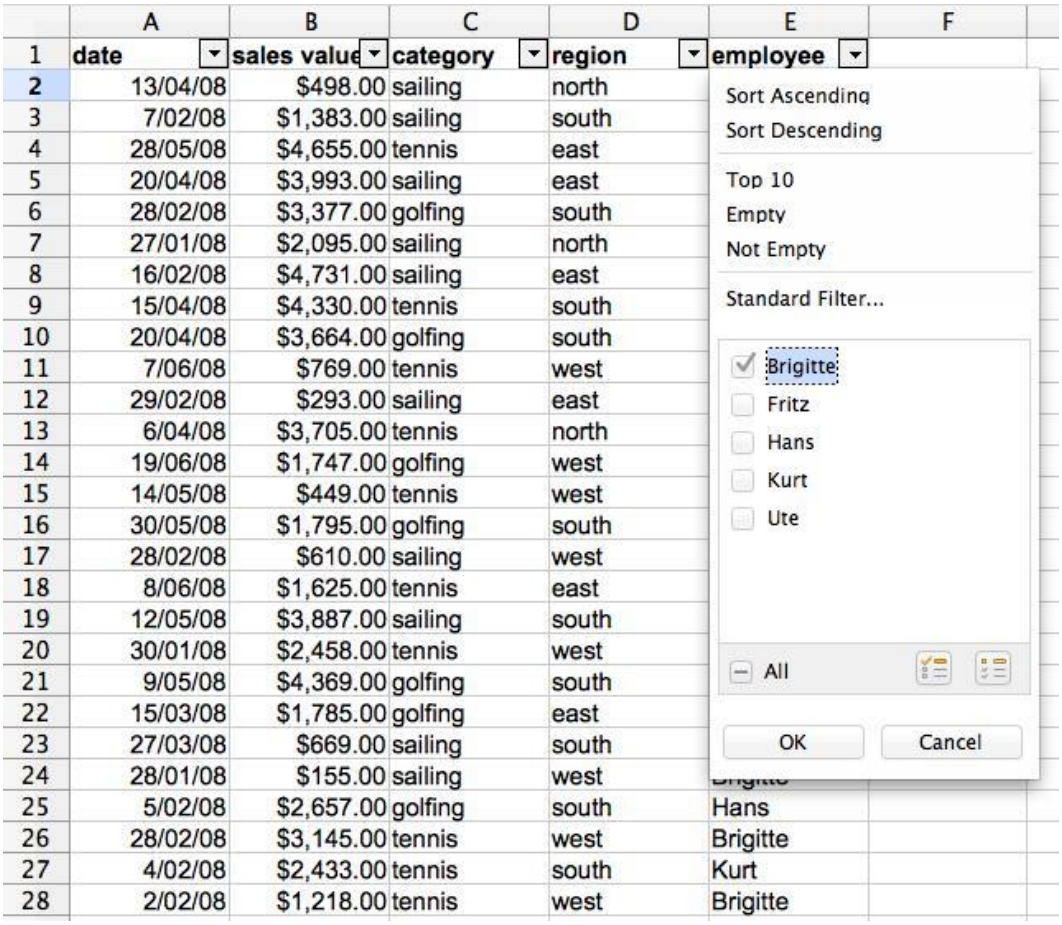
Subtotals are implemented in two ways:

The SUBTOTAL function

Data > Subtotals from the menu bar.

Using the SUBTOTAL function

SUBTOTAL is listed under the Mathematical category when you use the Function Wizard (**Insert > Function** or press *Ctrl+F2*). This function is a relatively limited method for generating a subtotal. To obtain a subtotal for our sales information for the employee Brigitte, we must first implement an AutoFilter on the data (**Data > Filter > AutoFilter**). This displays the selection arrows to the right of each column header; select Brigitte in the Employee field as shown in Figure 216.



	A	B	C	D	E	F
1	date	sales value	category	region	employee	
2	13/04/08	$498.00	sailing	north		
3	7/02/08	$1,383.00	sailing	south		
4	28/05/08	$4,655.00	tennis	east		
5	20/04/08	$3,993.00	sailing	east		
6	28/02/08	$3,377.00	golfing	south		
7	27/01/08	$2,095.00	sailing	north		
8	16/02/08	$4,731.00	sailing	east		
9	15/04/08	$4,330.00	tennis	south		
10	20/04/08	$3,664.00	golfing	south		
11	7/06/08	$769.00	tennis	west		
12	29/02/08	$293.00	sailing	east		
13	6/04/08	$3,705.00	tennis	north		
14	19/06/08	$1,747.00	golfing	west		
15	14/05/08	$449.00	tennis	west		
16	30/05/08	$1,795.00	golfing	south		
17	28/02/08	$610.00	sailing	west		
18	8/06/08	$1,625.00	tennis	east		
19	12/05/08	$3,887.00	sailing	south		
20	30/01/08	$2,458.00	tennis	west		
21	9/05/08	$4,369.00	golfing	south		
22	15/03/08	$1,785.00	golfing	east		
23	27/03/08	$669.00	sailing	south		
24	28/01/08	$155.00	sailing	west		
25	5/02/08	$2,657.00	golfing	south	Hans	
26	28/02/08	$3,145.00	tennis	west	Brigitte	
27	4/02/08	$2,433.00	tennis	south	Kurt	
28	2/02/08	$1,218.00	tennis	west	Brigitte	

Figure 216: AutoFilter applied and Brigitte selected in the Employee column

Select the location for the subtotal to be displayed by clicking in the chosen cell.

Select **Insert > Function** from the Menu bar, or click the Function Wizard button on the Function Bar, or press *Ctrl+F2* to open the Function Wizard.

Select SUBTOTAL from the function list in the Function Wizard dialog and click **Next>>** at the bottom of the dialog.

Enter the required information into the two input boxes as shown in Figure 217. The range is selected from the filtered data, and the function is selected from the list of available possible functions as shown in the Help file extract of Figure 218. In our example we select the sales figures (column B) and we require the sum total (function index 9).

Click **OK** to return the summed values of Brigitte's sales (Figure 219).

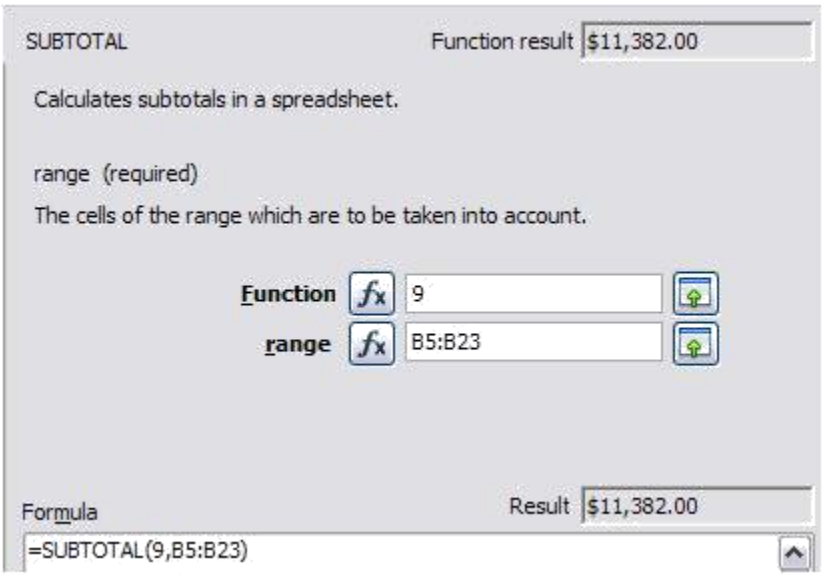


Figure 217: Enter the information into the two input boxes

SUBTOTAL

Calculates subtotals. If a range already contains subtotals, these are not used for further calculations. Use this function with the AutoFilters to take only the filtered records into account.

Syntax

`SUBTOTAL(Function; Range)`

Function is a number that stands for one of the following functions:

Function index	Function
1	AVERAGE
2	COUNT
3	COUNTA
4	MAX
5	MIN
6	PRODUCT
7	STDEV
8	STDEVP
9	SUM
10	VAR
11	VARP

Range is the range whose cells are included.

Figure 218: Function indexes for available functions

B27 =SUBTOTAL(9,B5:B23)

	A	B	C	D	E
1	Date	Sales	Category	Region	Employee
5	06/08/08	$1,200	golfing	east	Brigitte
13	15/04/08	$3,467	tennis	south	Brigitte
14	23/05/08	$2,356	tennis	east	Brigitte
20	04/06/08	$895	tennis	north	Brigitte
21	23/05/08	$1,275	golfing	south	Brigitte
23	15/04/08	$2,189	sailing	west	Brigitte
27		$11,382			

Figure 219: SUBTOTAL result for Brigitte's sales

You will appreciate that this is a tedious and time consuming exercise for a sales report if you want to subtotal for more than a couple of categories.

Using Data > Subtotals

A more comprehensive solution is to create subtotals using **Data > Subtotals** from the Menu bar, which opens the Subtotals dialog. Subtotal creates totals for data arranged in an array—that is, a group of cells with labels for columns. Using the Subtotals dialog, you can select up to three arrays, then choose a statistical function to apply to them. When you click **OK** , Calc adds subtotal and grand total rows to the selected arrays, using the Result and Result2 cell styles to differentiate those entries. By default, matching items throughout your array will be gathered together as a single group above a subtotal.

To insert subtotal values into a sheet:

Ensure that the columns have labels (we will use our sales data example again).

Select, or click in a single cell in the range of cells that you want to calculate subtotals for, and then choose **Data > Subtotals**.

In the Subtotals dialog (Figure 220), in the **Group by** list, select the column by which the subtotals need to be grouped. A subtotal will be calculated for each distinct value in this column.

In the **Calculate subtotals for** box, select the columns containing the values that you want to create subtotals for. If the contents of the selected columns change later, the subtotals are automatically recalculated.

In the **Use function** box, select the function that you want to use to calculate the subtotals.

You can create a further two **Group by** subtotals using the 2nd Group and 3rd Group tabs and repeating steps 3 to 5.

Click **OK**.

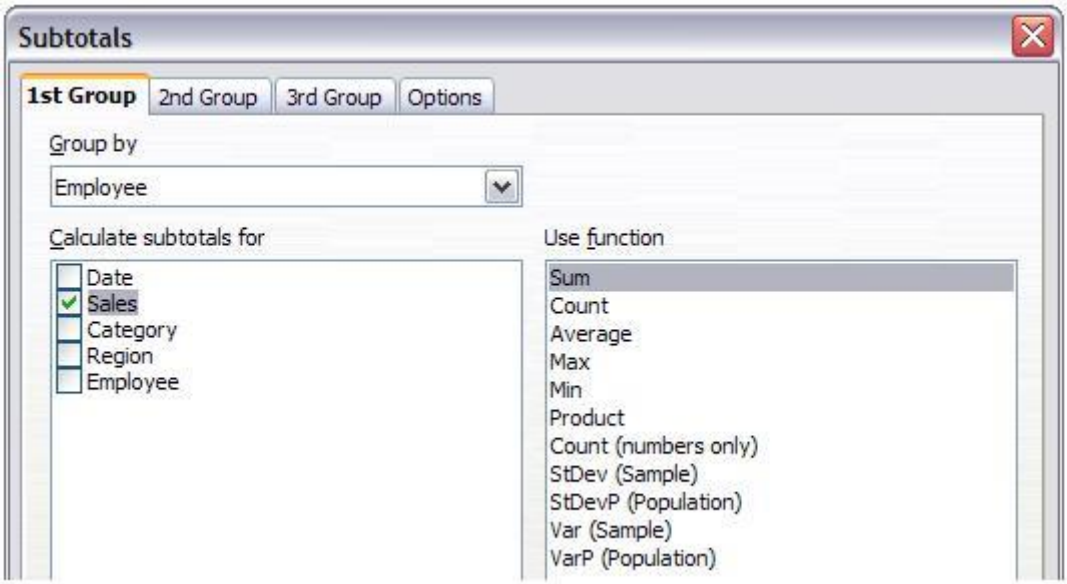


Figure 220: Setting up subtotals

A partial view of the results using our example data is shown in Figure 221. Subtotals for Sales by Employee and Category were used

Calc inserts, to the left of the row numbering labels, an outline area that graphically represents the structure of the subtotals. Number 1 represents the highest level of grouping, the Grand Total. Numbers 2 to 4 show reducing grouping levels, with number 4 showing individual entries. The number of levels depends on the number of groupings in the subtotals.

	A	B	C	D	E
1	Date	Sales	Category	Region	Employee
2	06/08/08	$1,200	golfing	east	Brigitte
3	23/05/08	$1,275	golfing	south	Brigitte
4		***$2,475***	***golfing Sum***		
5	15/04/08	$2,189	sailing	west	Brigitte
6		***$2,189***	***sailing Sum***		
7	23/05/08	$2,356	tennis	east	Brigitte
8	04/06/08	$895	tennis	north	Brigitte
9	15/04/08	$3,467	tennis	south	Brigitte
10		***$6,718***	***tennis Sum***		
11		***$11,382***			***Brigitte Sum***
12	05/02/08	$769	golfing	east	Fritz
13	06/04/08	$746	golfing	north	Fritz
14		***$1,515***	***golfing Sum***		
15	14/07/08	$567	tennis	south	Fritz
16		***$567***	***tennis Sum***		
17		***$2,082***			***Fritz Sum***
18	03/08/08	$1,002	golfing	west	Hans
19		***$1,002***	***golfing Sum***		
20	28/05/08	$4,655	tennis	east	Hans
21	15/08/08	$3,200	tennis	east	Hans
22	14/03/08	$1,231	tennis	west	Hans
23		***$9,086***	***tennis Sum***		
24		***$10,088***			***Hans Sum***

*Figure 221: Subtotals are calculated for each employee (partial view) using the **1st Group** and **2nd Group***

Clicking on a number at the top of the column shrinks the structure of that element of the subtotal. For column 1, this changes the minus button in the column to one with a plus symbol, indicating that it is expandable. For column 2 and others with content, each element of the column shrinks, and each button changes to a plus. For our example subtotal displayed in Figure 221, the structure which is displayed is Column 1 is the *Grand Total*, column 2 is the *Employee* subtotal, and column 3 is the *Category* subtotal.

For column 2, and for others if you have more groups, you can also click each individual minus button to shrink only that subtotal. If you click on the numbered button at the top, you must then click on the resultant plus buttons to expand the structure again (see Figure 222). Shrinking any element, temporarily hides any element contained in a column to its right. In Figure 222 Individual entries are hidden by shrinking the Category subtotals for Brigitte.

To turn off outlines, select **Data > Group and Outline > Remove** from the Menu bar.

Select **AutoOutline** to reinstate the outlines.

	A	B	C	D	E
1	Date	Sales	Category	Region	Employee
4		***$2,475***	***golfing Sum***		
6		***$2,189***	***sailing Sum***		
10		***$6,718***	***tennis Sum***		
11		***$11,382***			***Brigitte Sum***
12	05/02/08	$769	golfing	east	Fritz
13	06/04/08	$746	golfing	north	Fritz
14		***$1,515***	***golfing Sum***		
15	14/07/08	$567	tennis	south	Fritz
16		***$567***	***tennis Sum***		
17		***$2,082***			***Fritz Sum***

Figure 222: Click the plus buttons to expand the elements again

Further choices are available in the Options page of the Subtotals dialog.

In the *Groups* section:

Selecting **Page break between groups** inserts a new page after each group of subtotaled data.

Selecting **Case sensitive** recalculates subtotals when you change the case of a data label.

Selecting the Pre-sort area according to groups option sorts the area that you selected in the **Group by** box of the Group tabs according to the columns that you selected.

In the *Sort* section:

Selecting **Ascending** or **Descending**, sorts beginning with the lowest or the highest value. You can define the sort rules on **Data > Sort > Options**.

Selecting **Include formats** option gives consideration to the formatting attributes when sorting.

Selecting Custom sort order sorts according to one of the predefined custom sorts defined in **Tools > Options > LibreOffice Calc > Sort Lists**.

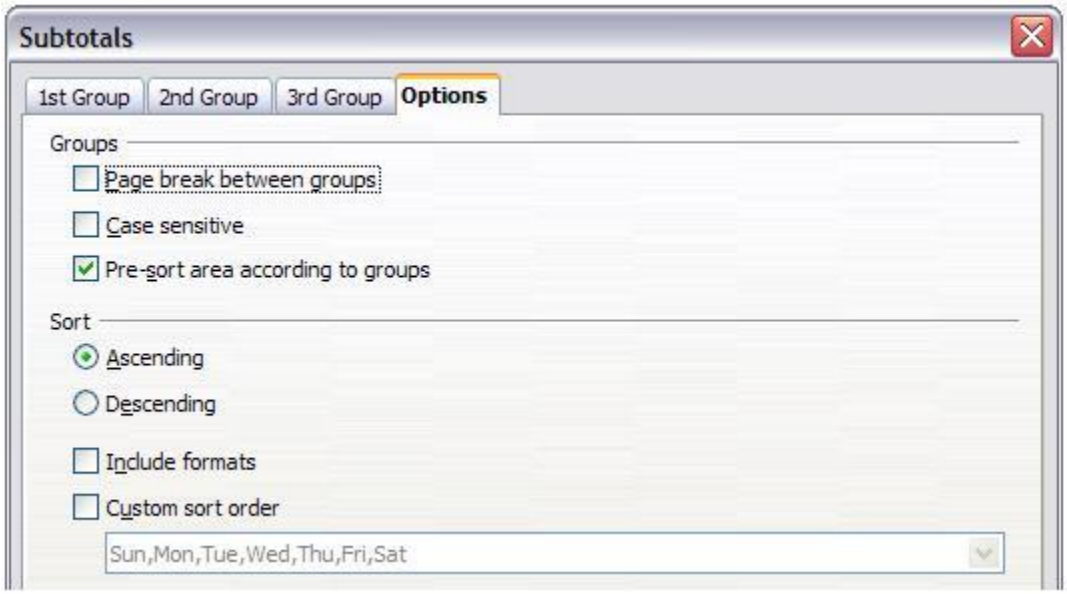


Figure 223: Choosing options for subtotals

Using “what if” scenarios

The Scenario is a tool to test “what-if” questions. Each scenario is named, and can be edited and formatted separately. When you print the spreadsheet, only the contents of the currently active scenario are printed.

A scenario is essentially a saved set of cell values for your calculations. You can easily switch between these sets using the Navigator or a drop-down list which can be shown beside the changing cells. For example, if you wanted to calculate the effect of different interest rates on an investment, you could add a scenario for each interest rate, and quickly view the results. Formulas that rely on the values changed by your scenario are updated when the scenario is opened. If all your sources of income used scenarios, you could efficiently build a complex model of your possible income.

Creating scenarios

Tools > Scenarios opens a dialog with options for creating a scenario.

To create a new scenario:

Select the cells that contain the values that will change between scenarios. To select multiple ranges, hold down the *Ctrl* key as you click. You must select at least two cells.

Choose **Tools > Scenarios**.

On the Create Scenario dialog (Figure 224), enter a name for the new scenario. It's best to use a name that clearly identifies the scenario, not the default name as shown in the illustration. This name is displayed in the Navigator and in the title bar of the border around the scenario on the sheet itself.

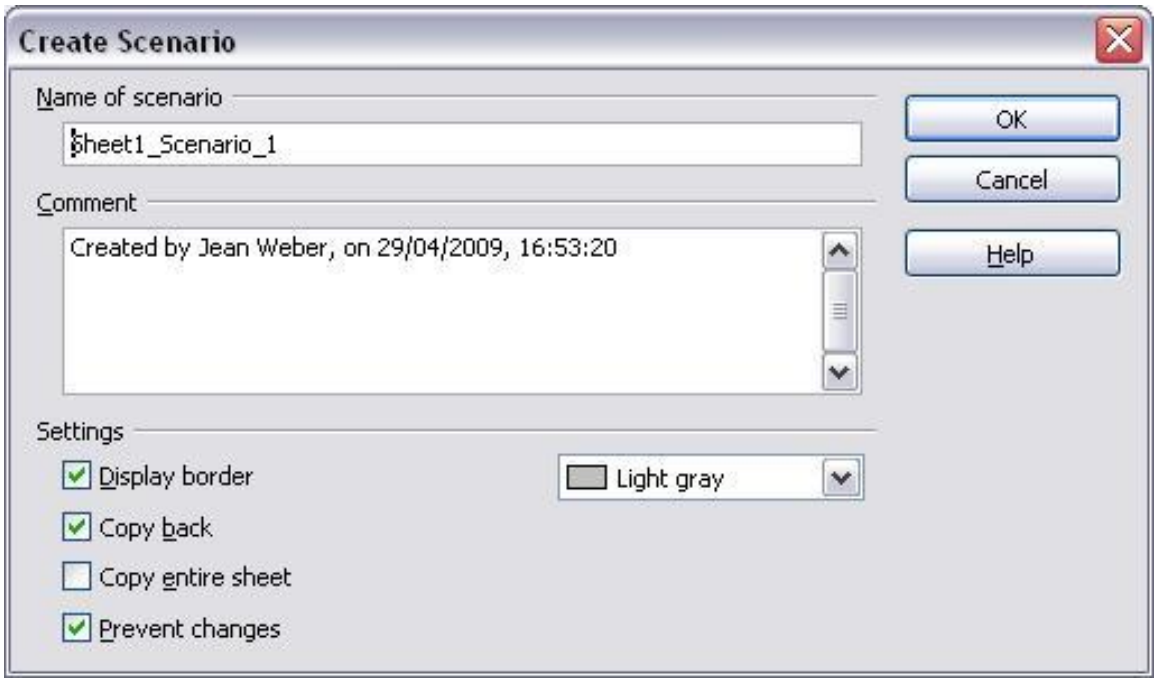


Figure 224: Creating a scenario

Optionally add some information to the **Comment** box. The example shows the default comment. This information is displayed in the Navigator when you click the Scenarios icon and select the desired scenario.

Optionally select or deselect the options in the *Settings* section. See below for more information about these options.

Click **OK** to close the dialog. The new scenario is automatically activated.

You can create several scenarios for any given range of cells.

Settings

The lower portion of the Create Scenario dialog contains several options. The default settings (as shown in Figure 224) are likely to be suitable in most situations.

Display border

Places a border around the range of cells that your scenario alters. To choose the color of the border, use the field to the right of this option. The border has a title bar displaying the name of the active scenario. Click the arrow button to the right of the scenario name to open a drop-down list of all the scenarios that have been defined for the cells within the border. You can choose any of the scenarios from this list at any time.

Copy back

Copies any changes you make to the values of scenario cells back into the active scenario. If you do not select this option, the saved scenario values are never changed when you make changes. The actual behavior of the **Copy back** setting depends on the cell protection, the sheet protection, and the **Prevent changes** setting (see Table 8 on page 258).

Caution

If you are viewing a scenario which has **Copy back** enabled and then create a new scenario by changing the values and selecting **Tools > Scenarios**, you also inadvertently overwrite the values in the first scenario.

This is easily avoided if you leave the current values alone, create a new scenario with **Copy back** enabled, and then change the values only when you are viewing the new scenario.

Copy entire sheet

Adds to your document a sheet that permanently displays the new scenario in full. This is in addition to creating the scenario and making it selectable on the original sheet as normal.

Prevent changes

Prevents changes to a scenario enabled as a *Copy back*, when the sheet is protected but the cells are not. Also prevents changes to the settings described in this section while the sheet is protected. A fuller explanation of the effect this option has in different situations is given below.

Changing scenarios

Scenarios have two aspects that can be altered independently:

Scenario properties (the settings described above)

Scenario cell values (the entries within the scenario border)

The extent to which either of these aspects can be changed is dependent upon both the existing properties of the scenario and the current protection state of the sheet and cells.

Changing scenario properties

If the sheet is protected (**Tools > Protect Document > Sheet**), and **Prevent changes** is selected then scenario properties cannot be changed.

If the sheet is protected, and **Prevent changes** is not selected, then all scenario properties can be changed except **Prevent changes** and **Copy entire sheet**, which are disabled.

If the sheet is not protected, then **Prevent changes** does not have any effect, and all scenario properties can be changed.

Changing scenario cell values

Table 8 summarizes the interaction of various settings in preventing or allowing changes in scenario cell values.

Table 8: Prevent changes behavior for scenario cell value changes

Settings	***Change allowed***
Sheet protection ON Scenario cell protection OFF Prevent changes ON Copy back ON	Scenario cell values cannot be changed.

Settings	*Change allowed*
Sheet protection ON Scenario cell protection OFF Prevent changes OFF Copy back ON	Scenario cell values can be changed, and the scenario is updated.
Sheet protection ON Scenario cell protection OFF Prevent changes ON or OFF Copy back OFF	Scenario cell values can be changed, but the scenario is not updated due to the Copy back setting.
Sheet protection ON Scenario cell protection ON Prevent changes ANY SETTING Copy back ANY SETTING	Scenario cell values cannot be changed.
Sheet protection OFF Scenario cell protection ANY SETTING Prevent changes ANY SETTING Copy back ANY SETTING	Scenario cell values can be changed and the scenario is updated or not, depending on the Copy back setting.

Working with scenarios using the Navigator

After scenarios are added to a spreadsheet, you can jump to a particular scenario by selecting it from the list in the Navigator.

Click the **Scenarios** icon in the Navigator (see Figure 225). The defined scenarios are listed, along with the comments that were entered when the scenarios were created.

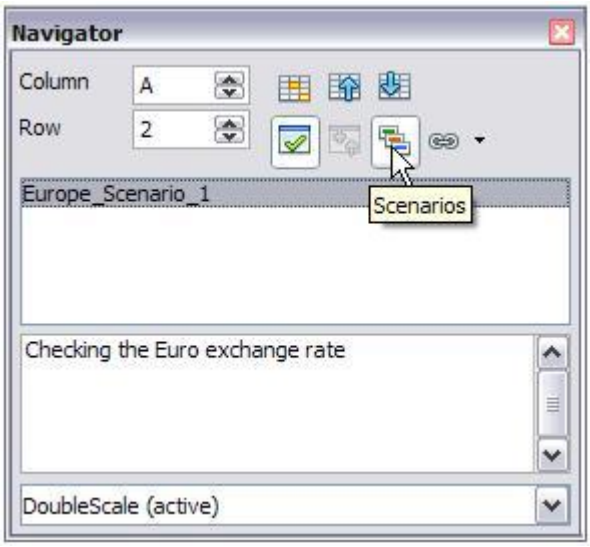


Figure 225: Scenarios in the Navigator

To apply a scenario to the current sheet, double-click the scenario name in the Navigator.

To delete a scenario, right-click the name in the Navigator and choose **Delete**.

To edit a scenario, including its name and comments, right- click the name in the Navigator and choose **Properties**. The Edit Properties dialog is the same as the Create Scenario dialog (Figure 224).

Tracking values in scenarios

To learn which values in the scenario affect other values, choose **Tools > Detective > Trace Dependents**. Arrows point to the cells that are directly dependent on the current cell.

Using other "what if" tools

Like scenarios, **Data > Multiple Operations** is a planning tool for "what if" questions. Unlike a scenario, the Multiple Operations tool does not present the alternate versions in the same cells or with a drop-down list. Instead, the Multiple Operations tool creates a formula array: a separate set of cells showing the results of applying the formula to a list of alternative values for the variables used by the formula. Although this tool is not listed among the functions, it is really a function that acts on other functions, allowing you to calculate different results without having to enter and run them separately.

To use the Multiple Operations tool, you need two arrays of cells. The first array contains the original or default values and the formulas applied to them. The formulas must be in a range.

The second array is the formula array. It is created by entering a list of alternative values for one or two of the original values.

Once the alternative values are created, you use the Multiple Operations tool to specify which formulas you are using, as well as the original values used by the formulas. The second array is then filled with the results of using each alternative value in place of the original values.

The Multiple Operations tool can use any number of formulas, but only one or two variables. With one variable, the formula array of alternative values for the variables will be in a single column or row. With two variables, you should outline a table of cells such that the alternative values for one variable are arranged as column headings, and the alternative values for the other variable act as row headings.

Setting up multiple operations can be confusing at first. For example, when using two variables, you need to select them carefully, so that they form a meaningful table. Not every pair of variables is useful to add to the same formula array. Yet, even when working with a single variable, a new user can easily make mistakes or forget the relationships between cells in the original array and cells in the formula array. In these situations, **Tools > Detective** can help to clarify the relations.

You can also make formula arrays easier to work with if you apply some simple design logic. Place the original and the formula array close together on the same sheet, and use labels for the rows and columns in both. These small exercises in organizational design make working with the formula array much less painful, particularly when you are correcting mistakes or adjusting results.

Note	If you export a spreadsheet containing multiple operations to Microsoft Excel, the location of the cells containing the formula must be fully defined relative to the data range.

Multiple operations in columns or rows

In your spreadsheet, enter a formula to calculate a result from values that are stored in other cells. Then, set up a cell range containing a list of alternatives for one of the values used in the formula. The **Multiple Operations** command produces a list of results adjacent to your alternative values by running the formula against each of these alternatives.

Note	Before you choose the **Data > Multiple Operations** option, be sure to select not only your list of alternative values but also the adjacent cells into which the results should be placed.

In the *Formulas* field of the Multiple Operations dialog, enter the cell reference to the formula that you wish to use.

The arrangement of your alternative values dictates how you should complete the rest of the dialog. If you have listed them in a single column, you should complete the field for *Column input cell*. If they are along a single row, complete the *Row input cell* field. You may also use both in more advanced cases. Both single and double-variable versions are explained below.

The above can be explained best by examples. Cell references correspond to those in the following figures.

Let's say you produce toys that you sell for $10 each (cell B1). Each toy costs $2 to make (cell B2), in addition to which you have fixed costs of $10,000 per year (cell B3). How much profit will you make in a year if you sell a particular number of toys?

Calculating with one formula and one variable

To calculate the profit, first enter any number as the quantity (items sold); in this example, 2000 (cell B4). The profit is found from the formula *Profit=Quantity * (Selling price – Direct costs) – Fixed costs*. Enter this formula in B5: **=B4*(B1-B2)-B3**.

In column D enter a variety of alternative annual sales figures, one below the other; for example, 500 to 5000, in steps of 500.

Select the range D2:E11, and thus the values in column D and the empty cells (which will receive the results of the calculations) alongside in column E.

Choose **Data > Multiple Operations**.

With the cursor in the *Formulas* field of the Multiple operations dialog, click cell B5.

Set the cursor in the *Column input cell* field and click cell B4. This means that B4, the quantity, is the variable in the formula, which is to be replaced by the column of alternative values. Figure 226 shows the worksheet and the Multiple operations dialog. Click **OK**. The profits for the different quantities are now shown in column E. See Figure 227.

Tip	You may find it easier to mark the required reference in the sheet if you click the Shrink icon to reduce the Multiple operations dialog to the size of the input field. The icon then changes to the Maximize icon; click it to restore the dialog to its original size.

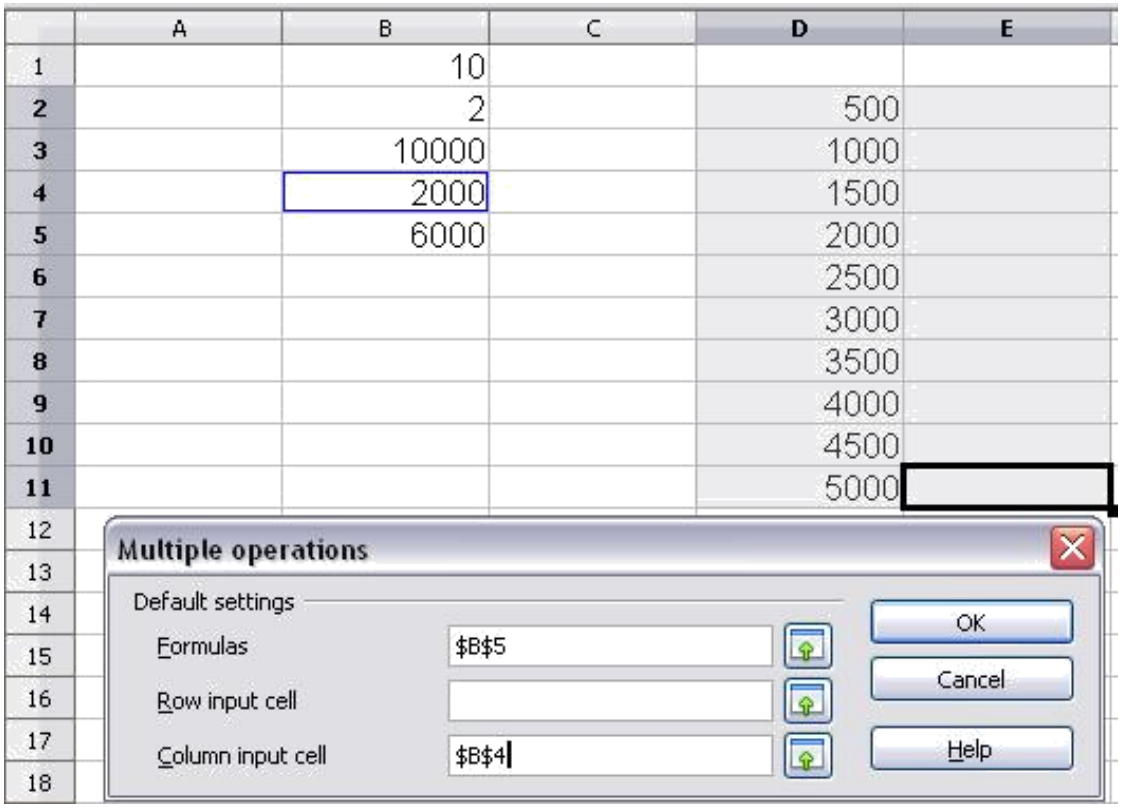


Figure 226: Sheet and Multiple operations dialog showing input

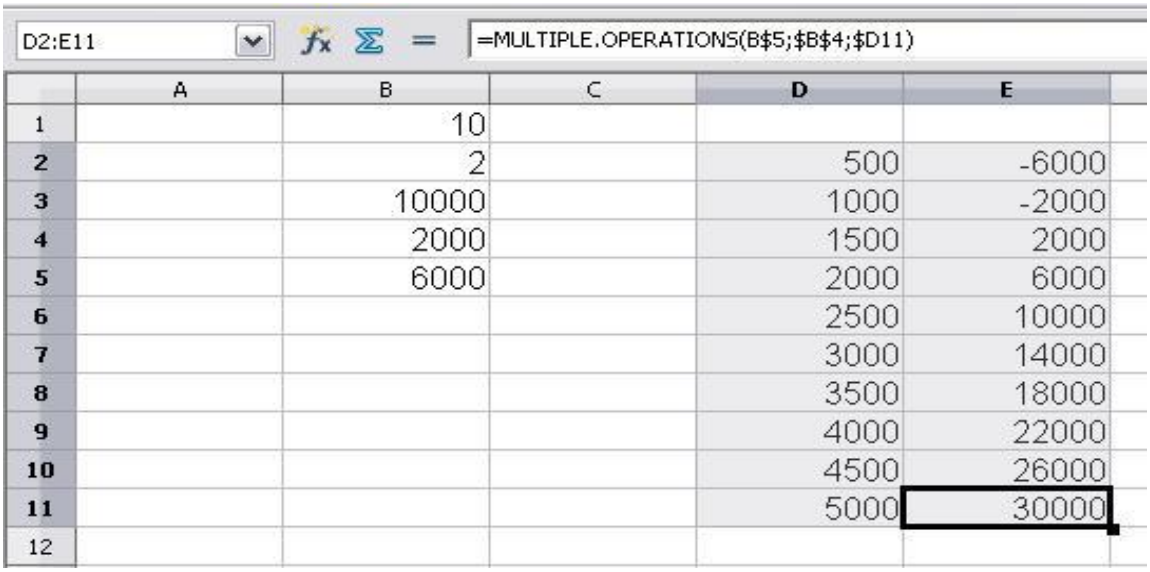


Figure 227: Sheet showing results of multiple operations calculations

Calculating with several formulas simultaneously

In the sheet from the previous example, delete the contents of column E.

Enter the following formula in C5: **=B5/B4**. You are now calculating the annual profit per item sold.

Select the range D2:F11, thus three columns.

Choose **Data > Multiple Operations**.

With the cursor in the *Formulas* field of the Multiple operations dialog, select cells B5 and C5.
Set the cursor in the *Column input cell* field and click cell B4. Figure 228 shows the worksheet and the Multiple operations dialog.

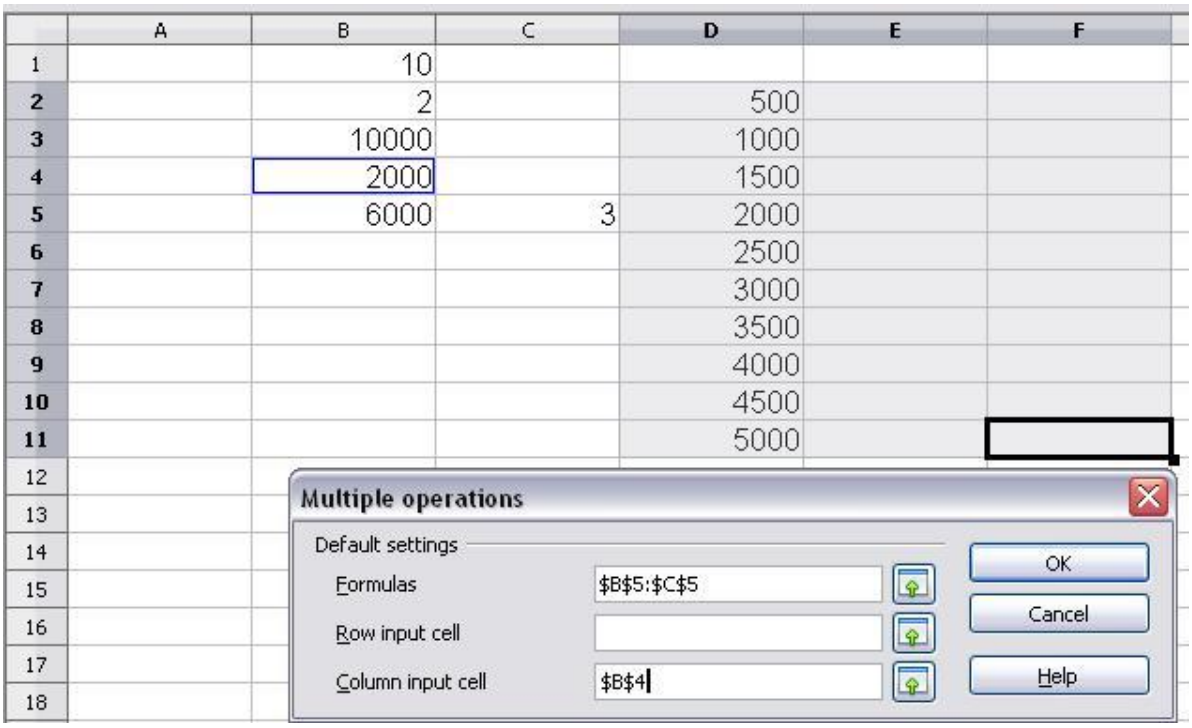
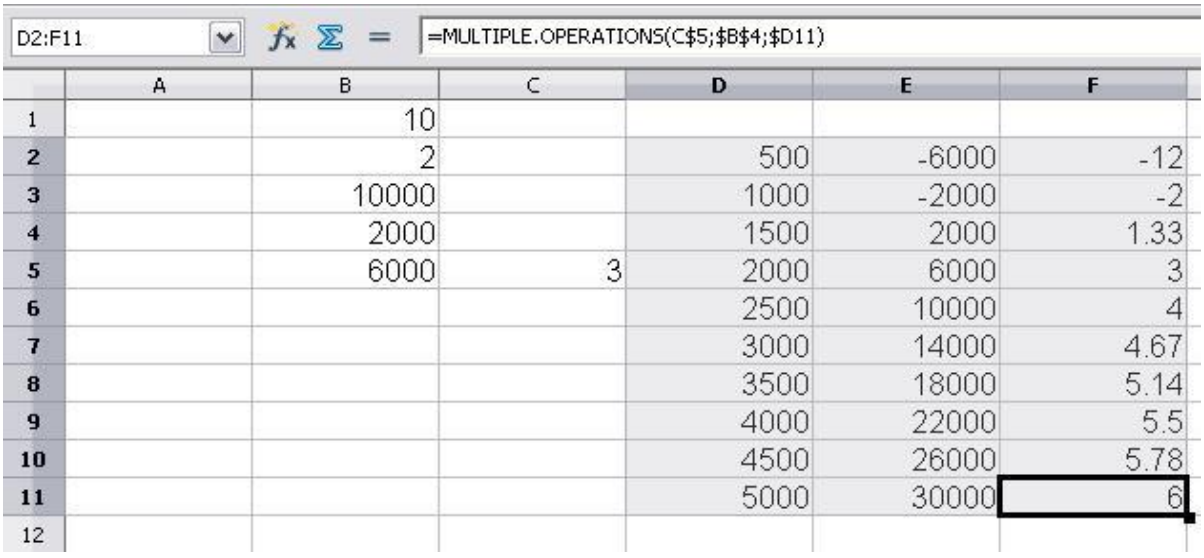


Figure 228: Sheet and dialog showing input

7) Click **OK**. Now the profits are listed in column E and the annual profit per item in column F.



	A	B	C	D	E	F
1		10				
2		2		500	-6000	-12
3		10000		1000	-2000	-2
4		2000		1500	2000	1.33
5		6000	3	2000	6000	3
6				2500	10000	4
7				3000	14000	4.67
8				3500	18000	5.14
9				4000	22000	5.5
10				4500	26000	5.78
11				5000	30000	6
12						

Figure 229: Results of multiple operations calculations

Multiple operations across rows and columns

You can carry out multiple operations simultaneously for both columns and rows in so-called cross-tables. The formula must use at least two variables, the alternative values for which should be arranged so that one set is along a single row and the other set appears in a single column. These

two sets of alternative values will form column and row headings for the results table produced by the Multiple Operations procedure.

Select the range defined by both data ranges (thus including all of the blank cells that are to contain the results) and choose **Data > Multiple operations**. Enter the cell reference to the formula in the *Formulas* field. The *Row input cell* and the *Column input cell* fields are used to enter the reference to the corresponding cells of the formula.

Caution	Beware of entering the cell reference of a variable into the wrong field. The Row input cell field should contain not the cell reference of the variable which changes down the rows of your results table, but that of the variable whose alternative values have been entered along a single row.

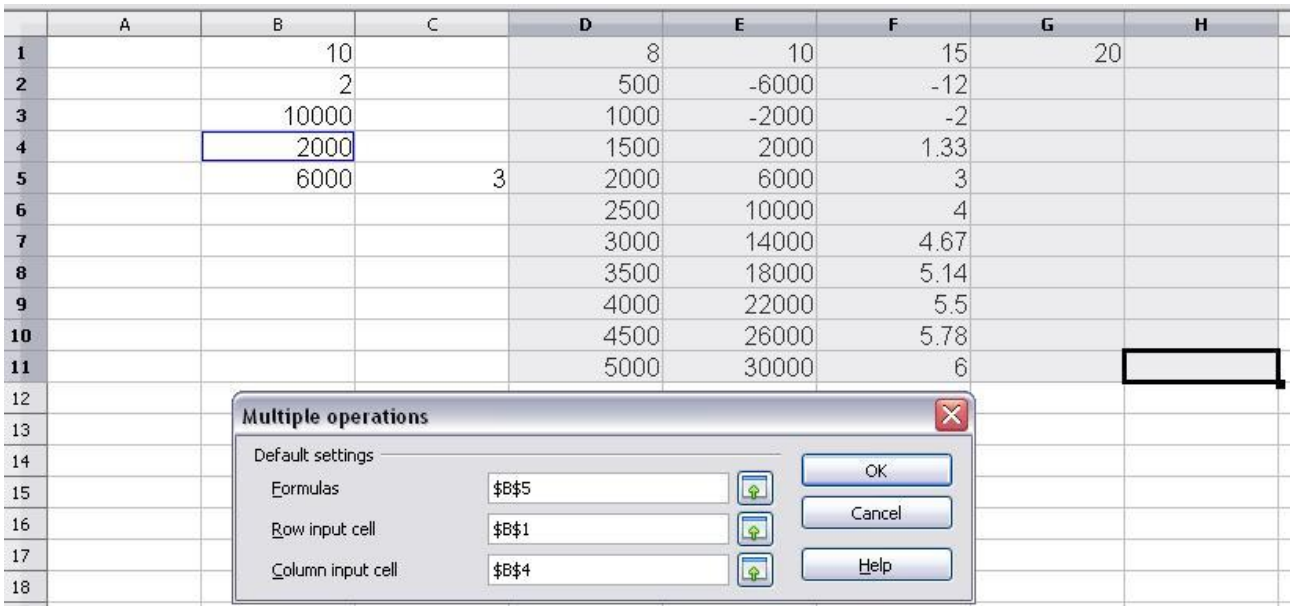
Calculating with two variables

You now want to vary not just the quantity produced annually, but also the selling price, and you are interested in the profit in each case.

Expand the table shown in Figure 228. D2 thru D11 already contain the numbers 500, 1000 and so on, up to 5000. In E1 through H1 enter the numbers 8, 10, 15 and 20.

Select the range D1:H11.

Choose **Data > Multiple Operations**.



	A	B	C	D	E	F	G	H
1		10		8	10	15	20	
2		2		500	-6000	-12		
3		10000		1000	-2000	-2		
4		2000		1500	2000	1.33		
5		6000	3	2000	6000	3		
6				2500	10000	4		
7				3000	14000	4.67		
8				3500	18000	5.14		
9				4000	22000	5.5		
10				4500	26000	5.78		
11				5000	30000	6		
12								
13								
14								
15								
16								
17								
18								

Figure 230: Sheet and dialog showing input

With the cursor in the *Formulas* field of the Multiple operations dialog, click cell B5 (profit).
Set the cursor in the *Row input cell* field and click cell B1. This means that B1, the selling price, is the horizontally entered variable (with the values 8, 10, 15 and 20).
Set the cursor in the *Column input cell* field and click cell B4. This means that B4, the quantity, is the vertically entered variable.
Click **OK**. The profits for the different selling prices are now shown in the range E2:H11 (See Figure 231).

D1:H11 =MULTIPLE.OPERATIONS(B5;B4;$D11;$B$1;H$1)

	A	B	C	D	E	F	G	H
1		10			8	10	15	20
2		2		500	-7000	-6000	-3500	-1000
3		10000		1000	-4000	-2000	3000	8000
4		2000		1500	-1000	2000	9500	17000
5		6000	3	2000	2000	6000	16000	26000
6				2500	5000	10000	22500	35000
7				3000	8000	14000	29000	44000
8				3500	11000	18000	35500	53000
9				4000	14000	22000	42000	62000
10				4500	17000	26000	48500	71000
11				5000	20000	30000	55000	80000

Figure 231: Results of multiple operations calculations

Working backwards using Goal Seek

Usually, you create a formula to calculate a result based upon existing values. By contrast, using **Tools > Goal Seek** you can discover what values will produce the result that you want.

To take a simple example, imagine that the Chief Financial Officer of a company is developing sales projections for each quarter of the forthcoming year. She knows what the company's total income must be for the year to satisfy stockholders. She also has a good idea of the company's income in the first three quarters, because of the contracts that are already signed. For the fourth quarter, however, no definite income is available. So how much must the company earn in Q4 to reach its goal? The CFO can enter the projected earnings for each of the other three quarters along with a formula that totals all four quarters. Then she runs a goal seek on the empty cell for Q4 sales, and receives her answer.

Other uses of goal seek may be more complicated, but the method remains the same. Only one argument can be altered in a single goal seek.

Goal Seek example

To calculate annual interest (I), create a table with the values for the capital (C), number of years (n), and interest rate (i). The formula is **I = C*n*i**.

Let us assume that the interest rate i of 7.5% and the number of years n (1) will remain constant. However, you want to know how much the investment capital C would have to be modified in order to attain a particular return I. For this example, calculate how much capital C would be required if you want an annual return of $15,000.

Enter each of the values mentioned above into adjacent cells (for Capital, C, an arbitrary value like $100,000 or it can be left blank; for number of years, n, 1; for interest rate, i, 7.5%). Enter the formula to calculate the interest, I, in another cell. Instead of C, n, and i, use the reference to the cell with the corresponding value. In our example (Figure 232), this would be =B1*B2*B3.

Place the cursor in the formula cell (B4), and choose **Tools > Goal Seek**.

In the Goal Seek dialog, the correct cell is already entered in the *Formula cell* field.

Place the cursor in the *Variable cell* field. In the sheet, click in the cell that contains the value to be changed, in this example it is B1.

Enter the desired result of the formula in the *Target value* field. In this example, the value is **15000**. Figure 232 shows the cells and fields.

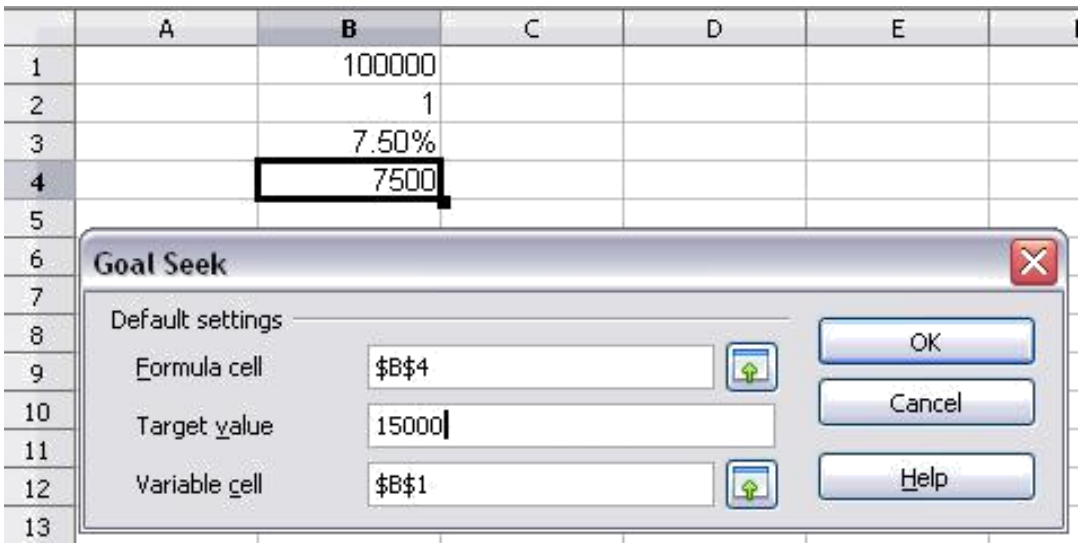


Figure 232: Example setup for goal seek

Click **OK**. A dialog appears informing you that the Goal Seek was successful. Click **Yes** to enter the goal value into the variable cell. The result is shown below indicating a capital requirement of $200,000 is needed to achieve $15,000 annual return.

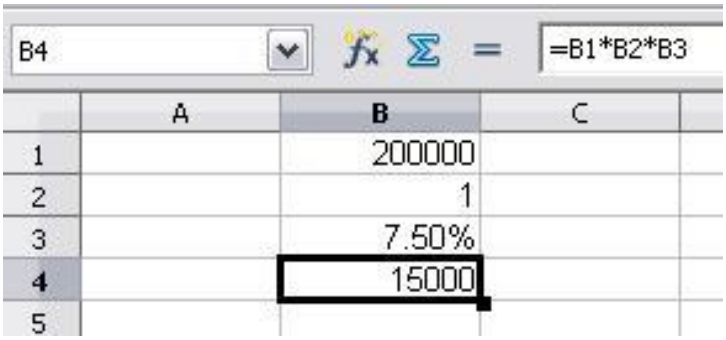


Figure 233: Result of goal seek operation

Using the Solver

Tools > Solver amounts to a more elaborate form of Goal Seek. The difference is that the Solver deals with equations with multiple unknown variables. It is specifically designed to minimize or maximize the result according to a set of rules that you define.

Each of these rules defines whether an argument in the formula should be greater than, less than, or equal to the figure you enter. If you want the argument to remain unchanged, you must enter a rule that specifically states that the cell should be equal to its current entry. For arguments that you would like to change, you need to add two rules to define a range of possible values: the limiting conditions. For example, you can set the constraint that one of the variables or cells must not be bigger than another variable, or not bigger than a given value. You can also define the constraint that one or more variables must be integers (values without decimals), or binary values (where only 0 and 1 are allowed).

Once you have finished setting up the rules, click the **Solve** button to begin the automatic process of adjusting values and calculating results. Depending on the complexity of the task, this may take some time.

Solver example

Let's say you have $10,000 that you want to invest in two mutual funds for one year. Fund X is a low risk fund with 8% interest rate and Fund Y is a higher risk fund with 12% interest rate. How much money should be invested in each fund to earn a total interest of $1000?

To find the answer using Solver:

Enter labels and data:

Row labels: **Fund X**, **Fund Y**, and **total**, in cells A2 thru A4.

Column labels: **interest earned**, **amount invested**, **interest rate**, and **time period**, in cells B1 thru E1.

Interest rates: **8** and **12**, in cells D2 and D3.

Time period: **1**, in cells E2 and E3.

Total amount invested: **10000**, in cell C4.

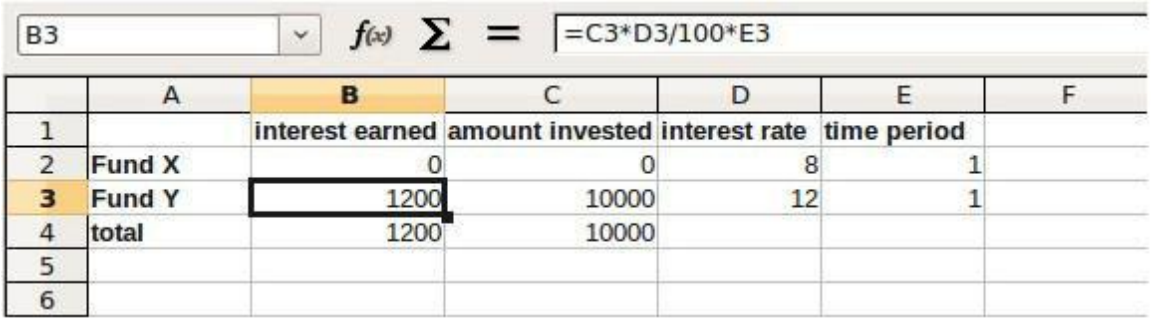
Enter an arbitrary value (0 or leave blank) in cell C2 as amount invested in Fund X.

Enter formulas:

In cell C3, enter the formula **C4–C2** (total amount – amount invested in Fund X) as the amount invested in Fund Y.

In cells B2 and B3, enter the formula for calculating the interest earned (see Figure 234).

In cell B4, enter the formula **B2+B3** as the total interest earned.



	A	B	C	D	E	F
1		interest earned	amount invested	interest rate	time period	
2	Fund X	0	0	8	1	
3	Fund Y	1200	10000	12	1	
4	total	1200	10000			
5						
6						

Figure 234: Example setup for Solver

Choose **Tools > Solver**. The Solver dialog (Figure 235) opens.

Click in the *Target cell* field. In the sheet, click in the cell that contains the target value. In this example it is cell B4 containing total interest value.

Select *Value of* and enter **1000** in the field next to it. In this example, the target cell value is 1000 because your target is a total interest earned of $1000. Select *Maximum* or *Minimum* if the target cell value needs to be one of those extremes.

Click in the *By changing cells* field and click on cell C2 in the sheet. In this example, you need to find the amount invested in Fund X (cell C2).

Enter limiting conditions for the variables by selecting the *Cell reference, Operator* and *Value* fields. In this example, the amount invested in Fund X (cell C2) should not be greater than the total amount available (cell C4) and should not be less than 0.

Click **OK**. A dialog appears informing you that the Solving successfully finished. Click **Keep Result** to enter the result in the cell with the variable value. The result is shown in Figure 236.

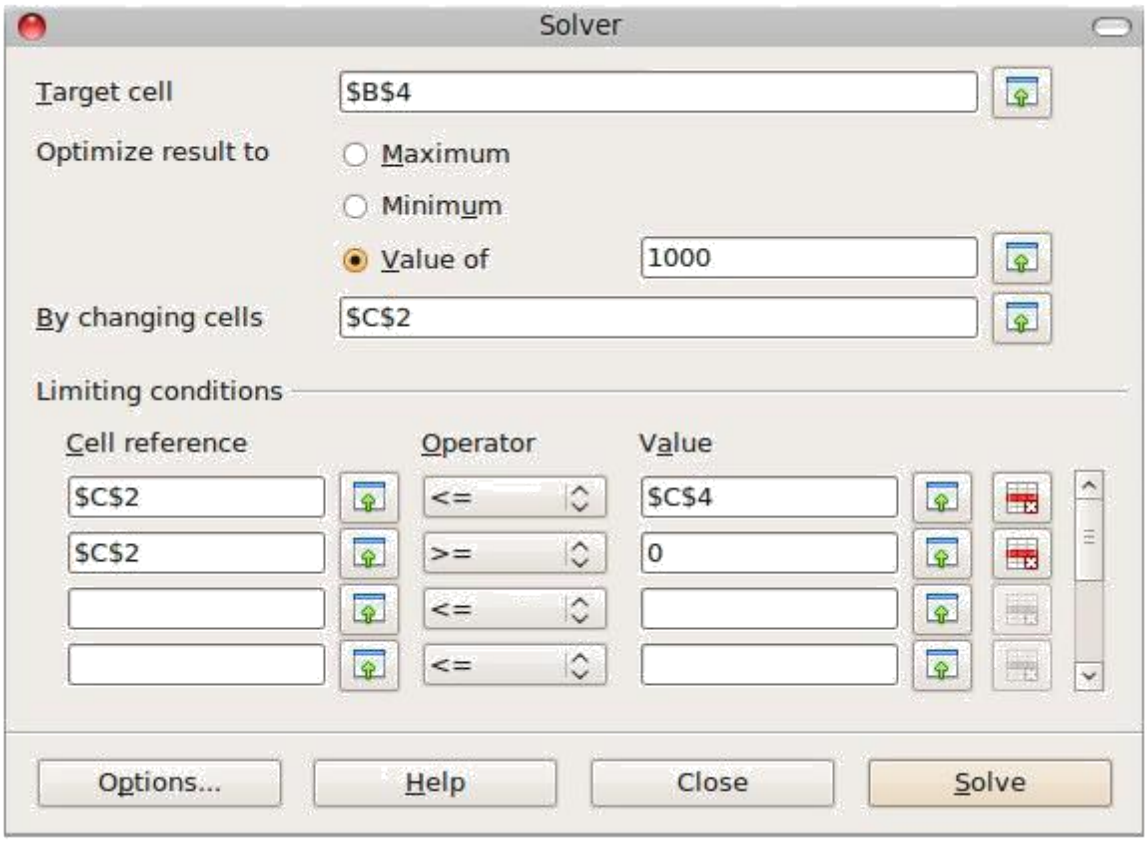


Figure 235: The Solver dialog

C3 | =C4-C2

	A	B	C	D	E	F
1		interest earned	amount invested	interest rate	time period	
2	Fund X	400	5000	8	1	
3	Fund Y	600	5000	12	1	
4	total	1000	10000			
5						
6						
7						

Figure 236: Result of Solver operation

Working with Macro

Introduction

A macro is a saved sequence of commands or keystrokes that are stored for later use. An example of a simple macro is one that “types” your address. The LibreOffice macro language is very flexible, allowing automation of both simple and complex tasks. Macros are especially useful to repeat a task the same way over and over again. This chapter briefly discusses common problems related to macro programming using Calc.

Using the macro recorder

Chapter 13 of the *Getting Started* guide, Getting Started with Macros, provides a basis for understanding the general macro capabilities in LibreOffice using the macro recorder. An example is shown here without the explanations in the *Getting Started* guide. The following steps create a macro that performs paste special with multiply.

Tip	Use **Tools > Options > LibreOffice > Advanced** and select the **Enable macro recording** option to enable the macro recorder.

Open a new spreadsheet.

Enter numbers into a sheet.

	A	B	C
1	1	8	9
2	2	7	10
3	3	6	11

Figure 285: Enter numbers

Select cell A3, which contains the number 3, and copy the value to the clipboard.

Select the range A1:C3.

Use **Tools > Macros > Record Macro** to start the macro recorder. The Record Macro dialog is displayed with a stop recording button.

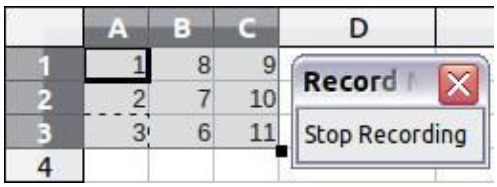


Figure 286: Stop recording button

6) Use **Edit > Paste Special** to open the Paste Special dialog (Figure 287).

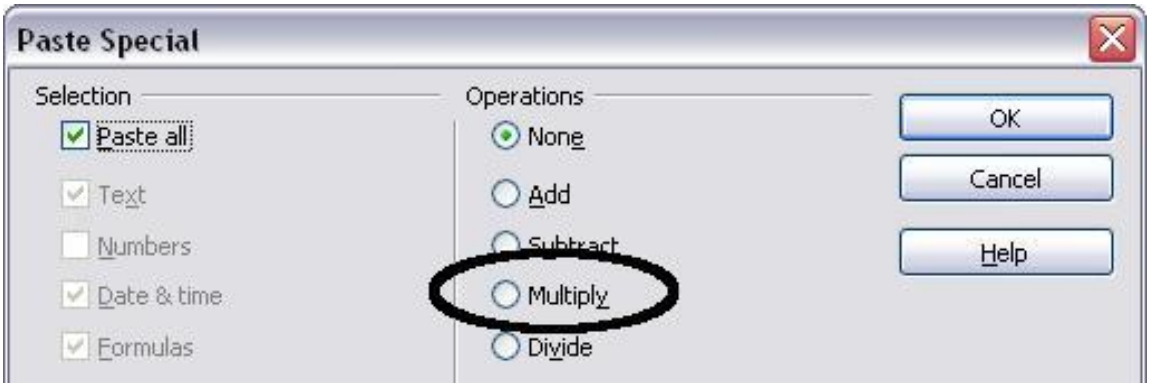


Figure 287: Paste Special dialog

7) Set the operation to **Multiply** and click **OK**. The cells are now multiplied by 3 (Figure 288).

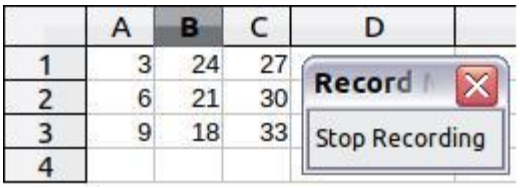
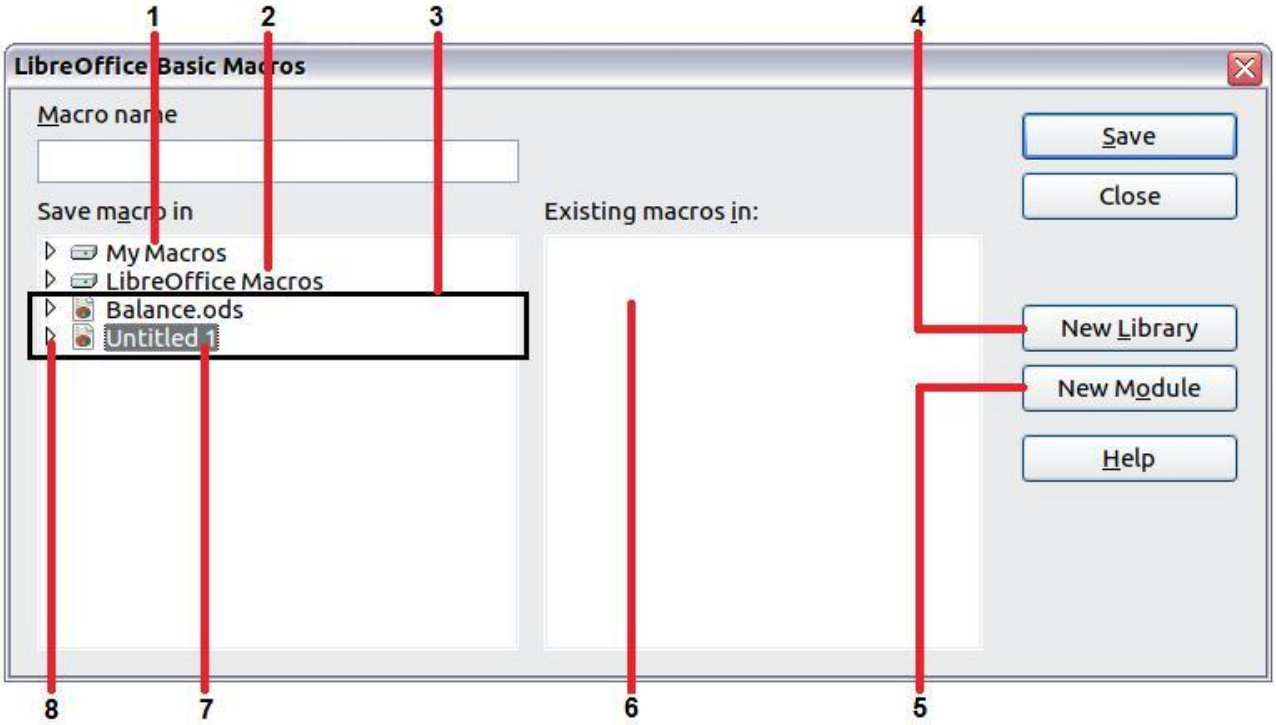


Figure 288: Cells multiplied by 3

Click **Stop Recording** to stop the macro recorder. The LibreOffice Basic Macros dialog (Figure 289) opens.



1 My Macros
2 LibreOffice Macros
3 Open documents
4 Create new library
5 Create new module in library
6 Macros in selected library
7 Current document
8 Expand/collapse list

Figure 289: Parts of the LibreOffice Basic Macros dialog

Select the current document. For this example, it is *Untitled 1*. Existing documents show a library named Standard. This library is not created until the document is saved or the library is needed, so at this point your new document does not contain a library. You can create a new library to contain the macro, but this is not necessary.

Click **New Module**. If no libraries exist, then the Standard library is automatically created and used. In the New Module dialog, type a name for the new module or leave the name as Module1.

Note	The libraries, modules and macro names must follow some strict rules. Following the main rules, the names must: • Begin with a letter • Not contain spaces • Not contain special caracters, accents included, except for _ (underscore)

11) Click **OK** to create a new module named Module1. Select the newly created Module1, type **PasteMultiply** in the *Macro name* box at the upper left, and click **Save**. (See Figure 290.)

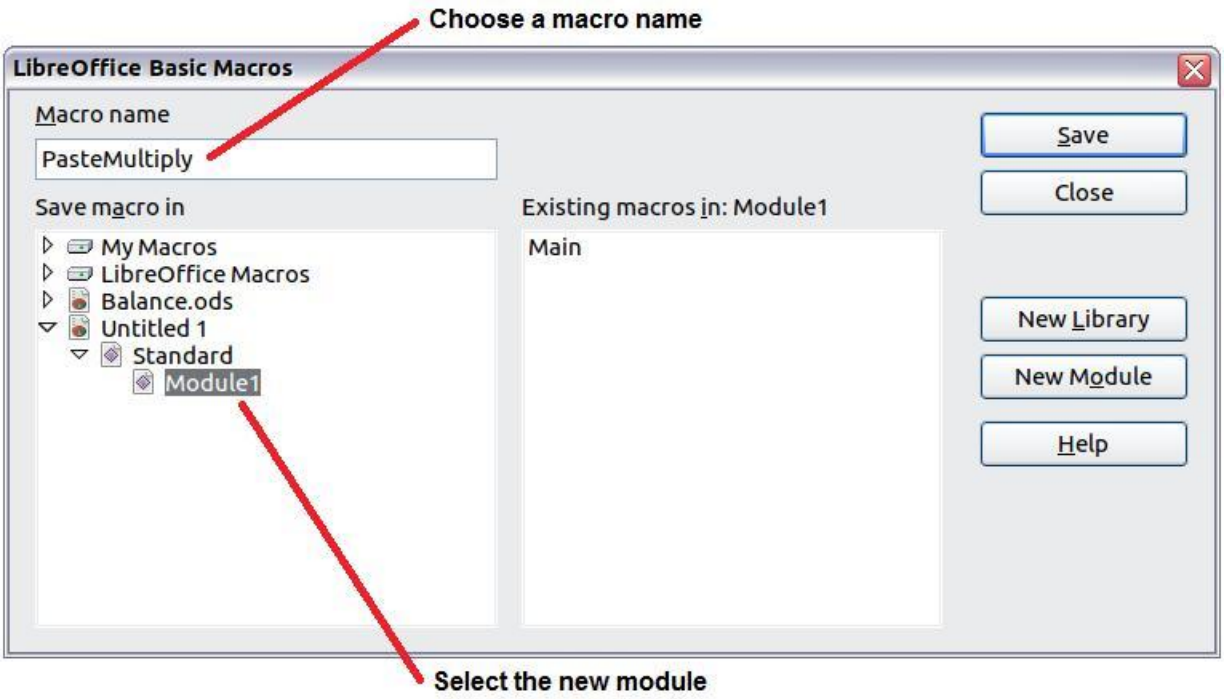


Figure 290: Select the module and name the macro

The created macro is saved in Module1 of the Standard library in the *Untitled 1* document. Listing 1 shows the contents of the macro.

Listing 1. Paste special with multiply.

```
sub PasteMultiply
    rem ----------------------------------------------------------------
    rem define variables
    dim document        as object
    dim dispatcher      as  object

    rem ----------------------------------------------------------------
    rem get access      to   the document
    document       = ThisComponent.CurrentController.Frame
    dispatcher = createUnoService("com.sun.star.frame.DispatchHelper")

    rem ----------------------------------------------------------------
    dim args1(5) as new com.sun.star.beans.PropertyValue
    args1(0).Name = "Flags"
    args1(0).Value = "A"
    args1(1).Name = "FormulaCommand"
    args1(1).Value = 3
    args1(2).Name = "SkipEmptyCells"
```

```
args1(2).Value = false
args1(3).Name = "Transpose"
args1(3).Value = false
args1(4).Name = "AsLink"
args1(4).Value = false
args1(5).Name = "MoveMode"
args1(5).Value = 4

dispatcher.executeDispatch(document, ".uno:InsertContents", "", 0, args1()) end sub
```

More detail on recording macros is provided in Chapter 13, Getting Started with Macros, in the *Getting Started* guide; we recommend you read it if you have not already done so. More detail is also provided in the following sections, but not as related to recording macros.

Write your own functions

Calc can call macros as Calc functions. Use the following steps to create a simple macro:

Create a new Calc document named CalcTestMacros.ods.

Use **Tools > Macros > Organize Macros > LibreOffice Basic** to open the LibreOffice Basic Macros dialog. The *Macro from* box lists available macro library containers including currently open LibreOffice documents. *My Macros* contains macros that you write or add to LibreOffice. *LibreOffice Macros* contains macros included with LibreOffice and should not be changed.

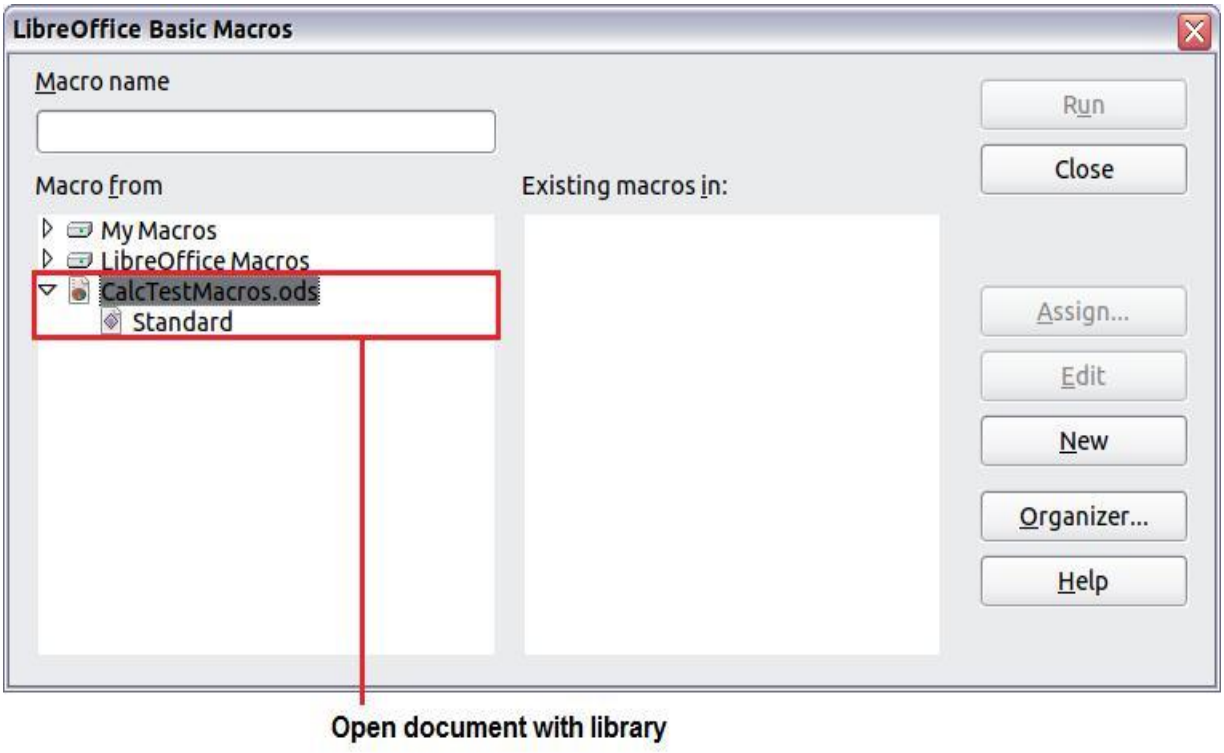


Figure 291: LibreOffice Basic Macros dialog

Source: - Libre Office Calc Guide: Version 4.1
https://documentation.libreoffice.org/assets/Uploads/Documentation/en/CG4.1/CG41CalcGuideLO.pdf