Welcome to ViewFinder

Welcome to ViewFinder for Windows, the spreadsheet and charting program designed for scientists!

Select one of the following help topics for further information:

Introduction

ViewFinder is a Windows application for storing numerical data, performing calculations and creating presentation-quality graphical data charts.

The graphical charts created by ViewFinder can be printed, saved as picture files for later insertion into a document, or transferred directly into another application using the Windows Clipboard.

Worksheets
The data is stored in worksheets, each of which can be regarded as a page containing a rectangular array, or table of data organised into rows and columns. As with other spreadsheet applications, arithmetic formulae can be used to carry out calculations using the data in a worksheet. A wide variety of mathematical and statistical functions are provided, including many specialised functions for oceanography.

Chart Pages
Charts are organised into chart pages, each page representing a single page of printed output on which there may be one or more data charts, as well as other graphical objects such as pictures and bitmaps. Each chart will generally refer to data in one or more worksheets.

Workbooks
ViewFinder stores both data and charts together in a combined file called a workbook. A single workbook file can contain as many worksheets and chart pages as available memory permits. This allows data and associated charts to be organised together as a single project.

Only one workbook file is held in memory and displayed at any one time. To transfer information between different workbooks, use the Windows clipboard.

See also:
The ViewFinder Screen
An overview of worksheet concepts
Doing calculations with worksheets
An overview of chart concepts
Menu Commands

The Windows clipboard is a device for transferring data from one place to another, including between different applications. In ViewFinder, the clipboard can be used to transfer graphics, text and/or cell data. Objects are saved onto the clipboard using Edit|Cut and Edit|Copy commands, and pasted into an application using Edit|Paste.

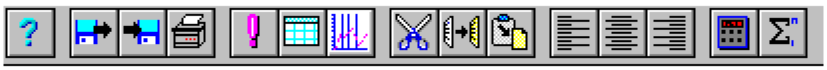
A workbook is the basic project file used by ViewFinder. A workbook contains one or more worksheets in which data is stored and calculations performed, as well as one or more chart pages on which data charts are displayed or printed. Generally, the data charts are linked to data in the worksheets. Each worksheet and chart page is identified by a unique name (up to 32 characters).

The ViewFinder Screen

ViewFinder uses a standard Windows MDI screen layout which incorporates:

Main Menu Bar
At the top, a main menu bar for selection of program commands

Button Bar
Below this is a button bar which provides graphical buttons as shortcuts for commands. There are different button bars displayed depending on whether the worksheet or chart window is active.



Client Area
The client area contains three windows that display the contents of the workbook currently loaded into memory:

The worksheet window, which displays data in the current worksheet in a spreadsheet grid array of rows and columns.

The chart window which displays the current chart page

The message window which displays program messages generated by ViewFinder.

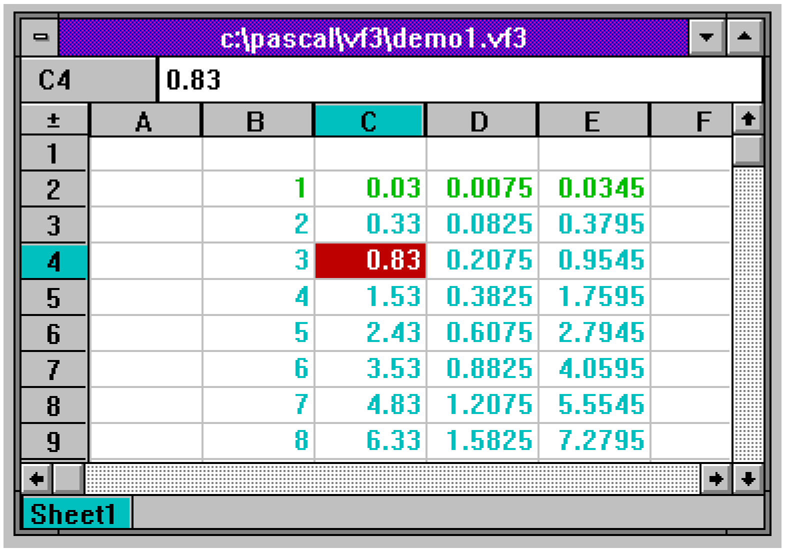
Any of these three windows may be minimized to an icon at the bottom of the client area for greater readability, and zoomed to fill the entire client area. For example, the message window icon is as follows:

Status Line
At the bottom of the screen, the status line displays program prompts and a progress indicator for lengthy tasks such as file loading.

Speed Menus can be popped up anywhere on the screen by clicking the right mouse button. The menu commands depend on whether the chart or worksheet window is visible.

Worksheet Window

The worksheet window is used to display the contents of worksheets in the current workbook. A typical worksheet window display is as follows:



Title bar
The title bar at the top of the window displays the filename of the current workbook.

Cell Display
The contents of cells are displayed in the centre, main part of the worksheet window. The way a cell is displayed depends both on the display format of the cell and on the type of cell.

Cursor cell
The cursor cell is the cell that is currently active, eg for receiving new input from the keyboard. The coordinates of the cursor cell are shown at the top left immediately below the title bar. In this example, the cursor cell is C4.

The contents of the cursor cell are shown in the editing box to the right of the cell coordinates. In the above example, the editing box shows a numerical value, 0.83. To edit the contents of the cursor cell, click in the editing box.

Note that the contants of the cursor cell are also displayed at its position in the worksheet in a highlighted color.

Row & Column Grids
The row and column coordinates visible in the window are displayed in the grid along the top and left of the worksheet display.

To scroll the row or column coordinates, use the scroll bars opposite the row/column grid.

To select a range of complete rows or columns, click and drag on the corresponding grid.

Dragging on the edge of the bar for a particular column can be used to change the column display width.

The worksheet bar
The bar at the bottom of the window displays the name(s) of all the worksheets in the workbook, with the current (displayed) worksheet name highlighted. To display a different worksheet, click on its name.

To scroll the list of worksheets, click on the left/right arrow icons at the right of the worksheet bar.

You can change the worksheet name using the Edit|Rename Page command. Worksheet names can contain up to 32 characters and must be unique.

See also:

- Moving around the worksheet
- Entering cell data
- Editing cell data
- Erasing cell data
- The ViewFinder screen
- Chart window
- Message window

Chart Window
The Chart Window is used to display the chart pages in which charts and other graphics are stored.

Chart Pages
Each page in the Chart window corresponds to a page of printed output. Like worksheets, each chart page has a unique name to identify it. These are displayed in a bar across the bottom of the window.

To select a new chart page, click on its name.

To scroll the list of chart pages, click on the left/right arrow icons at the right of the chartpage bar.

To change the chart page name, double-click on the name in the chart page bar.

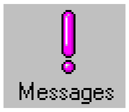
Chart pages are stored in the workbook file along with the worksheets.

Rulers
The chart window incorporates a vertical and a horizontal ruler that aids in locating objects on the page. The ruler display adjust automatically as the magnification of the window changes (see the View Menu for details of how to change the magnification.

The rulers also incorporate guides that can be used to align objects on the page to specific positions.

See also:
The ViewFinder screen
Worksheet window
Message window

Message Window



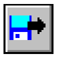
The message window displays program messages generated by ViewFinder.   These messages include:
information on loading files,
run-time errors encountered during the calculation of worksheet formulae
error messages encountered when linking worksheet data to data charts

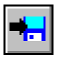
See also:
Chart window
Worksheet window
Run-time calculation errors

Worksheet Button Bar

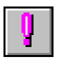
The worksheet button bar is visible at the top of the client window whenever the worksheet window is active. It contains the following graphical buttons:

 Get on-line help

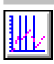
 Open a workbook file

 Save the current workbook to disk

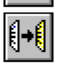
 Print the current worksheet

 Make the message window active

Make the worksheet window active

 Make the chart window active

 Cut the selected cells to the clipboard

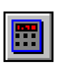
 Copy the selected cells to the clipboard

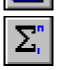
 Paste the contents of the clipboard into the worksheet

 Left-justify, centre-justify or right-justify the display of the selected cells.

Increase number of decimal places displayed

Decrease number of decimal places displayed

 Recalculate formulae in the selected cells

 Recalculate all formulae in the worksheet

See also:

Chart Button Bar

Chart Button Bar

The Chart Button Bar is visible at the top of the client area whenever the chart window is active. It contains the following graphical buttons:

Get on-line help

Open a workbook file

Save the current workbook to disk

Print the current chart page

Make the message window active

Make the worksheet window active

Make the chart window active

Cut the selected chart object to the clipboard

Copy the selected chart object to the clipboard

Paste a chart object, metafile picture or bitmap from the clipboard

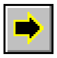
Left-justify, centre-justify or right-justify the display of the selected cells.

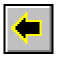
Make the selected object grow in size

Make the selected object shrink in size

Change the font for a chart label

 Change the colour of the selected object

 Select the next object on the chart page

 Select the previous object on the chart page

See also:

Worksheet button bar

Speed Menus

A speed menu is a small popup menu that can be activated inside the Chart window or the Worksheet window by right-clicking the mouse. Each speed menu contains a small subset of the active menu commands. Speed menus are an alternative to the menu bar for frequently-used commands.

See also

Menu commands

Overview of Worksheets

A ViewFinder worksheet is a rectangular grid of cells, each of which may contain numerical data, text labels or formulae for carrying out calculations.

The worksheet is organised into columns labelled A, B, C, ... horizontally across the grid, and rows numbered 1, 2, 3, ... vertically down the grid.   In each worksheet there can be up to 512 columns and 9999 rows.

The coordinates of a cell in the worksheet, specified as the column letter followed by the row number, are used to refer to a particular cell. For example, A1 is the cell in column A, row 1.

See also:

Worksheet cells
Syntax highlighting
Cell naming conventions
Cell display format
Moving around the worksheet
Entering cell data
Editing cell data
Worksheet calculations
Worksheet window

Cell naming conventions

Formulae used in ViewFinder worksheet often make reference to individual cells, or rectangular ranges of cells, in order to retrieve the values contained in cells.

Individual cells
Individual cells in a worksheet are referred to by giving the column letter A, B, C, ... immediately followed by the row number. For example

A1	refers to the cell in column A, row 1
B44	refers to the cell in column B, row 44
AZ12	refers to the cell in column AZ, row 12

Cell ranges
A rectangular block, or range, of cells is referred to by quoting the coordinated of the top left cell and the bottom right cell separated by either a colon character ':' or an ellipsis '..' (two full stops). For example

A1..A5	refers to the cells in column A, rows 1 through 5
A5..C11	refers to the cells in columns A through C, rows 5 through 11

Where possible, the range formula may be abbreviated. For example

A1..A5 may be abbreviated to A1..5 (column A is the same for both)

If the row OR column address is missing, the formula implies all rows or columns. Thus

A..C is columns A through C, all rows
1..3 is rows 1 through 3, all columns.

Special Range Names
There are two special range names:

NONE	equivalent to an empty cell range
ALL	the range containign all filled cells in the worksheet

Absolute vs Relative Cell & Range Names
By default, ViewFinder considers cell and range names to be relative to the current cell. Thus, for a formula, the coordinates of a cell are calculated relative to the cell in which the formula is located. As an example, suppose a formula containing the cell address

A2

was placed in the cell at address B5. ViewFinder translates the address A2 internally to mean the cell 1 column to the left and 3 rows up from the formula location (B5). Thus if this formula was copied to the cell at address C10, the cell address formula would be converted to

B5

which is still the cell 1 column to the left and 3 rows up from the new formula location (C10).

To fix the absolute coordinates of a cell or cellrange reference so that this relative translation is not done, precede the column and or row address by the '$' character. Thus

A2	always refers to the cell at A1
$A2	refers to the cell in column A, but row address is relative

A$2	refers to the cell in row 2, but column address is relative

Shortcut
To make the entire cell or range address absolute, precede it by the '@' character. Thus

@A2	is the same as	A2
@A2..5	is the same as	A2..A5

See also
Repeating formulae

Worksheet cells

Worksheet cells can be of several types:

A **text cell** contains a descriptive label, name or column heading used to add explanatory remarks to the worksheet. Any cell entry can be forced to be of text type by making the first character a double quote ".

A **repeating text** cell contains a single character that repeats across the worksheet until a non-empty cell is encountered. These are entered by typing a single quote character ' followed by the character that will be repeated.

A **procedure cell** contains a special formula that carries out some operation, usually one that affects the contents of many cells (see Worksheet procedure formulae).

A **not-available** cell is a cell that would normally be expected to contain a numerical value, but does not have a value available. These cells display as a dash character '-'. You can enter the **not available** attribute into a cell by typing a single dash character as input.

Not available also becomes assigned to a calculated cell if the formula giving rise to the cell's value refers to another cell whose value is not available. Text, repeating, procedure and not-available cells, as well as empty cells, have no valid numerical value and all return **not available** in cell formulae.

Cells that do contain a numerical value are of four kinds:

A **constant number value** obtained by typing in a valid number from the keyboard.

A **formula** that returns a valid numerical value.

A **calculated value** produced by a repeating formula.

An **ERROR** value generated in a formula or calculated value cell by a run-time arithmetic error such as divide by zero.

The different types of cell in a worksheet are distinguished by syntax highlighting in which each type is displayed using a different screen color.

See also
    Worksheet calculations

Moving around the worksheet

There are several methods for moving the cell cursor around the worksheet window.

Using the keyboard

Arrow keys	move one cell position left, right, up or down
Ctrl+Left, Right	move one screenful of columns left or right
PgUp, PgDn	move one screenful of rows up or down
Ctrl+PgUp, PgDn	move 100 rows up or down
Home	move to column A
End	move to last filled column
Ctrl+Home	move to cell A1
Ctrl+End	move to last filled column + row

Holding down the SHIFT key while making any of the above cursor moves will select all cells in the rectangular area created by the cursor movement.

Using the mouse

To move to a single cell visible in the window, click anywhere inside its cell position.

To make a cell position visible that is off screen, use the scroll bars at the right and/or bottom of the cell display.

To select a range of cells, click and drag the mouse over the required cells. The display will scroll at the extremes if required.

See also:

Entering cell data
Editing cell data
Selecting cells

Selecting cells

To select a range of cells, eg for use in a command,

EITHER
    Drag the mouse over the range of cells required
OR
    Hold down the SHIFT key and use the cursor keys

See also
    Moving around the worksheet

Entering cell data

To enter data into a worksheet cell, move the cursor to the desired cell and begin typing on the keyboard.

The worksheet prompt on the status line will switch from "Ready" to "Editing" and the characters that you type will appear in the edit box at the top of the worksheet window.

When you have finished typing, press the ENTER key to transfer the contents of the editing box to the cursor cell. Provided the new cell contents are valid, the cell cursor will advance automatically to the next cell one row down.

To cancel entering new cell data, press ESC.

See also:
Worksheet Cells
Editing cell data

Editing cell data

To edit the contents of a cell, move the cursor to it and

EITHER Click with the mouse left button in the editing box that displays the cell contents,

OR Press CTRL + ENTER

OR Select the menu command Edit|Selection

Edit the cell contents as required, then press ENTER to transfer the new contents to the cell, or press ESC to cancel the changes made.

See also:
Worksheet cells
Entering cell data

Display format of cells

The way cells are displayed and printed in worksheets is controlled by a variable called the **display format**.

Text cells

These can be displayed with left, right or centred justification (see Format|Align). Left- or centre-aligned text cells can overwrite the display width of the column if the cell(s) to the right are empty. In this case, centre-aligned cells will be centred within the group of columns that completely contain the text string.

The overwriting of empty cells by text is "cut off" by any non-empty cell.

Procedure cells (and formula cells when the Display Formulae option is set), display in the same way as text cells.

Number cells

This includes cells containing a number constant, a calculated constant and formula cells (provided the Display Formulae option is not set). Like text, numbers can be displayed with left, right or centre alignment.

There are 4 options for the way numbers are formatted:

Scientific format (e-format)
In this case, numbers are expressed in standard scientific notation, for example

1.23e12 9.76e-12 0.00e00

For scientific notation, the number of decimal places appearing in the mantissa is specified as part of the display format.

Floating point format
In this case, numbers are expressed with a predetermined number of decimal places

1.244 0.001233 0.0

General format
In this case, the maximum number of significant figures is specified. If the number falls within a range that is suitable for floating point display, this is used. Trailing zeros are suppressed. If the number is outside this range, scientific notation is used.

Significant figures format
This format is simiular to general except that trailing zeros are not suppressed, so the specified number of significant figures is always displayed.

If the number, as displayed by the selected format, is too wide to appear in the cell, then the display is converted to a sequence of '#' characters. In this case, increase the column width to see the correct display.

Repeating text cells

Format information is ignored for these cells.

How the format is applied

The display format can apply to the whole worksheet (see Default cell format), entire rows (Format|Rows) or columns (Format|Columns) or to an individual cell (Format|Cells). ViewFinder determines the format to use for a particular cell as follows:

1. If the cell is not empty and has a format different from its column, the cell format is used.

2. Otherwise, if the column is not empty and its format is different from the default, the column format is used.

3. Otherwise, the default cell format is used.

See also

Column display width

Number too wide?

If a number in the worksheet would be too wide to be properly displayed in its cell, the display is converted to a sequence of '#' characters:

##.##### appears instead of the expected number

In this case, increase the column width to see the correct display.

See also
Display format of cells

Column display width

The display width of columns in a new worksheet, or in new columns created by Insert|Column, is set to a default value determined by the Setup|Worksheet option Default column width. To change the display width of a particular column:

Either

Move the mouse over the right edge of the column bar at the top of the column until the cursor changes to a double arrow, and then drag the mouse until the dotted line indicates the desired column width,

Or

Select the desired column and then choose the Format|Column width menu command.

See also

Display format of cells

Worksheet calculations

Calculations are carried out in the ViewFinder worksheet by entering mathematical formulae directly into a cell.

The components of a cell formula may include:

Type	*Examples*
Numbers	1.25, -44.003, 1.25e+23
Cell references	A1, B1 + C1
Operators	+ - * /
Parentheses	( )
Mathematical functions	sin() sqrt() round()
Statistical functions	mean(), stderr()
Other special functions	rand, row

In general, cell formulae return a value (the result of the calculation) that becomes the value displayed in the cell. You can tell that a cell contains a formula, rather than a constant value, because

(a) it is displayed in a different color (see Syntax highlighting)
(b) the formula becomes visible in the editing box when the cursor is over the cell.
(c) the formula must be preceded by an equals '=' sign.

In addition, ViewFinder also includes procedures which are formulae that do not themselves return a value but which affect the contents of other cells in the worksheet. An example is the regression() procedure that calculates the coefficients of regression for two columns of data.

See also:
- How formulae are stored
- Entering a cell formula
- Constant formulae
- Repeating formulae
- Mathematical functions
- Procedure formulae
- Run-time error messages

How formulae are stored

In ViewFinder, formulae are first entered into a worksheet cell by typing text from the keyboard (see Entering a cell formula) or by importing text from the clipboard or a disk file.

Once entered, the text is *parsed* to see if the formula is valid. In this process, the formula is compiled to an internal binary notation (Reverse Polish) for actually calculating the results. This compilation greatly increases the speed of subsequent recalculations.

The text displayed for editing in the editing box is generating by de-compiling the internal binary notation. For this reason, all names in the formula are converted to upper case. Formulae are not case-sensitive.

Entering a cell formula

To enter a formula into a cell, move the worksheet cursor over the cell and begin typing the formula. Text that is typed will appear in the editing box (see Entering cell data).

NOTE: The first character for a formula must be the '=' character. This signals to ViewFinder that a formula is being entered.

When the formula is complete, press the ENTER key to transfer the formula to the cursor cell. ViewFinder then checks the formula for errors and displays an error message if any occur, returning focus to the editing box.

If the formula is correct, ViewFinder will convert all the text to upper case (as displayed in the editing box). Since formulae are not case sensitive, entering everything in lower case letters is a good check on the validity of formulae used.

Normally, the value of the formula is displayed in the worksheet cell and the formula itself is only visible in the editing box when the cursor is over the cell. However, the presence of the formula can be deduced from the syntax colors used to display the cell value.

To reverse this arrangement, ie display the formula in the cell and the value in the editing box, select the Display cell formulae option in the Options|Worksheet dialog.

Numbers in formulae

Constant numbers in cell formulae may be written in standard numerical notation, eg

1.23   125.778 -25

The last example shows that numbers need not contain a decimal point.

Scientific notation may also be used:

1.0e3 is equivalent to **1000**
1.25e-3 is equivalent to **0.00125**

Numbers are stored internally in 64-bit floating point precision (15-16 significant figures), regardless of the number of digits actually displayed in the worksheet. They may have magnitudes in the range 5.0e-324 to 1.7e+308.

An arithmetic expression that evaluates to a constant is stored as a constant formula.

Constant formula

A constant formula is one that contains number constants as well as operators and/or number-value functions that evaluates overall to a constant value. In other words, a constant formula is any cell formula that does not contain a cell reference.

Example	*Value*
=1+2+3	6
=sqrt(9)	3
=sqr(sqrt(4.25))	4.25

Constant formulae are stored like any other formulae in ViewFinder, making it easier to see their logical meaning. However, they are not normally recalculated.

See also:

Numbers in formulae

Parentheses in Formulae

The order in which arithmetic operations are carried out depends on the precedence of operators and functions in a formula. This order may be changed by grouping parts of a formula inside parentheses. The components of a formula inside paretheses are always completely evaluated before being used in operations outside the parentheses.

For example, the formula

=1 + 2 * 3

is evaluated by multiplying 2 and 3 together *first* (result 6) and then adding 1 (result 7). This is done since multiplication has higher precedence than addition.

However, if the expression were bracketed as follows

=(1 + 2) * 3

it is evaluated by *first* adding 1 and 2 (result 3) to evaluate the expression inside the parentheses, and then multiplying by 3 (result 9).

Parentheses are also used to surround the arguments of functions and procedures. For example

=SQRT(4 + 5)

This is done to ensure that function arguments are evaluated before the function is applied to the result.

See also

Precedence of operators

Operators in formulae

Operators, like functions, are used in formulae to carry out mathematical calculations or comparisons.

Unary operators
Binary operators
Comparison (boolean) operators
Precedence of operators

See also
Mathematical functions

Unary operators

The only unary operator in ViewFinder formulae is the NOT operator, which calculates the bitwise complement of the number that follows it. The symbol for the NOT operator is the exclamation mark '!'.

Examples

=!0 is equal to -1
=!C3 equals bitwise complement of value in C3

See also
Operators in formulae
Operator precedence

Binary operators

Binary arithmetic operators carry out a binary arithmetic operation on two numbers, producing a single number result. They have the general syntax

number_1 operator number_2

The operators used in ViewFinder are illustrated below acting on two number quantities symbolised by A and B.

A + B	add A and B
A - B	subtract B from A
A * B	multiply A and B
A / B	divide A by B
A & B	arithmetic AND of A and B
A | B	arithmetic OR of A and B
A ^ B	raise A to the power B

See also

Operators in Formulae
Operator precedence

Comparison (boolean) operators

Comparison, or boolean, operators compare the values of two numbers and return a TRUE (represented by 1) or FALSE (represented by 0) value.

The boolean operators are illustrated below using two symbolic numbers A and B.

A < B	TRUE if A is less than B
A > B	TRUE if A is greater than B
A <= B	TRUE if A is less than or equal to B
A >= B	TRUE if A is greater than or equal to B
A == B	TRUE if A is equal to B
A != B	TRUE if A is not equal to B

In addition to the above, the following logical operators can be used to link the results of tweo boolean comparisons B1 and B2

B1 && B2	Logical AND of B1 and B2
B1 || B2	Logical OR of B1 and B2

Logical expressions are used for conditional evaluation in the IF worksheet function.

See also

Operators in Formulae
Operator precedence

Precedence of operators

The order of operator and function precedence, from highest to lowest, is

8. Arithmetic functions
7. NOT operator (!)
6. Exponentiation (^)
5. Multiply (*), Divide (/), AND (&)
4. Add (+), Subtract (-), OR (|)
3. Boolean comparison operators < <= > >=
2. Boolean equality operators == !=
1. Logical operators && ||

See also

Parentheses in formulae

Cell references in formula

The numerical value of cells that contain a valid number can be included in a cell formula using the coordinates of the cell in column letter-row number terminology (see Cell naming conventions).

=**A1**	returns the value in cell A1
=**A1+A2**	returns the sum of the values in A1 and A2

Note that the use of a cell reference cannot be circular, ie a cell formula cannot refer to the cell in which it is stored.

Cell references expressed in normal column-row notation are considered to be coordinates that are **relative** to the cell in which the formula is found. **Absolute** coordinates are obtained by preceding the row or column address by '$' (see Cell naming conventions and Repeating formulae).

A1	relative address (both row and column)
A1	absolute address (both row and column)
@A1	same as A1
$A1	absolute column, relative row
A$1	relative row, absolute column

Not-available values
If a formula refers to one or more cells that does not contain a valid numerical value, the formula cannot be evaluated and returns a **Not Available** result. This is displayed as a dash character in the worksheet display.

Examples of cells that do not have a valid numerical value are

Empty cells
Cells containing text
A cell having a **Not-Available** value

A **Not Available** value can be entered deliberately into a cell (rather than just leaving it empty) by typing a dash character.

See also
Referencing cells in another worksheet
Worksheet Cells

Referencing cells in another worksheet

To refer to a cell in another worksheet in a formula, precede the cell reference with the name of the worksheet followed by a period.

For example, to obtain the value of cell B22 in worksheet SHEET4, use the reference

    =SHEET4.B22

in any cell formula.

NOTE: You can only refer to cells in worksheets contained in the same workbook.

See also

Cell references in formula
Cell naming conventions

Repeating formulae

Quite commonly, a calculation needs to be repeated for a set of numbers stored in one or more columns. This involves repeated calculations in which the formula applied is exactly the same, and all that changes is the cell values to which the formula is applied.

For example, to calculate the net profit for a set of monthly income and cost figures, one would use the following arrangement

A	B	C	D
	Income	Cost	Profit
Jan	1200	780	B2-C2
Feb	1400	850	B3-C3
Mar	1360	910	B4-C4

etc

The basic formula used here is

Profit = Income - Cost
= Bxx - Cxx

where xx is the row number for each month. This approach is wasteful, since it requires a copy of the formula for every case.

ViewFinder allows **repeating formulae** in which a formula is used as a template for repeating the calculation down a column. The syntax is

formula, stop_condition

where *formula* is the cell formula, written exactly as if the calculation was being carried out for a single cell, and *stop_condition* describes when to stop repeating the formula, row by row, down the column. The possibilities for *stop_condition* are

1. The number of the last row for the repeating calculation. For example

=B2-C2, 24

will repeat the calculation down to row 24, equivalent to B24-C24.

2. A plus sign '+' followed by the number of rows to repeat downwards. For example

=B2-C2, +11

will repeat for 11 further rows, making 12 rows in total.

3. The keyword ERROR will repeat until the first calculation error. This includes the minor error condition where the list of numbers used in the formula has run out, returning a NOT AVAILABLE result. Thus

=**B2-C2, error**

will repeat the calculation down the rows until a cell entry in either column B or column C is missing or invalid.

See also
Cell references in formulae

Cell naming conventions

Run-time calculation errors

Run-time calculation errors may arise when worksheet cells containing a formula are recalculated, for example if a function argument is out of range, or on division by zero.

Run-time errors are reported in the message window, providing information about the worksheet and cell which caused the error, and the type of error, for example:

Sheet1.H9: Divide by zero

indicates that cell H9 in the worksheet named 'Sheet1' contains an error value as a result of an attempted division by zero. In this case, **ERROR** would appear in the worksheet display in place of the cell's value (see Worksheet Cells)

ViewFinder run-time error messages

Math library error
Divide by zero
Zero arg in "TAN"
Abs(arg) > 1 in "ASIN"
Abs(arg) > 1 in "ACOS"
Arg <= 0 in "LOG"
Arg < 0 in "SQRT"
"EXP" or "ALOG" result out of range
"SINH"/"COSH"/"TANH" result out of range
"POW" result out of range
Not enough data in range for statistics
Negative/zero value in range for geometric mean
Singular matrix
Polynomial coefficient missing
"PUT" would overwrite it''s own cell
Procedure would overwrite input data
Not enough points for smoothing
Unknown chemical formula in "RMM"
Unable to execute "EXTERNAL" program
FFT allocation
ROOT: equation cell has no formula
ROOT: singularity, no root exists

Unknown arithmetic function
Unknown opcode
Argument stack error
Formula Cell not allocated
Argument must be a square matrix
Matrix order out of range
Matrix is singular, can''t invert
SOLVE: coefficient columns overlap
MINIMIZE: equation cell has no formula
MINIMIZE: no variables specified
RUNGEKUTTA: Invalid derivative value
RUNGEKUTTA: Invalid number of variables
RUNGEKUTTA: Invalid variable value
RUNGEKUTTA: Must have 1 or more integration steps
RUNGEKUTTA: Integration step too small

Math library error

An internal error has occurred in the maths library, perhaps due to overflow of a numerical value.

Divide by zero

An attempt was made to divide by zero. Check the contents of cells referenced in the formula for a zero value.

Infinite value in "TAN"

The angle supplied as argument to TAN is such that the result is infinite.

Abs(arg) > 1 in "ASIN"

The argument supplied to the ASIN function has a magnitude greater than 1.00

Abs(arg) > 1 in "ACOS"

The argument supplied to the ACOS function has a magnitude greater than 1.00

Arg <= 0 in "LOG"

The argument supplied to the LOGT function has a value less than or equal to zero.

Arg < 0 in "SQRT"

The argument supplied to the SQRT function has a negative value.

"EXP" or "ALOG" result out of range

The argument supplied to the EXP or ALOG function is so large in magnitude that the result woud exceed the valid range for numbers.

"SINH"/"COSH"/"TANH" result out of range

The argument supplied to the SINH, COSH or TANH function is so large in magnitude that the result woud exceed the valid range for numbers.

"POW" result out of range

The arguments supplied to the exponentiation operator ^ are so large in magnitude that the result woud exceed the valid range for numbers.

Not enough data in range for statistics

There are not enough data points in the cellrange supplied as argument to calculate the statistical function specified.

Negative/zero value in range for geometric mean

There is a negative or zero value in the cell range specified for calculating a geometric mean. All values must be positive.

Singular matrix

The coefficient matrix used for a statistical calculation is singular and cannot be inverted.

Polynomial coefficient missing

A polynomial coefficient needed for the POLY function is missing. Check the cells in the cellrange specified.

"PUT" would overwrite it's own cell

The target cell in the PUT procedure is the cell containing the PUT formula.

Procedure would overwrite input data

The specified procedure would overwrite worksheet cells that contain input data for the procedure.

Not enough points for smoothing

There must be at least 4 data points for the SMOOTH (moving average) procedure.

Unknown chemical formula in "RMM"

The chemical element symbol supplied as argument to the RMM function is not valid - it does not correspond to a known chemical element.

Unable to execute "EXTERNAL" program

ViewFinder is unable to execute the program specified in the EXTERNAL procedure, probably because the program file does not exist, the path to the program file was not specified or there is not enough memory.

FFT execute error

Error while executing Fast Fourier Transform calculation. Contact KAH Software.

ROOT: equation cell has no formula

The equation cell specified in the ROOT procedure does not contain a formula and hence cannot be varied.

ROOT: singularity, no root exists

The equations derived from the ROOT procedure are singular and have no solution.

Unknown arithmetic function

An unknown arithmetic function opcode was encountered. Contact KAH Software.

Unknown opcode

An unknown internal opcode was encountered. Contact KAH Software.

Argument stack error

An argument stack error was encountered. Contact KAH Software.

Formula Cell not allocated

A cell pointer allocation error was encountered. Contact KAH Software.

Argument must be a square matrix

The cellrange supplied as argument to the INVERT, EIGEN or SOLVE procedure does not correspond to a square matrix.

Matrix order out of range

The order (size) of the polynomial created for the INVERT, EIGEN or SOLVE procedure is too large. The maximum is order 9.

Matrix is singular, can't invert

The matrix created for solving the INVERT, EIGEN or SOLVE procedure is singular and cannot be inverted. No solution is possible.

SOLVE: coefficient columns overlap

The X, Y or matrix B coefficients in the SOLVE procedure arguments overlap with each other.

MINIMIZE: equation cell has no formula

The equation cell specified in the MINIMIZE procedure does not contain a formula and hence cannot be minimized.

MINIMIZE: no variables specified

There are no variable cells specified in the argument to the MINIMIZE procedure.

RUNGEKUTTA: Invalid derivative value

A cell specified for one of the variable derivatives in a RUNGEKUTTA procedure does not contain a valid numerical value.

RUNGEKUTTA: Invalid number of variables

There must be between 1 and 32 variables referred to in a RUNGEKUTTA procedure.

RUNGEKUTTA: Invalid variable value

A cell specified for one of the variables in a RUNGEKUTTA procedure does not contain a valid numerical value.

RUNGEKUTTA: Must have 1 or more integration steps

The number of integration steps specified in the RUNGEKUTTA procedure is invalid. There must be 1 or more steps.

RUNGEKUTTA: Integration step too small

The integration step for the RUNGEKUTTA procedure has become too small.

Mathematical functions

Mathematical functions used in cell formulae take one or more arguments (in parentheses) and return a numerical result that depends on the arguments. There are three basic groups of mathematical function:

Listings by Category

- Standard arithmetic functions
- Statistical functions
- Oceanographic functions
- Miscellaneous functions

Alphabetical Listing

Standard arithmetic functions

The standard arithmetic functions all have the same syntax:

function_name(argument)

where *function_name* is the name of the function and *argument* is any numerical expression (including a formula).

ABS	Absolute value
COS	Cosine
SIN	Sine
TAN	Tangent
ACOS	Inverse cosine
ASIN	Inverse sine
ATAN	Inverse tangent
COSH	Hyperbolic cosine
SINH	Hyperbolic sine of
TANH	Hyperbolic tangent
EXP	Exponential
LN	Natural logarithm
LOG	Common logarithm
ALOG	Common antilogarithm
TRUNC	Truncate to nearest integer lower in value
ROUND	Round up to nearest integer larger in value
SQR	Square
SQRT	Square root
RADIANS	Convert degrees to radians
DEGREES	Converts radians to degrees
GAMMALN	Logarithm of gamma function
ERF	Error function
ERFC	Complementary error function

See also:

Mathematical functions

ABS

Returns the absolute value of a number. The absolute value of a number is the number without its sign.

Syntax

ABS(number)

Number is the real number of which you want the absolute value.

Examples

ABS(2) equals 2
ABS(-2) equals 2
If A1 contains -16, then:
SQRT(ABS(A1)) equals 4

TRUNC

Truncates a number to an integer by removing the fractional part of the number.

Syntax

TRUNC(number)

Number is the number you want to truncate.

TRUNC and ROUND are similar in that both return integers. TRUNC removes the fractional part of the number. ROUND rounds numbers up to the nearest integer based on the value of the fractional part of the number.

Examples

TRUNC(8.9) equals 8
TRUNC(-8.9) equals -8
TRUNC(PI) equals 3

ROUND

Rounds a number to the nearest integer.

Syntax

ROUND(number)

Number is the number you want to round.

Examples

ROUND(21.50) equals 22
ROUND(21.49) equals 21

See also:
TRUNC

SQR

Returns the square of a number.

Syntax

SQR(number)

Number is the number you want the square of.

To obtain other powers of a number, use the exponentiation operator (see Operators in formulae).

Examples

SQR(2) equals 4
SQR(3) equals 3*3 equals 3^2

SQRT

Returns a positive square root.

Syntax

SQRT(number)

Number is the number for which you want the square root. If number is negative, SQRT returns the ERROR value.

Examples

SQRT(16) equals 4
SQRT(-16) equals ERROR
SQRT(ABS(-16)) equals 4

COS

Returns the cosine of the given angle.

Syntax

COS(number)

Number is the angle in radians for which you want the cosine. If the angle is in degrees, convert it to radians using the RADIANS function.

Examples

COS(1.047) equals 0.500171
COS(RADIANS(60)) equals 0.5, the cosine of 60 degrees

ACOS

Returns the arccosine of a number. The arccosine is the angle whose cosine is number. The returned angle is given in radians in the range 0 to π.

Syntax

ACOS(number)

Number is the cosine of the angle you want and must be from -1 to 1.
If you want to convert the result from radians to degrees, use the DEGREES function.

Examples

ACOS(-0.5) equals 2.094395 ($2\pi/3$ radians)
DEGREES(ACOS(-0.5)) equals 120 (degrees)

COSH

Returns the hyperbolic cosine of a number.

Syntax

COSH(number)

Examples

COSH(4) equals 27.30823
COSH(EXP(1)) equals 7.610125, where EXP(1) is e, the base of the natural logarithm.

SIN

Returns the sine of the given angle.

Syntax

SIN(number)

Number is the angle in radians for which you want the sine. If the angle is in degrees, convert it to radians using the RADIANS function.

Examples

SIN(1.047) equals 0.86593
SIN(RADIANS(30)) equals 0.5, the sine of 30 degrees

ASIN

Returns the arcsine of a number. The arcsine is the angle whose sine is number. The returned angle is given in radians in the range -π/2 to π/2.

Syntax

ASIN(number)

Number is the sine of the angle you want and must be from -1 to 1.   To express the arcsine in degrees, use the DEGREES function..

Examples

ASIN(-0.5) equals -0.5236 (-π/6 radians)
DEGREES(ASIN(-0.5)) equals -30 (degrees)

SINH

Returns the hyperbolic sine of a number.

Syntax

SINH(number)

Number is any real number.

Examples

SINH(1) equals 1.175201194
SINH(-1) equals -1.175201194

You can use the hyperbolic sine function to approximate a cumulative probability distribution. Suppose a laboratory test value varies between 0 and 10 seconds. An empirical analysis of the collected history of experiments shows that the probability of obtaining a result, x, of less than t second s is approximated by the following equation:

P(x<t) = 2.868 * SINH(0.0342 * t), where 0<t<10

To calculate the probability of obtaining a result of less than 1.03 seconds, substitute 1.03 for t:

2.868*SINH(0.0342*1.03) equals 0.101049063

You can expect this result to occur about 101 times for every 1000 experiments.

TAN

Returns the tangent of the given angle.

Syntax

TAN(number)

Number is the angle in radians for which you want the tangent. If your argument is in degrees, convert it to radians using the RADIANS function.

Examples

TAN(0.785) equals 0.99920
TAN(RADIANS(45)) equals 1

ATAN

Returns the arctangent of a number. The arctangent is the angle whose tangent is number. The returned angle is given in radians in the range -π/2 to π/2.

Syntax

ATAN(number)

Number is the tangent of the angle you want. To express the arctangent in degrees, use the DEGREES function.

Examples

ATAN(1) equals 0.785398 (π/4 radians)
DEGREES(ATAN(1)) equals 45 (degrees)

TANH

Returns the hyperbolic tangent of a number.

Syntax

TANH(number)

Number is any real number

Examples

TANH(-2) equals -0.96403
TANH(0) equals 0
TANH(0.5) equals 0.462117

RADIANS

Converts an angle in degrees to radians.

Syntax

RADIANS(number)

where **number** is the angle in degrees you wish to convert.

Examples

RADIANS(0) equals 0
RADIANS(180) equals 3.1415... (PI)

DEGREES

Converts an angle in radians to degrees.

Syntax

    DEGREES(number)

where **number** is the angle in radians you wish to convert.

Examples

DEGREES(0) equals 0
DEGREES(PI) equals 180

EXP

Returns e raised to the power of number. The constant e equals 2.71828182845904, the base of the natural logarithm.

Syntax

EXP(number)

Number is the exponent applied to the base e.

To calculate powers of bases other than e and 10, use the exponentiation operator (^) (see Operators in formulae).

EXP is the inverse of LN, the natural logarithm of number.

Examples

EXP(1) equals 2.718282 (the approximate value of e)
EXP(2) equals SQR(e), or 7.389056
EXP(LN(3)) equals 3

LN

Returns the natural logarithm of a number. Natural logarithms are based on the constant e (2.71828182845904).

Syntax

LN(number)

Number is the positive real number for which you want the natural logarithm.

LN is the inverse of the EXP function.

Examples

LN(86) equals 4.454347
LN(2.7182818) equals 1
LN(EXP(3)) equals 3
EXP(LN(4)) equals 4

LOG

Returns the base-10 (common) logarithm of a number.

Syntax

LOG10(number)

Number is the positive real number for which you want the base-10 logarithm.

Examples

LOG(86) equals 1.934498451
LOG(10) equals 1
LOG(1E5) equals 5
LOG(10^5) equals 5

ALOG

Returns 10 raised to the power of number.

Syntax

ALOG(number)

Number is the exponent applied to the base 10.

ALOG is the inverse of LOG, the common logarithm of a number.

Examples

ALOG(1) equals 10
ALOG(2) equals 10^2, or 100
ALOG(LOG(2.5)) equals 2.5

GAMMALN

Returns the natural logarithm of the gamma function, $\Gamma(x)$.

Syntax

GAMMALN(x)

X is the value for which you want to calculate GAMMALN.

If $x \leq 0$, GAMMALN returns the ERROR value.

The number e raised to the GAMMALN(i) power, where i is an integer, returns the same result as the factorial (i - 1)!.

Examples

GAMMALN(4) equals 1.791759
EXP(GAMMALN(4)) equals 6 or (4 - 1)!

ERF

Returns the error function integrated between zero and a specified limit.

Syntax

ERF(limit)

limit is the upper lower bound for integrating ERF. If **limit** is negative, ERF returns the ERROR value.

Examples

ERF(0.74500) equals 0.70793
ERF(1) equals 0.84270

ERFC

Returns the complementary ERF function integrated between a specified limit and infinity.

Syntax

ERFC(x)

X is the lower bound for integrating ERF. If x is negative, ERFC returns the ERROR value.

Example

ERFC(1) equals 0.1573

Statistical functions

COUNT	number of valid values (cells) in the range
MEAN	average of the range
MEDIAN	median of the range
LQUARTILE	lower quartile of the range
UQUARTILE	upper quartile of the range
QRANGE	range from lower to upper quartile
GEOMEAN	geometric mean of the range
MIN	minimum value in the range
MAX	maximum value in the range
SUM	sum of the range
STDDEV	standard deviation of the range
AVEDEV	average of absolute deviations from the mean of the range
RSD	relative standard deviation of the range
STDERR	standard error of the range
VAR	variance of the range

CORREL	Correlation coefficient between two data sets
COVAR	Covariance between two data sets

TDIST	Student's t-distribution
TINV	Inverse of Student's t-distribution
CHIDIST	Chi-squared distribution
CHIINV	Inverse of Chi-squared distribution
GAMMADIST	Gamma distribution
GAMMAINV	Inverse of gamma distribution
BETADIST	Beta distribution
BETAINV	Inverse of beta distribution
FDIST	F probability distribution
FINV	Inverse of F probability distribution
BINOMDIST	Binomial distribution

COUNT

Returns the number of number-filled cells in a cell range.

Syntax

COUNT(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Examples

COUNT(A1..A100)
COUNT(ALL)

SUM

Returns the sum of all the values in a cell range.

Syntax

SUM(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Examples

SUM(A1..A100)
SUM(ALL)

MEAN

Returns the average (arithmetic mean) of the numeric cells in a range.

Syntax

MEAN(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Examples

If A1:A5 contains the numbers 10, 7, 9, 27, and 2, then MEAN(A1:A5) equals 11.

MEAN(A1:A5) equals SUM(A1:A5)/COUNT(A1:A5) equals 11

MEDIAN

Returns the median of the numbers in a cell range. The median is the number in the middle of a set of numbers; that is, half the numbers have values that are greater than the median and half have values that are less.

Syntax

MEDIAN(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

If there is an even number of numbers in the set, then MEDIAN calculates the average of the two numbers in the middle. See the second example following.

Examples

Suppose A1..A6 contains the values 1, 2, 3, 4, 5 and 6.

MEDIAN(A1..A5) equals 3
MEDIAN(A1..A6) equals 3.5, the average of 3 and 4

See also
Lower quartile
Upper quartile
Quartile range

LQUARTILE

Returns the lower quartile of the numbers in a cell range. The lower quartile is the number which has 1/4 of the numbers in the set below it in value and 3/4 above it.

Syntax

LQUARTILE(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

See also
UQUARTILE
MEDIAN
QRANGE

UQUARTILE

Returns the upper quartile of the numbers in a cell range. The upper quartile is the number which has 3/4 of the numbers in the set below it in value and 1/4 above it.

Syntax

UQUARTILE(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

See also

- LQUARTILE
- MEDIAN
- QRANGE

QRANGE

Returns the difference between the upper and lower quartiles of the numbers in a cell range.

Syntax

QRANGE(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

See also

LQUARTILE
UQUARTILE
MEDIAN

GEOMEAN

Returns the geometric mean of positive data in a cell range.

Syntax

GEOMEAN(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

If any data point ≤ 0, GEOMEAN returns the ERROR value.

Example

If A1..7 contains the values 4, 5, 8, 7, 11, 4, 3 then

GEOMEAN(A1..7) equals 5.476987

MIN

Returns the smallest value in a cell range.

Syntax

    MIN(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Examples

    MIN(A1..A100)
    MIN(ALL)

MAX

Returns the largest value in a cell range.

Syntax

MAX(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Examples

MAX(A1..A100)
MAX(ALL)

STDDEV

Estimates standard deviation based on a sample. The standard deviation is a measure of how widely values are dispersed from the average value (the mean).

Syntax

STDEV(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

STDEV assumes that its arguments are a sample of the population. The standard deviation is calculated using the "nonbiased" or "n-1" method.

Example

Suppose 10 tools stamped from the same machine during a production run are collected as a random sample and measured for breaking strength. The sample values (1345, 1301, 1368, 1322, 1310, 1370, 1318, 1350, 1303, 1299) are stored in A2:E3, respectively.

STDEV estimates the standard deviation of breaking strengths for all the tools.

STDEV(A2:E3) equals 27.46

RSD

Estimates the relative standard deviation based on a sample.

Syntax

RSD(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Note:

RSD = STDDEV / MEAN

VAR

Estimates variance based on a sample.

Syntax

VAR(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Example

Suppose 10 tools stamped from the same machine during a production run are collected as a random sample and measured for breaking strength. The sample values (1345, 1301, 1368, 1322, 1310, 1370, 1318, 1350, 1303, 1299) are stored in A2:E3, respectively.

VAR estimates the variance for the breakin g strength of the tools.

VAR(A2:E3) equals 754.3

STDERR

Estimates standard error of the mean value of a sample.

Syntax

STDERR(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

STDERR = STDDEV / SQRT(COUNT)

AVEDEV

Returns the average of the absolute deviations of data points from their mean. AVEDEV is a measure of the variability in a data set.

Syntax

AVEDEV(cell_range)

cell_range is the name of the rectangular range of cells. Empty cells, or cells containing non-numerical values, are ignored.

Example

If A1..A7 contain the values 4, 5, 6, 7, 5, 4, 3 then

AVEDEV(A1..7) equals 1.020408

CORREL

Returns the correlation coefficient for paired sets of data.

Syntax

CORREL(y_data, x_data)

y_data is the cellrange name of a block of worksheet cells containing the dependent variable values, and
x_data is the cellrange name of a block of worksheet cells containing the independent variable values.

The two cell ranges must be the same size, and must contain at least 2 valid data pairs.

See also
COVAR
CORRELMATRIX
COVARMATRIX

COVAR

Returns the covariance of paired sets of data.

Syntax

COVAR(y_data, x_data)

y_data is the cellrange name of a block of worksheet cells containing the dependent variable values, and **x_data** is the cellrange name of a block of worksheet cells containing the independent variable values.

The two cell ranges must be the same size, and must contain at least 2 valid data pairs.

See also

CORREL
CORRELMATRIX
COVARMATRIX

TDIST

Returns the two-tailed Student's t-distribution. The t-distribution is used in the hypothesis testing of small sample data sets. Use this function in place of a table of critical values for the t-distribution.

Syntax

TDIST(x, degrees_freedom)

X is the numeric value at which to evaluate the distribution.
Degrees_freedom is an integer indicating the number of degrees of freedom.

Example

TDIST(1.96,60) equals 0.054645

See also

TINV

TINV

Returns the inverse of the Student's t-distribution for the specified degrees of freedom.

Syntax

TINV(probability, degrees_freedom)

Probability is the probability associated with the two- tailed Student's t-distribution.
Degrees_freedom is the number of degrees of freedom to characterize the distribution.

TINV uses an iterative technique for calculating the function. Given a probability value, TINV iterates until the result is accurate to within ± 3x10^-7. If TINV does not converge after 100 iterations, the function returns the ERROR.

Example

TINV(0.054645,60) equals 1.96

See also
TDIST

CHIDIST

Returns the one-tailed probability of the chi-squared distribution. The $\chi 2$ distribution is associated with a $\chi 2$ test. Use the $\chi 2$ test to compare observed and expected values. For example, a genetic experiment might hypothesize that the next generation of plants will exhibit a certain set of colors. By comparing the observed results with the expected ones, you can decide if your original hypothesis is valid.

Syntax

CHIDIST(X, degrees_freedom)

X is the value at which you want to evaluate the distribution.
Degrees_freedom is the number of degrees of freedom.

Test values

ChiDist(0, N)   = 1
ChiDist(10, 18) = 0.931906
ChiDist(18.307, 10) = 0.050001

See also
CHIINV

CHIINV

Returns the inverse of the one-tailed probability of the chi-squared distribution. If probability = CHIDIST(x,¼), then CHIINV(probability,¼) = x. Use this function to compare observed results with expected ones to decide if your original hypothesis is valid.

Syntax

CHIINV(probability, degrees_freedom)

Probability is a probability associated with the chi-squared distribution.
Degrees_freedom is the number of degrees of freedom.

CHIINV uses an iterative technique for calculating the function. Given a probability value, CHIINV iterates until the result is accurate to within ± 3x10^-7. If CHIINV does not converge after 100 iterations, the function returns the ERROR value.

Example

CHIINV(0.05,10) equals 18.30703

See also
CHIDIST

GAMMADIST

Returns the incomplete gamma function P(x, a).

You can use this function to study a variable whose distribution may be skewed.

Syntax

GAMMADIST(x, a)

x is the value at which you want to evaluate the distribution.
a is a parameter to the distribution.

See also
GAMMAINV

GAMMAINV

Returns the inverse of the incomplete gamma cumulative distribution. If p = GAMMADIST(x,a) then GAMMAINV(p,a) = x

You can use this function to study a variable whose distribution may be skewed.

Syntax

GAMMAINV(p, a)

p is the probability associated with the distribution.
a is a parameter to the distribution.

Example

GAMMAINV(0.068094,9) equals 10

See also
GAMMADIST

BETADIST

Returns the standard cumulative beta probability density function. The cumulative beta probability density function is commonly used to study variation in the percentage of something across samples, such as the fraction of the day people spend watching television.

Syntax

BETADIST(x, alpha, beta)

x is the value between A and B at which to evaluate the function.
alpha, beta are parameters to the distribution.

Example

BETADIST(2,8,10) equals 0.685470581

See also
BETAINV

BETAINV

Returns the inverse of the standard cumulative beta probability density function. That is, if probability = BETADIST(x,a,b), then BETAINV(probability,a,b) = x. The cumulative beta distribution can be used in project planning to model probable completion times given an expected completion time and variability.

Syntax

BETAINV(probability, alpha, beta)

Probability is a probability associated with the beta distribution.
alpha and **beta** are parameters to the distribution.

BETAINV uses an iterative technique for calculating the function. Given a probability value, BETAINV iterates until the result is accurate to within ±3x10-7. If BETAINV does not converge after 100 iterations, the function returns the ERROR.

Example

BETAINV(0.685470581,8,10) equals 2

See also
BETADIST

FDIST

Returns the F probability distribution. You can use this function to determine whether two data sets have different degrees of diversity. For example, you can examine test scores given to men and women entering high school and determine if the variability in the females is different from that found in the males.

Syntax

FDIST(x, degrees_freedom1, degrees_freedom2)

x is the value at which to evaluate the function.
degrees_freedom1 is the numerator degrees of freedom.
degrees_freedom2 is the denominator degrees of freedom.

Example

FDIST(15.20675,6,4) equals 0.01

See also
FINV

FINV

Returns the inverse of the F probability distribution. If p = FDIST(x,...), then FINV(p,...) = x.
The F distribution can be used in an F-test that compares the degree of variability in two data sets. For example, you can analyze income distributions in the United States and Canada to determine whether the two countries have a similar degree of diversity.

Syntax

FINV(probability, degrees_freedom1, degrees_freedom2)

probability is a probability associated with the F cumulative distribution.
degrees_freedom1 is the numerator degrees of freedom.
degrees_freedom2 is the denominator degrees of freedom.

FINV can be used to return critical values from the F distribution. For example, the output of an ANOVA calculation often includes data for the F statistic, F probability, and F critical value at the 0.05 significance level. To return the critical value of F, use the significance level as the probability argument to FINV.

FINV uses an iterative technique for calculating the function. Given a probability value, FINV iterates until the result is accurate to within ± 3x10^-7. If FINV does not converge after 100 iterations, the function returns the ERROR value.

Example

FINV(0.01,6,4) equals 15.20675

See also

FDIST

BINOMDIST

Returns the cumulative binomial probability distribution, ie the probability that an event of probability P will occur K or more times when N events are observed.

Syntax

BINOMDIST(P, N, K)

P is the probability if the event
N is the number of trials
K is the number of events observed in N trials (N < K)

Examples

BinomDist(0, N, K) = 0
BinomDist(0, N, K) = 1
BinomDist(0.5, 1, 2) = 0.75
BinomDist(0.5, 2, 2) = 0.25

Oceanographic functions

SIGMA_T	density anomaly at given S, T
SIGMA	density anomaly for S,T,p at pressure p_ref
SALINITY	salinity given T, p and conductivity ratio R
CONDUCTIVITY	conductivity ratio given S, T, p
DEPTH	convert pressure to depth
PRESSURE	convert depth to pressure
TEMPERATURE	T for a given S and sigma_t
POTENTIAL_T	Potential temperature give S, T and p
OXYGEN	Equilibrium solubility of O2 in seawater

SIGMA_T

This function calculates the density anomaly σt of seawater

SIGMA_T(S, T)

where **S** is the salinity, **T** is the temperature in degrees Celsius. Both parameters may be supplied as any valid arithmetic expression.

Example:

SIGMA_T(A1, B1), 25

In this example, salinity data is in column A and temperature data in column B. The formula is evaluated down to row 25 using the Repeating Formula feature.

Sigma-t is calculated using the UNESCO equation of state for seawater given in the UNESCO Technical Paper in Marine Science #44, 1983.

This function evaluates sigma-t at the surface (p = 0) and assumes that the temperature value is relevant to that pressure (depth). To calculate the potential density function, sigma-theta, either convert the temperature value using the POTENTIAL_T function, or use the full, pressure-dependent SIGMA function.

See also
Oceanographic functions

SIGMA

This function calculates the density anomaly σ of seawater at any reference pressure

SIGMA(S, T, p, p_ref)

where **S** is the salinity, **T** is the temperature in degrees Celsius, p is the pressure (decibars) at which T and S apply, and p_ref is the pressure (decibars) at which sigma is calculated. All four parameters may be supplied as any valid arithmetic expression.

Example:

SIGMA(A1, B1, C1, 4000), 25

In this example, salinity data is in column A, temperature data in column B and pressure in column C. The reference pressure is 4000 decibars (corresponding to $\sigma 4$). The formula is evaluated down to row 25 using the Repeating Formula feature.

Sigma is calculated using the UNESCO high-pressure equation of state for seawater given in the UNESCO Technical Paper in Marine Science #38, 1981. The input temperature value is converted to the potential temperature at the reference pressure. Thus the potential density at the surface, sigma-theta can be calculated in two ways:

SIGMA(S, T, p, 0)
or SIGMA_T(S, POTENTIAL_t(S, T, p))

The common derived density functions $\sigma 2$ and $\sigma 4$ are calculated, respectively, as

$\sigma 2$ = SIGMA(S, T, p, 2000)
$\sigma 4$ = SIGMA(S, T, p, 4000)

See also
SIGMA_T
Oceanographic functions

SALINITY

SALINITY(R, T, p)

This function calculates the salinity of seawater given the in-situ conductivity ratio **R**,

R = C(S,T,p) / C(35,15,0)

where **T** is temperature in degrees Celcius and **p** is pressure in dbar (p=0 at the surface). All three parameters may be supplied as any valid arithmetic expression.

Example:

SALINITY(A1, B1, 0), 25

In this example, the conductivity ratio data is in column A, temperature data in column B and pressure is constant at zero. The formula is evaluated down to row 25 using the Repeating Formula feature.

Salinity is calculated using the UNESCO Practical Salinity algorithm given in
the UNESCO Technical Paper in Marine Science #44, 1983.

See also:
CONDUCTIVITY
Oceanographic functions

CONDUCTIVITY

CONDUCTIVITY(S, T, p)

This function calculates the in-situ conductivity ratio **R** of seawater,

R = C(S,T,p) / C(35,15,0)

where "S" is salinity, "T" is temperature in degrees Celcius and "p" is pressure in dbar (p=0 at the surface). All three parameters may be supplied as any valid arithmetic expression.

Example:

CONDUCTIVITY(A1, B1, 0), 25

In this example, the salinity data is in column A, temperature data in column B and pressure is constant at zero. The formula is evaluated down to row 25 using the Repeating Formula feature.

This function works by numerical inversion of the UNESCO Practical Salinity algorithm given in the UNESCO Technical Paper in Marine Science #44, 1983.

See also

SALINITY
Oceanographic functions

PRESSURE

PRESSURE(depth, latitude)

This function calculates the pressure in dbar (p=0 at the surface) given the water **depth** in meters and the **latitude** in degrees. Both parameters may be supplied as any valid arithmetic expression.

Example

PRESSURE(1250, 30)

Converts a depth of 1250 meters to dbar at 30 degrees latitude.

This function works by numerically inverting the UNESCO depth algorithm given in the UNESCO Technical Paper in Marine Science #44, 1983.

See also:

DEPTH
Oceanographic functions

DEPTH

DEPTH(p, latitude)

This function calculates the water depth in meters given the pressure "p" in dbar (p=0 at the surface) and the latitude in degrees. Both parameters may be supplied as any valid arithmetic expression.

Example

DEPTH(1250, 30)

Converts a pressure of 1250 dbar to meters at 30 degrees latitude.

This function uses the UNESCO depth algorithm given in the UNESCO Technical Paper in Marine Science #44, 1983.

See also

PRESSURE
Oceanographic functions

TEMPERATURE

TEMPERATURE (S, sigma, p, p_ref)

This function calculates the temperature (in deg. C) of seawater with a given salinity "S" and density anomaly "sigma", where p is the pressure in dbar of the seawater and p_ref is the pressure at which sigma has been calculated. In other words, the function calculates the value of temperature T for which the supplied sigma value is given by
the expression

SIGMA(S, T, p, p_ref)

All 4 parameters may be supplied as any valid arithmetic expression.

The function is particularly useful for drawing contours of constant sigma_t on a T-S diagram. To do this, set up a column list of salinity values, e.g. 34.0 to 36.0 in 0.05 increments, e.g. in cells A2:50. Now use repeating formulae in row 2 to calculate temperatures for particular sigma_t values

TEMPERATURE(A2, 29, 0, 0), 50

will evaluate temperature for all salinities in A2:50 at a sigma_t of 29.

This function works by numerical inversion of the UNESCO equation of state for seawater given in the UNESCO Technical Paper in Marine Science #44, 1983.

See also
Oceanographic functions

POTENTIAL_T

POTENTIAL_T (S, T, p, p_ref)

This function calculates the potential temperature in deg. C of seawater of salinity "S" and temperature "T" for an adiabatic displacement from pressure "p" to reference pressure "p_ref" (both pressures in dbar, p=0 at the surface), with no salinity change.

All four parameters may be supplied as any valid arithmetic expression.

Example:

POTENTIAL_T(A1, B1, C1, 0), 25

In this example, the salinity data is in column A, temperature data in column B and pressure in column C. The reference pressure is constant at zero. The formula is evaluated down to row 25 using the Repeating Formula feature.

The function operates by Runge-Kutte integration of the adiabatic temperature gradient as described in the UNESCO Technical Paper in Marine Science #44, 1983.

See also
Oceanographic functions

OXYGEN

OXYGEN (S, T)

This function calculates the dissolved oxygen concentration of seawater in equilibrium with air as a function of salinity "S" and temperature "T" in deg. C. Both parameters may be supplied as any valid arithmetic expression. The result is given in micromoles of O_2 per litre (use the SIGMA_T function to convert results to micromoles per kilogram).

Example

OXYGEN (35, 15)

evaluates O_2 solubility in seawater of salinity 35.0, temperature 15oC.

The algorithm for dissolved oxygen concentration is taken from B. Benson and D. Krause (1984), Limnology and Oceanography 29: 620-632.

See also

Oceanographic functions

Miscellaneous mathematical functions

CELL	Value in a cell having variable coordinates
ROW	Number of row in which formula is located
COL	Column in which formula is located (A=1, B=2, ..)
IF	Conditional branching
POLY	Evaluate a polynomial
PI	Value of Pi = 3.1415...
RAND	Random number between 0 and 1
RMM	Relative molar mass of a chemical element

PI

Returns the number 3.14159265358979, the mathematical constant π, accurate to 15 digits.

Syntax

PI

Examples

PI/2 equals 1.57079...
SIN(PI/2) equals 1
If the radius of a circle is stored in cell B2, the area of the circle is PI*SQR(B2)

See also
Miscellaneous mathematical functions

RMM

This formula returns the molar mass of a chemical element identified by its chemical symbol.

Syntax

RMM(element)

element is the chemical symbol of the element whose molar mass is required.

Examples

RMM(H) equals 1.008
RMM(Cu) equals 63.54

See also
Miscellaneous mathematical functions

COL

This function returns an integer number corresponding to the column in which the formula it contains is located, such that

A=1, B=2, C=3 etc

Syntax

COL

Note that the function has no arguments or brackets.

Example

If the formula

COL

were located in cell C12, the result would be 3.

See also

ROW
CELL
Miscellaneous mathematical functions

ROW

This function returns an integer number corresponding to the row in which the formula it contains is located, such that

Row 1=1, Row 2=2, Row 3=3 etc

Syntax

ROW

Note that the function has no arguments or brackets.

Example

If the formula

ROW

were located in cell C12, the result would be 12.

See also
COL
CELL
Miscellaneous mathematical functions

CELL

This formula returns the value of a cell at a specified address in which the row and column coordinates are variables.

Syntax

    CELL(column, row)

where **column** and **row** are integer expressions giving the column and row numbers of the desired cell, such that

    column A = 1, column B = 2, ...

Example

CELL(1, 1) returns the value in cell A1
CELL(1, B2) returns the value in the cell in column A whose row number is found in cell B2
CELL(1, ROW) returns the value in the cell in column A whose row number is the same as this formula.

See also
ROW, COL
Miscellaneous mathematical functions

IF

This gives a conditional expression, one whose value depends on the result of a logical (Boolean) comparision.

Syntax

IF(comparison, true_value, false_value)

comparison is any logical expression evaluating to TRUE or FALSE
true_value is a numerical expression whose value is taken if **expression** is TRUE.
false_value is a numerical expression whose value is taken if **expression** is FALSE.

Example

IF(A1 > 0, 55, C4)
If the value in cell A1 is greater than zero, return 55, otherwise the value in cell C4.

See also
Comparison (boolean) operators
Miscellaneous mathematical functions

RAND

Returns an evenly distributed random number greater than or equal to 0 and less than 1. A new random number is returned every time the worksheet is calculated.

Syntax

RAND

Note that the function has no arguments.

To generate a random real number between a and b, use:

RAND*(b-a)+a

If you want to use RAND to generate a random number but don't want the numbers to change every time the cell is calculated, first enter =RAND in the cell. Then, click on the cell and select Data|Convert to change the formula to a constant number.

To initialise the random number generator to a different seed value, use the INITRAND procedure.

Examples

To generate a random number greater than or equal to 0 but less than 100:

RAND*100

See also

INITRAND
Miscellaneous mathematical functions

POLY

This function evaluates a polynomial at a particular abscissa value.

Syntax

POLY(coefficient_list, x_value)

x_value is any numerical expression for the abscissa value at which to evaluate the polynomial.
coefficent_list is a cell range containing the coefficients of the polynomial in the form of a vertical (column) list.

If the polynomial is denoted

a0 + a1*X + a2*X^2 + a3*X^3 ....

then the coefficents a0, a1, a2,... should be entered into the worksheet as a vertical list, a0 first, followed by a1 etc. Then enter the name of the cellrange containing the coefficients as **coefficient_list**.

This arrangement of coefficients is the same as that generated by the REGRESSION procedure.

Example

Evaluate the polynomial 1.25 + 2*X + 4*X^2 at X=0.55

Place in cells A1..A3 the values of the coefficients

	A	B
1	1.25	
2	2	
3	4	
4	=POLY(A1..A3, 0.55)	

See also

REGRESSION
Miscellaneous mathematical functions

Alphabetical Listing of Worksheet functions

ABS	Absolute value
ACOS	Inverse cosine
ALOG	Common antilogarithm
ASIN	Inverse sine
ATAN	Inverse tangent
AVEDEV	average of absolute deviations from the mean of the range
BETADIST	Beta distribution
BETAINV	Inverse of beta distribution
BINOMDIST	Binomial distribution
CELL	Value in a cell having variable coordinates
CHIDIST	Chi-squared distribution
CHIINV	Inverse of Chi-squared distribution
COL	Column in which formula is located (A=1, B=2, ..)
CONDUCTIVITY	Conductivity ratio given S, T and p
CORREL	Correlation coefficient between two data sets
COS	Cosine
COSH	Hyperbolic cosine
COUNT	number of valid values (cells) in the range
COVAR	Covariance between two data sets
DEGREES	Converts radians to degrees
DEPTH	convert pressure to depth
ERF	Error function
ERFC	Complementary error function
EXP	Exponential
FDIST	F probability distribution
FINV	Inverse of F probability distribution
GAMMADIST	Gamma distribution
GAMMAINV	Inverse of gamma distribution
GAMMALN	Logarithm of gamma function
GEOMEAN	geometric mean of the range
IF	Conditional branching
LOG	Common logarithm
LN	Natural logarithm
LQUARTILE	Lower quartile
MAX	maximum value in the range
MEAN	average of the range
MEDIAN	median of the range
MIN	minimum value in the range
OXYGEN	Equilibrium solubility of O2 in seawater
PI	Value of Pi = 3.1415...
POLY	Evaluate a polynomial
POTENTIAL_T	Potential temperature give S, T and p

PRESSURE	Convert depth to pressure
QRANGE	Range between lower and upper quartiles
RADIANS	Convert degrees to radians
RAND	Random number between 0 and 1
RMM	Relative molar mass of a chemical element
ROUND	Round up to nearest integer larger in value
ROW	Number of row in which formula is located
RSD	relative standard deviation of the range
SALINITY	Salinity given T, p and conductivity ratio R
SIGMA_T	Density anomaly at given S, T, p
SIN	Sine
SINH	Hyperbolic sine of
SQR	Square
SQRT	Square root
STDDEV	standard deviation of the range
STDERR	standard error of the range
SUM	sum of the range
TAN	Tangent
TANH	Hyperbolic tangent
TDIST	Student's t-distribution
TEMPERATURE	T for a given S and sigma_t
TINV	Inverse of Student's t-distribution
TRUNC	Truncate to nearest integer lower in value
UQUARTILE	Upper quartile
VAR	variance of the range

Procedure formulae

Procedure formulae are different in two respects from other formulae:

1. They do not return a numerical value.

2. They cannot be included in other cell formulae, ie a cell containing a procedure formulae can contain only the procedure and any arguments it requires.

The procedures available are

INITRAND	Initialise the random number generator
CORRELMATRIX	Correlation matrix for data sets
COVARMATRIX	Variance-covariance matrix for data sets
INVERT	Invert a square matrix
EIGEN	Find eigenvalues of a matrix
EXTERNAL	Call an external program
FFT	Fast Fourier Transform
SMOOTHFFT	Smooth data using FFT
SMOOTH	Smooth data by moving average
MINIMIZE	Minimize a set of equations
HISTOGRAM	Compute histogram frequencies of data
PUT	Put a value into a cell
ROOT	Find zero of an equation
LOOP	Repeat calculations until condition met
REGRESSION	Least-squares polynomial regression
SOLVE	Solve simulataneous equations
RUNGEKUTTA	Runge-Kutta integration of differential equations

INITRAND

Worksheet Procedure: initialises the internal random number generator.

Syntax

=INITRAND(seed_number)

seed_number is any number value used to initialise the generator. The sequence of random numbers generated will depend on the seed used.

See also

RAND

CORRELMATRIX

Worksheet procedure: calculates the correlation matrix for sets of data.

Syntax

=CORRELMATRIX(data_array)

where **data_array** is an array of worksheet cells containing the data to be correlated. Each column of cells corresponds to a different variable.

The procedure writes out the correlation matrix immediately below the cell in which the procedure resides.

Example

Suppose temperature, humidity and barometric pressure data have been stored in a worksheet as follows

	A	B	C
1	Temp	Hum	Press
2	21.1	94.5	1022
3	19.3	87.5	1014
4	....		
	....		
33	24.3	67.5	998

The correlation matrix is calculated using

=CORRELMATRIX(A2..C33)

See also
COVARMATRIX
CORREL
COVAR

COVARMATRIX

Worksheet procedure: calculates the variance-covariance matrix for sets of data.

Syntax

=COVARMATRIX(data_array)

where **data_array** is an array of worksheet cells containing the data to be correlated. Each column of cells corresponds to a different variable.

The procedure writes out the variance-covariance matrix immediately below the cell in which the procedure resides.

Example

Suppose temperature, humidity and barometric pressure data have been stored in a worksheet as follows

	A	B	C
1	Temp	Hum	Press
2	21.1	94.5	1022
3	19.3	87.5	1014
4	....		
	....		
33	24.3	67.5	998

The variance-covariance matrix is calculated using

=COVARMATRIX(A2..C33)

See also
CORRELMATRIX
CORREL
COVAR

INVERT

Worksheet procedure: inverts a square matrix

Syntax

=INVERT(matrix)

where **matrix** is the cellrange whose cells contain the coefficients of the square matrix.

The procedure returns error messages if the matrix is not square or if it is singular (cannot be inverted).

See also
EIGEN

EIGEN

Worksheet procedure: finds the eigenvectors and eigenvalues of a matrix.

Syntax

=EIGEN(matrix)

where **matrix** is a cellrange whose cells contain the coefficients of the original matrix.

The procedure writes the eigenvalues, in order, as a column below the cell containing the formula. It also writes the eigenvectors, as a series of columns, immediately to the right of the eigenvalues.

See also

INVERT

EXTERNAL

Worksheet procedure: exchange data with an external application.

Syntax

=EXTERNAL(data_range, command_string)

where **data_range** is the cellrange for exchange of data and **command_string** is the external application to be called.

Firstly, the data contained in **data_range** is written to a disk file named EXTERNAL.DAT as formatted text (see File|Export Data).

Next, the application corresponding to **command_string** is executed. The command string should contain any switches or command line parameters needed to execute the program. This may include specifying the filename EXTERNAL.DAT as a data source. If your application is one that modifies the data, it should write the final results back to a file of the same name.

Finally, the file EXTERNAL.DAT is read back into the worksheet if it was changed by the xternal application.

FFT

Calculates the Fast Fourier transform of a set of 2*N real data points stored in a cell range either as the direct or inverse transform.

Syntax

=FFT(cell_range [, mode])

cell_range is the name of a range of worksheet cells containing the data. The range should contain 2*N elements where N must be an integral power of 2. Pad the array with zeroes as required.

The optional parameter **mode** is any number expression. If non-zero, the direct Fourier transform is calculated, otherwise the inverse transform is calculated. The default value is 1 (direct transform).

Examples

=FFT(A1..100) calculates the first FFT of the data in A1..A100

=FFT(A1..100, 0) calculates the inverse FFT of the data in A1..A100

See also
SMOOTHFFT

SMOOTHFFT

Smooths a set of data points using a Fourier Transform filtering method. The Fourier transform of the data is first calculated, and then smoothed using a moving avaerage method with a variable window size specified by the user.

Syntax

=FFT(cell_range, window)

cell_range is the name of a range of worksheet cells containing the data to be smoothed.
window is the width of the data window used for the moving average. The larger the window, the greater the smoothing.

See also

- FFT
- SMOOTH
- Vector curve fitting properties

SMOOTH

This worksheet procedure smooths a set of data using a moving 3-point average method.

Syntax

=SMOOTH(data [,iterations])

data is the name of a cellrange containing the values to be smoothed. The optional parameter **iterations** sets how many times the smoothing is performed. The default value is 1. Setting interations to 2 gives a 5-point average, and so forth.

The results are written as a column list immediately beneath the cell containing the smooth procedure.

Example

=SMOOTH (A1:100) smoothes the data in A1:100 using a 3-point moving average.

=SMOOTH (B1:50, 2) smoothes the data in B1:50 using a 5-point moving average.

See also
SMOOTHFFT
Vector curve fitting properties

MINIMIZE

Help screen not completed yet.

HISTOGRAM

Help screen not completed yet.

PUT

This worksheet formula is used to insert a formula or value into another worksheet cell.

Syntax

    =PUT(target_cell, expression)

where **target_cell** is the name of the cell to receive the new contents and **expression** is any valid cell formula.

This procedure is normally used for initialising LOOP calculations.

Example

    =PUT(B1, SQRT(A1))

places the formula SQRT(A1)into cell B1.

ROOT

Procedure: root (formula, variable [, tolerance])

This worksheet procedure finds the zero value or root of a formula.

Syntax

=ROOT(formula, variable [tolerance])

where **formula** is the name of a cell containing a formula that depends on the cell named **variable**. The **tolerance** parameter is optional and assumes a default value of 1.0e-5 if it is omitted.

The procedure varies the value in "variable" until "formula" has a value within "tolerance" of zero. The equation is solved by iteration using the secant method. You may interrupt iteration by pressing any keyboard key.

Example

=ROOT (A1, A2, 1.0e-6)

varies the value in cell A2 until the value of A1 is within 1.0e-6 of zero.

Hint: You may use a series of ROOT() procedures associated with a controlling LOOP() procedure to solve simultaneous non-linear equations.

LOOP

This worksheet procedure will carry out a sequence of repeated recalculations over a specified cell range until a target calue is reached.

Syntax

=LOOP(range, test_cell [, tolerance])

The procedure recalculates all of the cells in the specified cellrange **range** until the value of the cell **test_cell** is within **tolerance** of zero. The "tolerance" parameter is optional and assumes a default value of 1.0e-5 if it is omitted.

Example

=LOOP(A1:20, A20)

will recalculate all formulae in cells A1:20 until cell A20 is with the default tolerance (1.0e-5) of zero.

See also

ROOT

REGRESSION

Syntax

=REGRESSION (y_range, x_range [, order])

This procedure calculates the least-squares best-fit polynomial of the dependent variable in cellrange **y_range** against the independent variable in **x_range**. The polynomial has the degree specified by **order** which, if omitted, is assumed to be 1 (linear regression). The row range of the x and y data must be the same, and only the column of "x_range" need be given.

The procedure calculates the coefficients of the polynomial (denoted a0, a1, a2, ..., their standard errors and the coefficient of variation (r2), writing these data beneath the procedure cell.

Example

=REGRESSION (A1:100, B, 3)

calculates the cubic least-squares polynomial of A1:100 on column B.

Setting the order of the polynomial to zero, i.e.

=REGRESSION (A1:100, B, 0)

calculates the least-squares regression line that passes through the origin.

See also
CORREL
Vector curve fitting properties

SOLVE

Syntax

=SOLVE (a, x, b)

This procedure solves the simultaneous linear equations expressed in matrix form

a.x = b,

where **a** is a square matrix of coefficients, **x** is a column vector for the solution and **b** is the right hand side vector.

Only the column addresses of "x" and "b" need to be specified.

Example

=SOLVE (A1:10, B, C)

solves the equations with coefficients in A1:A10, right-hand-side in C1:C10 and places the result in B1:B10.

See also
INVERT

RUNGEKUTTA

This worksheet procedure carries out numerical integration using the Runge-Kutta method.

Syntax

=RUNGEKUTTA(data_range, step_size, number_steps)

data_range is the name of a worksheet cell range containing the data formatted as follows:

1. Independent (X) variable in the first (top left) cell
2. Dependent (Y) variables in succeeding rows in the leftmost column.
3. Opposite each dependent variable cell, in the second column, there should be a formula for calculating the derivative of each variable.

step_size is the value of the X-variable increment for each integration step.
number_steps is the number of integration steps to carry out.

Hint: To make sure that the recalculation starts with the same initial values for X and Y, use PUT() procedures to initialise the required values before the RUNGEKUTTA procedure cell.

Overview of Chart concepts

In ViewFinder, a chart is a graphic in which numerical data is plotted, using x-y cartesian coordinates. This is the usual method used in science to reveal relationships between numerical data.

ViewFinder charts are organised into chart pages, each representing a single printed page. Each chart page can contain as many charts as you like, as well as other graphic objects.

Each workbook file can contain as many chart pages as you wish. A newly-created workbook contains a single, empty chart page. You can switch from one page to another using the chart page bar at the bottom of the Chart Window.

The numerical data used for each chart is obtained from one or more worksheets in the workbook file. Generally, this is done by specifying the worksheet name and the range of cell coordinates that contains the data.

Each newly-created chart page is initially empty. The first step is to create a chart on the page using the Insert|Chart command. This also inserts default axes and a single vector in the new chart. Further objects, including axes, vectors, titles, text and a legend are inserted using the Insert menu.

To edit the contents of a chart object after it is inserted, select it with the mouse and choose the Edit|Selection command (or double-click on the object). In addition, various display options are provided in the Format menu and the Chart button bar.

Many objects in a chart can be moved about by left-dragging with the mouse.   The plot area of the chart can be resized by left-dragging on its size handles.

To delete a chart object, select it and choose the Edit|Delete command (Ctrl+Del).

Chart objects can also be transferred from one chart to another, or duplicated, using the clipboard (see Edit|Copy, Edit|Cut and Edit|Paste).

See also

- Chart axes
- Chart vectors
- Vector callouts
- Chart titles
- Chart text
- Chart legend
- Metafile pictures
- Bitmap pictures

Selecting a chart object

To select a chart object (vector, axis, axis labels etc), left-click on it once using the mouse. The selected object will be either highlighted (chart vectors) or surrounded by a rectangular selection box.

When the mouse is left-clicked in the chart page area, ViewFinder selects the object whose centre is nearest to the point clicked on. If more than one object is under a particular mouse position, keep clicking until the required object is selected.

Note: Don't click too fast, or it will be interpreted as a double click which activates the Edit|Selection command.

Alternatively, use the View|Next object and View|Previous object commands to cycle through all the chart page objects.

To de-select, click anywhere outside the chart page.

See also
Moving a chart object

Moving a chart object

To move a chart object to a different position, select it and, holding down the left mouse button, drag its outline box to the new location and release the mouse button. The display will be redrawn with the object at the new location.

Chart vectors cannot be moved relative to the plot area of the chart in which they are contained.

Chart axes can only be moved in the direction perpendicular to the axis. Axis labels and captions move with the parent axis, but can be moved separately. Axis labels can be moved by a very slight amount in the direction of the axis, enough to give a pleasing visual effect but not enough to make the number scale incorrect. The labels can be moved by any amount in the perpendicular direction. The different scale items of the axis labels always move as a unit. The axis caption can be placed anywhere.

All other objects can be moved in any direction. The chart plot area can be both moved and re-sized.

When a composite object (chart, axis, whole chart page) is moved, all of the objects it contains also moves in relation to the composite parent.

See also

Format|Reset position

Resizing a chart object

Some chart objects can be re-sized using the mouse. If this is possible, the selection box drawn around the object will have *size handles* (small boxes) at each corner and in the centre of each edge.

When the mouse cursor sits over the handle, it will change from the usual cross-hairs to a double arrow indicating the direction(s) for resizing. To resize the object, left-drag the mouse over one of the size handles. Drag the box outline to the new required size and release the mouse button.

Note: to resize the object while retaning its shape (ratio of width to height), hold down the SHIFT key while dragging.

See also

Moving a chart object

Line widths in charts

The width, or thickness, of lines used in charts and chart objects can be adjusted by the user for a better visual effect.

For each object that uses lines, this is done in a spin edit control that displays the relative line thickness. The units used are approximately 0.01mm, but the final effect varies with the overall size of the chart. In most property dialogs, a sample panel is used to display the approximate line thickness.

Note that the screen is only able to display lines of 1, 2, 3, ... pixels wide, so that the representationof line width on the screen will not correspond exactly to that observed in a printed chart page. The actual effect depends on the printer resolution. It is best to experiment with your printer to obtain the desired effect.

Chart plot area

The chart plot area is the rectangular area within which the data points of each vector are drawn. Normally, each axis is located at one of the edges of the plot area, but this is not required.

The plot area can be resized using the mouse.

See also

Format|Plot area

Chart legend

The legend of a chart displays information about all the vectors it contains, usually to illustrate the name of the variable and the type of symbol or line being used ot draw the vector.

The legend is drawn automatically using the list of vectors in the chart. The name of each vector, and the type and colour of symbol and linestyle is obtained from the properties for each vector.

To insert a legend, select the Insert|Legend command.

Vectors can be excluded from the legend if required. To review the list of vectors in a chart, double-click on the legend or select it and choose Edit|Selection. A dialog box will be displayed showing two lists of vector names, those that are included and those that are excluded.To change whether a vector is included or excluded in the legend, press the right or left arrow buttons to move the vector from one list to another.

The vector names are drawn in the legend in the order in which they apear in the "Included vectors" list. Use the up and down arrow buttons at the bottom of the list to rearrange the position of different vectors.

See also
    Chart vectors

Chart vectors

A vector in a ViewFinder chart is a set of data pairs, X and Y, which comprise the data points to be plotted in the chart.

Each vector corresponds to a range of cells in a worksheet (contained in the same workbook file as the chart). This is specified as a worksheet name, a range of worksheet rows and two columns, one for the X (horizontal axis) and one for the Y (vertical axis) data.

Various options exist for selecting the type of symbol to plot at each point, whether to connect points together with line segments, and various types of curve fitting through the points. In addition, display options (colour, linestyles etc) can also be selected. These vector properties are changed using the Vector Properties menu that is activated by selecting the vector and choosing the Edit|Selection command (or double-clicking on the vector).

A newly-created chart has a single default vector that uses columns B and C of the current worksheet. To insert a new vector, select the chart and choose the Insert|Vector command.

Each chart may contain as many vectors as you wish. Indeed, each vector may relate to data in different worksheets.

If the chart contains only single X and Y axes, the vector will be drawn against these axes. If more than one axis has been inserted, the axis to be used for drawing a vector can be selected using the Properties menu.

See also

Chart axes

Vector Properties

This dialog is used to edit the properties of a chart vector. It is a multi-page dialog. To select a page, click on the page name at the top of the dialog.

The pages available are

- Data
- Linestyle
- Symbols
- Curve fitting
- Error bars (X and Y)

See also

- Chart vectors

Vector linestyle properties

This page of the Vector Properties dialog is used to edit the display options of the lines used for joining points and drawing curves.

The **Style** radio buttons provide choices for the style of line - solid, dotted etc.

The **Width** spin edit determines the relative width of the line (see Line widths in charts).

The **Color** button allows editing of the color used for the line. The **Same color as symbol border** check box sets the line color to the same as that used for the borders of data point symbols.

A sample of the line is displayed in the sample panel.

See also
    Chart vectors

Vector symbol properties

This page of the Vector Properties dialog is used to edit the display options of the symbols used for data points.

The **Symbol at each point** check box determines if a symbol will be plotted at each data point. This is usually unchecked if a curve is being drawn, or the points are being joined with line segments.

The **Type** radio buttons allow selection of the symbol shape (circle, square etc).

The **Relative size** spin edit determines the size of the symbol relative to the chart plot area. The values are relative.

The **Border width** determines the linewidth of the line used for drawing the symbol border (or, for symbols without a border, such as a cross, the whole symbol). See Line widths in charts.

The **Border color** button allows editing of the color used for the symbol border.

The **Fill color** button allows editing of the color used for filling the interior of symbols (if any). This is used in conjunction with the **Fill Type** radio buttons that have three options:

Transparent - the symbol is not filled and has a transparent interior.
Background - the symbol is filled with the current plot area background color (the default).
Solid fill - the symbol is filled with the fill color specified.

See also
    Chart vectors

Vector curve fitting properties

This page of the Vector Properties dialog is used to edit the options for joining data points and drawing curves.

Join points with line segments causes a straight line segment to be drawn between data points in the row order in which they appear in the worksheet. It may be necessary to sort the data into order for sensible results (see Data|Sort). This option is used in conjunction with **Link gaps in data** which, when selected, ignores missing data in the vector row range. If the option is not selected, gaps will appear in the line segments wherever data is missing.

Polynomial regression draws the least-squares polynomial of order 1 (linear regression) up to 9 through the vector data. Use the **Order** spin edit to select the order of the polynomial. An order of zero draws the least-squares line passing through the origin.

Moving average calculates a moving average through the data points, depending on the number of **Loops** specified. Each loop through the data calculates a 3-point average (the average of the point itslef, plus one to the left and one to the right. Thus doing 2 loops gives a 5-point average etc.

This option is functionally equivalent to transforming the data using the SMOOTH procedure and then plotting the smoothed points with joined line segments, except that the smoothing process is done internally rather than in the worksheet. For a large number of points (n > 200) it is faster to do the smoothing in the worksheet.

Fast Fourier Transform smoothes the vector data by first transforming it into the frequency domain, then applying a low-pass filter whose size is a specified percentage of the data **window**, then transforming back again. The option is functionally equivalent to using the SMOOTHFFT procedure on the data in the worksheet.

Locally-weighted regression smoothes the vector data using the LOWESS method with the specified number of **steps**.

See also
    Chart vectors

Vector data properties

This page of the Vector Properties dialog is used to edit how the data of a vector is obtained from a worksheet.

The **X-Column** and **Y-Column** edits are used to select the worksheet columns for the X and Y values of the vector, while the **Row Range** edit selects the range of worksheet rows.

The **Worksheet** edit panel is used to specify the worksheet to which the above coordinates refer. If there is more than one worksheet, click on the edit control and a list will appear, from which the required worksheet can be selected. If there is only one worksheet in the workbook file, this coontrol is inactive.

The **X-Axis** and **Y-Axis** controls are used to select which X- and Y-axis in the chart will be used for drawing the vector. Click on the edit control to select from a list of axes currently defined for the chart. If there is only one axis of either type, the relevant control is inactive.

The **Legend Label** is the text descriptor for the vector that will appear in the chart legend, and as the default entry for a vector callout.

See also

- Chart vectors
- Chart legend
- Vector callouts

Vector error bar properties

The **X-Errors** and **Y-Errors** pages of the Vector Properties dialog are used to set options for drawing error bars in the X- and Y- values of each data point in a vector. The options presented for both error types are the same.

The **Type** radio buttons give 4 options for calculating errors:

None - no error bars are drawn

Fixed absolute error - each data point has a fixed absolute error whose value is given in the **Value** edit opposite.

Fixed percentage error - each data point has a fixed percentage error whose value is given in the **Value** edit opposite.

Errors in Column - the absolute error for each data point is to be found in the data source worksheet in the **Column** specified. The error value for each point is taken from the same row as the data values.

Error bars are drawn in the direction of the variable (X- or Y-) and have a length corresponding to the magnitude of the error. The **Bars across each end** option determines if a small tick line is drawn across the end of each error bar.

See also
Chart vectors

Vector callouts

A vector callout is a text label that is attached to a particular chart vector, generally to explain something about the variable being plotted in the chart.

The callout displays the name of the vector (as set in the Vector Properties dialog) inside an optional frame, with a line connecting the name to a particular point of the vector. The line may be plain, or have an arrow at the end pointing to the data vector.

To insert a callout, select the required vector and choose the Insert|Callout command. Each vector may have as many callouts as desired.

See also
    Chart vectors

Chart axes

The chart axis is the vertical or horizontal scale against which data points of the chart vectors are drawn. It is used to reveal the X and Y values of each point.

Usually, the choice of axes is made at the time the chart itself is created (see Insert|Chart) and this choice will suffice for the majority of charts. Sometimes it is useful to insert a new, additional axis, for example where two different vectors are being compared on the same chart, but each requires a different Y-axis, X-axis, or both. To insert a new axis, use the Insert|Axis command.

An axis also contains two dependent child objects, the axis labels and the axis caption, both of which are optional.

Each axis has two types of tick marks on the scale. **Major tick marks** correspond to the labelled scale values, while **minor tick marks** are the sub-divisions of each major tick mark interval. Minor tick marks are never labelled.

To edit the various options affecting the display of an axis, select it and activate the Axis Properties dialog box by choosing Edit|Selection (or double-click on the axis).

See also

Chart vectors

Axis Properties

The axis properties dialog is used to edit all the properties that affect the display of an axis. To use the axis properties dialog, select the axis and double-click, or choose Edit|Selection.

The dialog is a multi-page tabbed dialog. To select the page required, click on the page name at the top of the dialog. The pages available are

Caption
Labels & Arrows
Position
Scaling
Tick marks
Line style

See also
- Chart axes
- Axis labels
- Axis caption

Axis caption properties

This page of the Axis Properties dialog is used to edit properties of the axis caption.

Caption text is an edit control in which the text of the caption is entered. If the text field is empty when the dialog closes, the axis will have no caption.

The **Positioned at** radio buttons allow the caption to be positioned at the minimum or maximum values of the axis scale, or at the centre.

The **Font** button allows the caption font to be edited. A sample of the current font is displayed in the sample panel.

See also

Axis caption
Format|Fonts

Axis labels properties

This page of the Axis Properties dialog is used to edit properties concerned with axis labels and arrows.

The **Label the axis** checkbox determines if the axis is labelled.

The **Invert about axis** checkbox determines whether the labels are inverted about the axis. For a vertical Y-axis, the default label position is to the left of the axis line. If the labels are inverted, they are drawn to the right of the axis line, which is the correct place if the axis was located at the right of the plot area.

The **Axis Arrow** checkboxes determine if the axis line has a direction arrow at the minimumn and/or maximum ends of the scale.

The **Labels font** button is used to edit the labels font. A sample of the current font is displayed in the sample panel.

See also

Axis labels
Format|Fonts

Axis scaling properties

This page of the Axis Properties dialog is used to edit the axis scale values.

A set of radio buttons are used to determine the **scale type**. The options are

Linear - a simple axis with a linear scale

Logarithmic - the vector data are interpreted as base 10 logarithms, and an axis with logarithmic scaling is used (see Using a logarithmic axis).

Latitude - the data are interpreted as the sine of the latitude, and the axis has a fixed scale ranging from 90o South to 90o North (see Using a latitude axis).

The **scaling values** for the axis are

Minimum - the value at the minimum end of the axis. For an X-axis, this is the left side.
Maximum - the value at the maximum end of the axis. For an X-axis, this is the right side.

The minimum and maximum values do not need to be in increasing order. If the axis has a reversed scale, they will be reversed.

Interval - the size of the interval between major ticks.

Major ticks - the number of major tick marks.

These values are mutually interdependent, so if one is altered, one or more of the other values will change automatically. The **Autoscale** check box indicates whether the scaling values are calculated automatically from the range of values for each vector in the chart that uses the axis. If one of the scaling values is latered manually, this box is unchecked.

The **Invert Scale** check box causes the order of the axis scale to be reversed.

The minor tick marks are set using the Minor ticks **Number** spin edit. The size of the interval is updated on each change. Set the number to zero if you do not want minor tick marks.

See also
    Chart axes

Axis tick marks properties

This page of the Axis Properties dialog is used to edit display properties of the axis tick marks.

The check boxes provided allow tick marks to be placed

Inside the plot area (pointing in towards the centre of the chart)
Outside the plot area (pointing away from the axis)
At the axis minimum
At the axis maximum

In addition, gridlines at the major and/or minor tick marks can be drawn right across the plot area.

See also
Chart Axes

Axis linestyle properties

This page of the Axis Properties dialog is used to determine the style and color of lines making up the axis and tick marks.

The **Color** button is used to set the line color. The axis line and tick marks share the same color.

The three spin edit controls set the relative line width of the axis line itself, and the major and minor tick marks. A sample of the resulting display is shown in the sample panel. To increase or decrease the required width value, click on the up or down arrows next to the number display.

To set the relative length of the major and minor tick marks, see Options|Chart.

See also

- Chart axes
- Line widths in charts

Axis position properties

This page of the Axis Properties dialog is used to determine the position where the axis crosses the other, perpendicular axis. The options are at the minimum or maximum scale values of the other axis, or at its centre.

Note that an axis can also be manually positioned using the mouse (see Moving a chart object). If you have manually positioned an axis and wish to revert to one of the above default positions, reset the axis position first using Format|Reset position.

See also

Chart axes

Axis labels

The axis labels are the numerical labels for each major tick mark on the axis. These are automatically generated by ViewFinder. However, attributes such as the font, colour, display angle of the labels may be changed by selecting the labels and using the required command in the Format Menu.

To add labels to an un-labelled axis, use the Axis Properties dialog. To remove labels, either use the dialog or select the labels and delete them (Edit|Delete, Ctrl+Del).

The actual numbers displayed as labels depends on the scale of the axis as set in the Properties dialog.

See also

Axis caption
Chart axes

Axis caption

The axis caption is the title applied to the axis to explain the quantity, or variable, being plotted. The axis caption is not generated automatically, and must be entered by the user.

For a new axis, the caption contents may be set in the Axis Properties dialog box. To change the contents at any other time, select the caption and choose Edit|Selection (or double-click on the caption).

Special effects such as subscript characters, superscript characters and the symbol font may be used in any axis caption.

See also

Axis labels
Chart Axes

Using a logarithmic axis

To plot logarithmic data, use a logarithmic axis as set in the Axis scaling page of the Axis Properties dialog.

First, ensure that the data in the worksheet that the vector refers to is in logarithmic form. If it is linear, use the LOG worksheet function to convert the data. Then, change the axis type to logarithmic.

NOTE: if the data range is greater than 15 log units, this feature is disabled.

See also
Axis scaling properties

Using a latitude axis

This type of axis is used to plot data as a function of latitude, ranging from 90oS to 90oN, eg for a geographical contour plot.

The axis actually assumes that the vector data is in the form of the sine of the latitude (ranging from -1 to +1), since this gives a fairer representation of a geographical distribution at the Earth's surface.

First, ensure that the vector data which refers to the axis is in this form. If, for example, your raw data is presented as the latitude in degrees, then convert it using the SIN and RADIANS worksheet functions (The SIN function uses an argument in radians):

=SIN(RADIANS(B2))

Next, change the axis type to latitude using the Axis scaling properties dialog page.

See also

Chart Axes

Metafile pictures

A metafile picture is a graphic object that conforms to the Windows placeable metafile format. Such a picture can be obtained from a disk file, or from a graphics application (including ViewFinder), through the clipboard.

To insert a metafile from disk, use the File|Import|Metafile command. To insert a metafile from the clipboard, use Edit|Paste.

Once a metafile picture has been inserted, it cannot be edited, but it can be moved and resized.

Metafile pictures can be inserted into a chart page, either to the page itself or as a child object of a chart. If a chart is selected when the insertion occurs, the parent will be the chart. This means that if the chart object is moved on the page, the picture will move with it. Otherwise, the picture becomes attached to the chart page.

To extract a picture object from a chart and attach it to the whole chart page, use the Format|Attach to page command.

See also
    Bitmap pictures

Bitmap pictures

A bitmap picture is a graphic object that conforms to the Windows bitmap (BMP) format. Such a picture can be obtained from a disk file, or from a graphics application (including ViewFinder), through the clipboard.

To insert a bitmap from disk, use the File|Import|Bitmap command. To insert a bitmap from the clipboard, use Edit|Paste.

Once a bitmap picture has been inserted, it cannot be edited, but it can be moved and resized.

Bitmap pictures can be inserted into a chart page, either to the page itself or as a child object of a chart. If a chart is selected when the insertion occurs, the parent will be the chart. This means that if the chart object is moved on the page, the picture will move with it. Otherwise, the picture becomes attached to the chart page.

To extract a picture object from a chart and attach it to the whole chart page, use the Format|Attach to page command.

See also

Metafile pictures

Chart titles

A chart title is a single line of text that is normally displayed at the top of a chart.

ViewFinder permits both major and minor titles. To insert a title, select the Insert|Major title or Insert|Minor title commands.

Special effects such as subscript characters, superscript characters and the symbol font may be used in any chart title.

See also

Chart text

Chart text

Chart text is any multi-line string of text that is displayed on a chart.

A chart text object differs from a chart title in that they can display more than one line of text, can be justified (left, right or centred) and can have adjustable line spacing.

To insert a chart text object, select the Insert|Text command.

Special effects such as subscript characters, superscript characters and the symbol font may be used in any text object.

See also

Insert|Major title

Insert|Minor title

Use of Fonts in Charts

All chart objects that involve text use a display font that can be selected by the user. The default setup for charts is to have all chart objects based on a single default font (see Options|Chart) but having different point sizes appropriate to the object.

There are two ways to change the font of a chart object:

1. Select the object and choose Format|Fonts|Edit or press the font button in the Chart button bar.
In this case, the new font is attached to the object itself. Other objects in the chart of the same type will still have the original font.

2. Select the parent chart object and edit the required font. In this case, all objects in the chart of that type will use the same new font.

For example, if you select the caption of the Y-axis in a chart and change its font, the caption of the X-axis (and any other axes) will remain unchanged. To change the font of all captions at the same time, select the chart itself and edit the font named **Axis caption** using Format|Fonts|Edit.

The different fonts available in a chart are:

Axis caption
Axis labels
Vector callouts
Vector legend
Major title
Minor title
Chart text

Editing the caption or labels font of an axis by selecting the axis, or selecting the caption or labels object, has the same effect as in method 1 above.

To clear any fonts in a chart, or any chart object, that have been created by method 1 above, select the Format|Fonts|Clear command.

Subscripts

Subscripts in any chart text can be achieved by inserting the control characters '\' (backslash) followed by 'b' or 'B'. This control switch toggles subscripts on and off.

For example, the chemical formula for water would be written as

    H\b2\bO

Subscripts and superscripts automatically use a font size that is a pre-determined fraction of the current font, as well as displacements below, or above, the current text baseline.

See also

Superscripts
Symbol font

Superscripts

Superscripts in any chart text can be achieved by inserting the control characters '\'   (backslash) followed by 'p' or 'P'. This control switch toggles superscripts on and off.

Subscripts and superscripts automatically use a font size that is a pre-determined fraction of the current font, as well as displacements below, or above, the current text baseline.

See also

Subscripts
Symbol font

Symbol font

Characters from the Windows standard symbol font can be inserted into normal text for display in charts by inserting the control characters '\' (backslash) followed by 's' or 'S'. This control switch toggles then symbol font on and off.

To find the appropriate characters to include in a text string, use the Character Map accessory (normally provided with your Windows software).

The symbol font uses the same point size as that in use for the current normal text font.

For example, to display the SI abbreviation for 'microlitres'

    \sm\sL = μL

See also
    Subscripts
    Superscripts

Menu Commands

The popup command menus provided on the full menu bar at the top of the ViewFinder screen are shown below. Some commands will be inactive (dimmed) depending on whether the worksheet window or the chart window is currently selected. If there is no workbook file loaded, a limited subset of the main menu is displayed.

- File Menu
- Edit Menu
- View Menu
- Insert Menu
- Format Menu
- Data Menu
- Options Menu
- Window Menu
- Help Menu

A subset of the main menu commands can be selected using a speed menu activated by the right mouse button.

See also:

- Worksheet Button Bar
- Chart Button Bar
- Keyboard shortcuts

File Menu

The File Menu is used to manipulate workbook files, importing and exporting data or graphics to/from disk files, and printing operations.

File|New
File|Open
File|Recall
File|Save
File|Save As

File|Export|Data
File|Export|Metafile

File|Import|Data
File|Import|Metafile
File|Import|Bitmap

File|Print
File|Printer setup
File|Exit

See also

Menu Commands

File|New

Keyboard shortcut: Ctrl + N

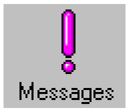
This command is used to create a new, empty workbook file in memory.

If the current workbook in memory (if any) has been changed, you will be prompted to save changes to disk before the new workbook is created.

The default filename for the new workbook is BOOKn.VF3, where n = 1, 2, 3, ... is a number that increases each time a new file is created. You will be prompted to change the default filename when File|Save or File|Save As is selected.

See also:
- File|Open
- File|Exit

File|Open



Keyboard shortcut: Ctrl + O

This command is used to load a previously-created workbook file from disk into memory.

If the current workbook in memory (if any) has been changed, you will be prompted to save changes to disk before the new workbook is loaded.

The command displays the Windows common dialog box for opening document files. Use the **Directories** and **Drives** panels to select the correct path for your file. Use the **List Files of Type** panel to choose whether to display ViewFinder for Windows workbook files (.VF3) or ViewFinder for DOS files (.VFS).

To open a file, select the filename with the mouse and press the **Ok** button (or double-click on the filename).

You can also select a workbook file used in a previous ViewFinder session using the File|Recall command.

See also:
- File|New
- File|Save
- File|Save As

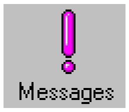
File|Recall

This command is used to load into memory a recently-used workbook file.

Each time a workbook file is saved to disk, its name is saved in the configuration file VFW.CFG and displayed in the File|Recall list.

See also:
- File|Open
- File|Save
- File|Save As

File|Save



Keyboard shortcut: **Ctrl + S**

This command is used to save the current workbook file to disk.

If the workbook is newly-created, or has the default workbook name BOOKn.VF3, ViewFinder will prompt for a filename using the File|Save As command. Otherwise, the file will be saved directly to disk.

See also:
File|New
File|Open

File|Save As

This command is used to save a newly-created workbook file to disk, or to save a copy of the current workbook under a new filename. In both cases, the command uses the Windows File|Save common dialog box to select the filename required.

Use the **Directories** and **Drives** panels to select the disk drive and/or directory path for the file. Typ the required filename in the **Filename** panel.   The default filename extension .VF3 will be added automatically by ViewFinder and need not be included.

See also:
- File|New
- File|Open
- File|Save

File|Printer Setup

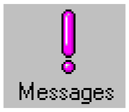
This command is used to set up the printer used for printing worksheets or chart pages.

The Windows common dialog is used, and its appearance and available options depend on the printers installed on your system.

ViewFinder always prints to the default Windows printer.

See also:
File|Print

File|Print



Keyboard shortcut: Ctrl + P

This command is used to print the current worksheet or current chart page on the default Windows printer.

If the worksheet window is active, then the current worksheet will be printed.

If the chart window is active, then the current chart page will be printed.

See also:
File|Printer Setup
Printing worksheets
Printing chart pages

Printing worksheets

Part, or all, of a worksheet may be printed on the Windows default printer using the File|Print command when the worksheet window is active.

The command will activate the Print dialog which allows you to choose whether to print the whole worksheet (Print All) or just the selected cells (Print Selection) or a range of pages (Print Pages). The second option is only available if a range of cells has been selected.

The printer used can be selected or set up using the Setup button which activates the File|Printer Setup dialog.

Printing options are set using the Options|Worksheet|Printing dialog.

See also:

Printing chart pages

Printing chart pages

Selecting File|Print when the chart window is active will print the current chart page on the Windows default printer.

The desired paper size and orientation for the printed page can be selected using the Setup|Graphics dialog.

To set up the printer beforehand, use File|Printer Setup. Be sure to set the paper size and orientation to match those selected in the Options|Chart dialog.

See also:
    Printing worksheets

File|Import|Data

This command is used to import data into the current worksheet from a disk file, eg one that was created by another application.

How the imported data in the file is interpreted depends on the filename extension of the filename chosen for importing the data. The available types are

.DIF	Data Interchange Format
.CSV	Comma-separated values
.WKS or .WK1	Lotus 1-2-3 worksheet file (imports text & numbers only)
.VFS	ViewFinder version 2 file
any other	Formatted text file

If you import from a ViewFinder version 2 file, you will be given the choice whether to import worksheet data, charts or both.

See also:
File|Export|Data

File|Import|Metafile

This command is used to insert a placeable Windows metafile picture object into the current chart page.

To attach the metafile object to the chart page itself, make sure there is no selection by clicking outside the chart page area.

To attach the metafile object to a particular data chart (so that the picture moves with the data chart if it is dragged to a new position), select the data chart first.

The command uses the Windows File|Open dialog to select the name of the disk file containing the metafile object. Once imported, a copy of the metafile graphic is stored inside the workbook file. It may then be resized or relocated.

See also:

File|Export|Metafile
File|Import|Bitmap

File|Import|Bitmap

This command is used to insert a Windows bitmap graphic object into the current chart page.

To attach the bitmap object to the chart page itself, make sure there is no selection by clicking outside the chart page area.

To attach the bitmap object to a particular data chart (so that the picture moves with the data chart if it is dragged to a new position), select the data chart first.

The command uses the Windows File|Open dialog to select the name of the disk file containing the bitmap. Once imported, a copy of the bitmap is stored inside the workbook file. It may then be resized or relocated.

See also:
File|Import|Metafile

File|Export|Data

This command is used to export data from the current worksheet to a disk file for later use by other applications.

The type of file used depends on the filename extension of the filename chosen for exporting the data. The available types are

.DIF	Data Interchange Format
.CSV	Comma-separated values
any other	Formatted text file (as per the screen display)

To save a particular rectangular range of cells, first select them with the mouse. To save the whole worksheet, make sure there is no selection by clicking on an empty cell.

See also:
File|Import|Data

File|Export|Metafile

This command is used to save all, or part, of the current chart page to disk as a placeable Windows metafile (WMF). Such a file can later be imported into other applications (eg word processing) as a picture object.

To save the entire chart page, make sure there is no current selection in the chart window by clicking outside the chart page area.

To save part of the chart page, select the object required with the mouse or use the selection arrows on the chart button bar.

The command uses the Windows File|Save common dialog box to select the filename required. The default filename extension (recommended) is .WMF.

See also:
File|Import|Metafile
File|Import|Bitmap

File|Exit

Keyboard shortcut: Alt + F4

This command is used to exit from the current ViewFinder session. You will be prompted to save the current workbook file if it has changed before exiting.

Note: if you want to restore your ViewFinder session next time you start up the program, save the current configuration of the desktop using Window|Save desktop. Then, on resuming ViewFinder, select Window|Restore desktop.

The most recently-used desktop configuration can be automatically saved and restored between ViewFinder sessions by selecting the 'Restore desktop on startup' option in the Setup|Global options dialog.

See also:
File|Save
File|Save As

Edit Menu

The Edit menu provides access to commands that manipulate the Windows clipboard, or can be used to change the contents and arrangement of worksheet cells and chart objects.

Edit|Cut
Edit|Copy
Edit|Paste
Edit|Select all
Edit|Selection

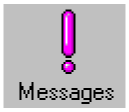
Edit|Vector

Edit|Delete
Edit|Clear|Contents
Edit|Clear|Formats
Edit|Clear|All
Edit|Clear|Clipboard
Edit|Fill

Edit|Erase page
Edit|Delete page
Edit|Rename page
Edit|Swap pages

See also
Menu Commands

Edit|Cut



Shortcut key: Ctrl+X or Shift+Del

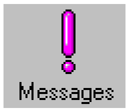
This command deletes the current worksheet or chart page selection to the Windows clipboard.

In the worksheet window, the command cuts the cursor cell if there is no selected cell range.

In the chart window, the command is inactive if there is no selection.

See also:
- Edit|Copy
- Edit|Paste

Edit|Copy



Shortcut key: Ctrl+C or Ctrl+Ins

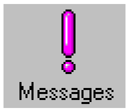
This command copies the current worksheet or chart page selection to the Windows clipboard.

In the worksheet window, the command copies the cursor cell if there is no selected cell range.

In the chart window, the command is inactive if there is no selection.

See also:
  Edit|Cut
  Edit|Paste

Edit|Paste



Keyboard shortcut: Ctrl+V or **Shift+Ins**

This command pastes the contents of the Windows clipboard into the current worksheet or chart page (depending on which is currently active).

The types of objects that can be pasted depend on the target (worksheet or chart page).

Refer to
- Pasting objects into a worksheet
- Pasting objects into a chart page

See also:
- Edit|Cut
- Edit|Copy

Pasting objects into a worksheet

ViewFinder supports several formats for pasting clipboard data into a worksheet. The following formats are tried successively on each paste operation:

ViewFinder's native format for cells
This format is used for copying data from one worksheet to another within ViewFinder. This format preserves all cell formatting and formula information.

DIF (Data Interchange Format)
This standard format is used by many spreadsheet applications, eg Microsoft Excel, for exchanging data.

ASCII Text
This format regards the data as formatted text, eg with rows on separate lines and columns separated by spaces or tabs.

See also:

File|Import|Data
File|Export|Data

Pasting objects into a chart page

Three types of graphical objects may pasted from the Windows clipboard into a chart page.:

ViewFinder Chart Objects
These include whole charts, labels, axes, vectors, callouts and pictures. In this case, the pasted object will become attached to the most logical parent object, eg an axis will be attached to a chart etc.

Placeable Windows metafiles

Windows bitmaps

In the latter two cases, the pasted graphic will be attached to the chart page itself if there is no selection and to a data chart if one is present on the page and selected.

See also:
File|Import|Bitmap
File|Import|Metafile

Edit|Select all

In the chart window, this will make the whole chart page the current selection.

In the worksheet window, this command will select the whole filled cell area in the current worksheet.

Shortcut: the same effect can be achieved by clicking on the +/- bar at the top left of the row and column grids.

Edit|Selection

Keyboard shortcut: Ctrl+Enter

Worksheet window
This command is functionally identical to clicking in the worksheet editing box and allows the contents of the cursor cell to be edited. Input focus transfers to the editing box.

Chart window
This command allows the "contents" of the currently-selected chart object to be edited. The resulting editing action depends on the nature of the object.

For a chart title or text, a dialog box appears allowing editing of the text.

For a chart vector or axis, a multi-pane dialog appears allowing different options to be set.

Some objects, eg bitmaps and metafile pictures, cannot be edited.

Shortcut: Chart objects can also be edited directly by double-clicking on the object.

Many of the properties of chart objects, for example colors and fonts, be also edited directly using commands from the Format menu and the Chart button bar.

Edit|Vector

This command is used to select a chart vector for editing using the Vector Properties dialog.

A list of the vectors in the current chart is displayed. Highlight the vector required, and the Properties dialog will be displayed. If there is only one vector, the list is bypassed and that vector selected for editing.

The effect is the same as selecting the vector, and then activating the Properties dialog by double-clicking or choosing Edit|Selection. However, vectors sometimes become invisible or difficult to find on the chart because the data is out of the axis scale range, or the chart is crowded, so the Edit|vector command can be useful.

See also
    Chart vectors

Edit|Delete

Keyboard shortcut: **Ctrl+Del**

Chart window
This command deletes the currently-selected chart object from the chart page.

Worksheet window
This command is used to delete cells from the worksheet, at the same time moving other cells in to fill the gap created.

First, select the range of cells to be deleted. Once activated, the command offers 4 different ways for moving cells to fill in the gap that will be created by deleting:

Pull columns left
Pull rows up
Delete complete rows
Delete complete columns

In the first two cases, the cells immediately outside the deleted area will be pulled in, and empty cells inserted at the extreme right or bottom of the worksheet.

In the second two cases, cells outside the selected block that fall within the rows or columns to be deleted will also disappear.

Note that Edit|Delete functions like the delete character operation in a word-processor. To erase the contents of cells without moving them, use Edit|Clear|Contents.

See also:
Insert|Cells

Edit|Clear|Contents

This command erases the contents of all cells in the current selection. If there is no selection, the contents of the cursor cell are erased.

See also:
  Edit|Clear|Formats
  Edit|Clear|All

(Worksheets only)

Edit|Clear|Formats

This command clears the display formats of all cells in the current selection. If there is no selection, only the cursor cell is affected. After clearing, the display format is set to the default for the worksheet (see Setup|Worksheet|Default cell format).

See also:
Edit|Clear|Contents
Edit|Clear|All

(Worksheets only)

Edit|Clear|All

This command clears both the the contents and display formats of cells in the current selection.

It is functionally equivalent to calling Edit|Clear|Contents and Edit|Clear|Formats.

(Worksheets only)

Edit|Clear|Clipboard

This command clears the contents of the Windows clipboard.

To examine the contents of the clipboard before clearing it, use the Windows Clipboard viewer accessory.

Edit|Fill

The Edit|Fill|Right, |Left, |Up and |Down commands are used to quickly fill in a rectangular block of cells using a single row or column of cells as a source of data.

First select the range of cells to be filled, then choose the direction in which to fill the range (left, right, up or down).

Using Fill|Right, cell data in the first column in the selected range is copied to every other column.

Using Fill|Left, cell data in the last column in the selected range is copied to every other column.

Using Fill|Down, cell data in the first row in the selected range is copied to every other row.

Using Fill|Up, cell data in the last row in the selected range is copied to every other row.

(Worksheets only)

Edit|Erase page

This command erase the contents of the current page.

In the worksheet window, this corresponds to erasing the contents and formats of all cells in the current worksheet (see also Edit|Clear|All).

In the chart window, this corresponds to erasing all chart and graphic objects from the current chart page.

See also:
    Edit|Delete page
    Insert|New page

Edit|Delete page

This command deletes the current worksheet or chart page from the workbook.

In the worksheet window, this corresponds to deleting the current worksheet. If this deletion would leave the workbook with no worksheet pages, a new empty worksheet is created.

In the chart window, this corresponds to deleting the current chart page. If this deletion would leave the workbook with no chart pages, a new empty page is created.

See also:

- Edit|Erase page
- Insert|New page

Edit|Rename page

This command allows the current worksheet or chart page to be renamed.

The default names used for newly-created pages are SHEET1, SHEET2, ... (worksheets) and CHART1, CHART2, ... (chart pages).

The maximum length of a page name is 32 characters. Page names must be unique.

Shortcut: Double-click on the page name displayed in the page bar.

See also:
Insert|New page

Edit|Swap pages

In the worksheet window, this command swaps the position of the current worksheet with that next to the right.

In the chart window, the corresponding chart pages swap positions.

Only the positions in the list change. The contents of each page remain the same.

View Menu

The View menu provides access to commands that change what is visible in the ViewFinder main window. Most of the menu commands concern operations that affect the chart window.

View|Portrait
View|Landscape

View|Fit in window
View|Actual size
View|Zoom

View|Next object
View|Previous object

View|Redraw
View|Toggle

See also
Menu Commands

View|Portrait

This command selects portrait orientation for the chart window. The current orientation, portrait or landscape, is indicated by a check mark in the menu display.

The default chart page orientation and size is set in the Options|Chart dialog.

See also
   View|Landscape

View|Landscape

This command selects landscape orientation for the chart window. The current orientation, portrait or landscape, is indicated by a check mark in the menu display.

The default chart page orientation and size is set in the Options|Chart dialog.

See also
    View|Portrait

View|Fit in window

This command adjusts the view scaling so that the whole chart page fits into the current client window. The visible size will depend on how large the ViewFinder main window currently is, and on the page orientation.

The alternatives are viewing at the actual size (View|Actual size), and at a predetermined scaling factor (View|Zoom).

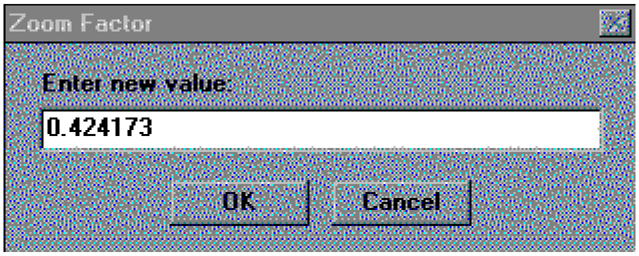
View|Actual size

This command changes the display of the chart page so that it is drawn as close as possible to its actual size, ie if it were printed.

See also
  View|Fit in window
  View|Zoom

View|Zoom

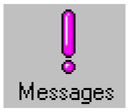
This command displays the chart window in any selected scaling factor. When the command is selected, a dialog box appears allowing the user to enter the required scale factor:



A scale factor of exactly 1.000 corresponds to View|Actual size.

See also
View|Fit in window

View|Next object



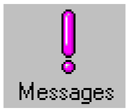
Keyboard shortcut: F7

This command shifts the chart page selection to the next object on the chart page (if there is another object to be selected).

See also

View|Previous object

View|Previous object



Keyboard shortcut: Shift + F7

This command shifts the chart page selection to the previous object on the chart page (if there is another object to be selected).

See also
View|Next object

View|Redraw

This command causes the current window to be redrawn. Redrawing applies equally to the worksheet window and the chart window.

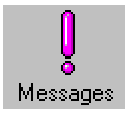
View|Toggle

Keyboard shortcut: F3

This command toggles the active window between the worksheet, chart and message windows.

The same effect can also be achieved by

1. Selecting the desired window in the numbered items of the Window Menu.
2. Using the button bar commands (both worksheet and chart button bars).



make the worksheet window active

make the chart window active

make the message window active

Insert Menu

The Insert Menu provides commands for inserting objects into worksheets and chart pages.

For worksheets:

Insert|Cells
Insert|Row
Insert|Column

For chart pages:

Insert|Chart
Insert|Vector
Insert|Axis
Insert|Legend
Insert|Major title
Insert|Minor title
Insert|Text
Insert|Callout

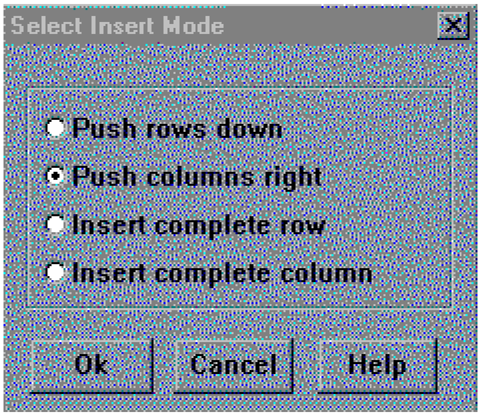
For both:

Insert|New page

Insert|Cells

This command is used to insert a space of empty cells into the worksheet. Existing cells are pushed aside to make room. If you only want to erase the contents of a block of cells without moving any, use the Edit|Clear|Contents command instead.

First select the range of cell positions to be filled with empty cells, then choose the Insert|Cells command. A dialog appears allwoing selection of how to move cells to make the insertion.



The available options are:

Push rows down
Cells in all rows in the selected range will be pushed downwards to make room.

Push columns down
Cells in all columns in the selected range will be pushed rightwards to make room.

Insert complete row
Same as Insert|Row

Insert complete column
Same as Insert|Column

This command is the opposite of Edit|Delete when one or more cells has been selected (but not an entire row or column).

See also
Insert|Row
Insert|Column

Insert|Row

This command inserts a new, blank row into the worksheet at the current row position. Existing rows, if not empty, are pushed downwards.

This command is the opposite of choosing Edit|Delete when an entire row has been selected.

Note: If the last possible row in the worksheet (row 9999), contains any filled cells, their contents are lost.

See also

Insert|Cells
Insert|Column

Insert|Column

This command inserts a new, blank column into the worksheet at the current column position. Existing columns, if not empty, are pushed rightwards.

This command is the opposite of choosing Edit|Delete when an entire column has been selected.

Note: If the last possible column in the worksheet (column WB), contains any filled cells, their contents are lost.

See also
- Insert|Cells
- Insert|Row

Insert|Chart

This command inserts a new chart onto the current chart page.

The command begins by displaying a dialog box for selecting the axis arrangement for the new chart (this can also be edited later). The choices are either

1. A complete box, with labelled X and Y axes at the bottom and left, and identical but unlabelled axes on the opposite sides.

2. A pair of labelled X and Y axes that may be placed at the bottom or top, and left or right, sides respectively.

After choice of axes, the chart is displayed with a single vector that uses column B for the X-variable and column C for the Y-variable. This choice may be changed by selecting the vector and editing its properties (see Edit|Selection and Edit|Vector).

An existing chart may be copied via the clipboard using Edit|Copy and Edit|Paste.

Each chart page may contain as many charts as you wish.

To change the default chart properties for newly-created charts, use the Options|Chart command.

See also

Overview of chart concepts

Insert|Vector

This command inserts a new chart vector into the current chart.

After creation, the Vector Properties dialog is displayed allowing editing of the properties of the new vector.

When new vectors are inserted, ViewFinder examines the current use of columns for existing vectors, and selects the most likely columns for the new vector. In addition, the chart options that relate to colour, symbol type and linestyle choices for new vectors are used to select the initial values of these properties (see Options|Chart).

When the Vector Properties dialog closes, the new vector is displayed in the chart and becomes the current selection.

NOTE: if after creation nothing is visible in the chart, it is possible that

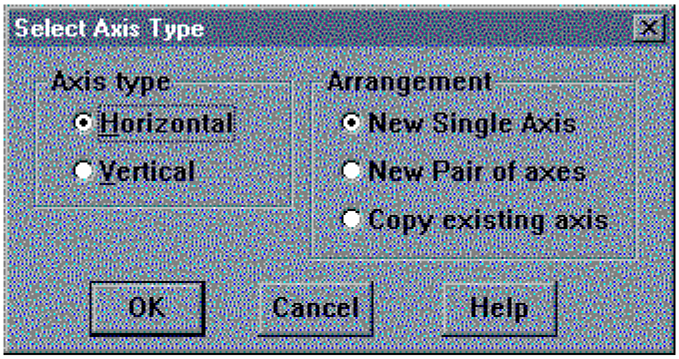
1. The data values are out of range
2. The worksheet cells are empty
3. The option to plot symbols at each point is turned off
4. You are plotting lines only, and the selection is hard to see.

In this case, press Ctrl+Enter to re-activate the Vector Properties dialog and re-check everything.

Insert|Axis

This command is used to insert a new axis into a chart. Usually, the choice of axes is made at the time the chart itself is created (see Insert|Chart) and this choice will suffice for the majority of charts. Sometimes it is useful to insert a new, additional axis, for example where two different vectors are being compared on the same chart, but each requires a different Y-axis, X-axis, or both.

First, the command displays a dialog box that displays choices about the new axis:



In the left box, choose whether you want a vertical or horizontal axis.

In the right box, there are three choices:

New single axis is the default. The new axis will be located as far away from any existing axis of the same direction. For example, if you are inserting a vertical axis and the current one is at the left of the chart plot area, the new one will be located at the right. The orientation of the labels will also be inverted.

New pair of axes means that an axis pair will be created. In an axis pair, the second axis of the pair (the one that initially has tick marks but no labels or caption) is not really an independent axis but is simply a copy of the other drawn on the other side of the plot area. This corresponds to the situation when a box chart, with 4 axes, is created using Insert|Chart.

The second, copied axis can be made into a 'real' independent axis by selecting it and choosing Edit|Selection.

Copy existing axis creates a new axis that is not independent, but a copy (as described above) of the exisiting axis of the same orientation.

After the axis type has been selected, the command displays the Axis Properties dialog box so that the different options affecting display of the axis can be edited.

See also
Chart axes

Insert|Legend

This command inserts a new legend into the selected chart. The command is inactive if the chart already has a legend.

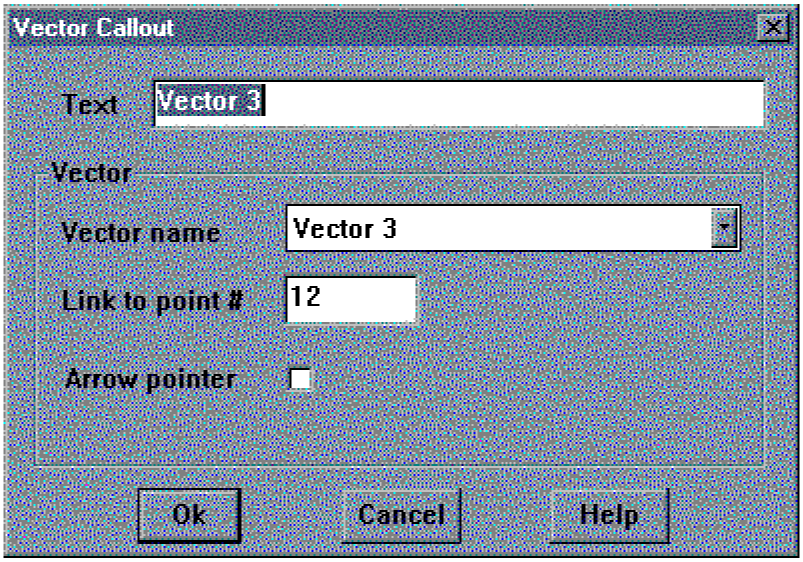
See also

Chart legend

Insert|Callout

This command is used to insert a callout attached to a particular chart vector (see Vector callouts).

First select the vector to which the callout is to refer, and then choose the command. A dialog box displaying the properties of the callout will appear:



Text is the text to be displayed in the callout. By default, ViewFinder uses the name of the vector as set in the Vector Properties dialog.

Vector name is the name of the vector to which the callout refers. To select the vector required, press the down arrow at the right of the control and click on the required vector name. If there is only one vector in the chart, its name will be displayed here and this control inactivated.

Link to point refers to the data point, in order, to which the callout is linked.

The **Arrow pointer** checkbox determines whether or not an arrow is drawn at the end of the callout line.

See also

Chart vectors

Insert|Major title

This command allows insertion of a major title into the current chart. The command is disabled if there is no chart on the current chart page, or if the chart already has a major title.

Once selected, the command displays an edit box into which you should type the required title. When completed, press the Ok button.

To edit the text of an existing title, double click on it, or select it and choose Edit|Selection (Ctrl+Enter).

See also

- Insert|Minor title
- Chart titles

Insert|Minor title

This command allows insertion of a minor title into the current chart. The command is disabled if there is no chart on the current chart page, or if the chart already has a minor title.

Once selected, the command displays an edit box into which you should type the required title. When completed, press the Ok button.

To edit the text of an existing title, double click on it, or select it and choose Edit|Selection (Ctrl+Enter).

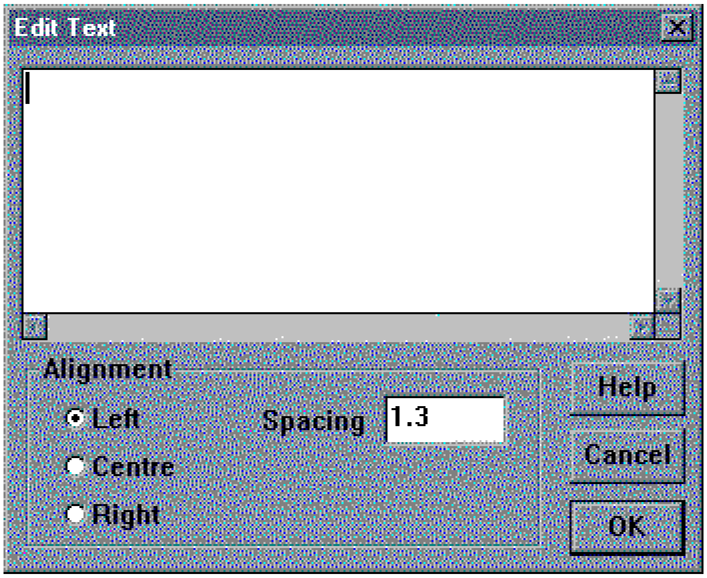
See also

Insert|major title
Chart titles

Insert|Text

This command is used to insert a multi-line text object into a chart.

When selected, the command displays an editing box for entering the contents of the object, as well as a selection panel for setting the line spacing and justification:



In the editing area, type the text required. To end the current line, press ENTER. Insert special effects, such as subscripts, superscripts or symbol font characters, as required.

To select the required justification (left, right or centred), click on the corresponding radio button (see Format|Align).

To change the line spacing, click on the edit control and type in the required spacing as a decimal value (units are lines).

See also

Insert|Major title
Insert|Minor title

Insert|New page

This command inserts a new, empty worksheet or chart page into the current window, depending on whether the worksheet or chart window is active.

This command is the opposite of Edit|Delete page.

See also
    Insert Menu

Format Menu

The Format Menu provides commands that change the visual appearance of objects in the current window.

For the worksheet window:

Format|Cells
Format|Rows
Format|Columns

For the chart window:

Format|Grow
Format|Shrink
Format|Resize
Format|Rotate
Format|Flip
Format|Reset position
Format|Border

Format|Bring to front
Format|Send to back
Format|Attach to page
Format|Background

Format|Fonts
Format|Pens
Format|Pattern

For both windows

Format|Align Text align text left, right or centred.

Format|Cells

This command is used to change the display format of worksheet cells. The command uses a 2-page dialog box, with a page for **Number format** and a page for **Text format**.

Number format

Numbers may be aligned in the worksheet column in 4 ways:

Left aligned
Right aligned
Centre aligned
Aligned on the decimal point

There are 4 different ways of formatting numbers, each of which used the **precision** field in different ways:

Fixed point **-** the number is displayed with **precision** places after the decimal point. eg 1.225.

Scientific **-** the number is displayed with **precision** places after the decimal point in the mantissa and with an exponent, in standard e-format: eg 1.224e-5 .

Significant figures - the number is displayed in either fixed point or scientific notation, depending on its magnitude, and has a minimum of **precision** significant figures.

General - the number is displayed in either fixed point or scientific notation, depending on its magnitude, and has a maximum of **precision** significant figures. Redundant zeroes are truncated.

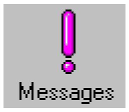
Text format

Text cells may be aligned in the worksheet column in 3 ways:

Left aligned
Right aligned
Centre aligned

See also
Format|Rows
Format|Columns
Format|Align

Increase decimal places

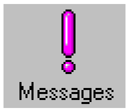


This command, which is accessed through the Worksheet button bar, converts number cells in the selected range to floating point format and increases the number of decimal places displayed.

See also

Format|Cells
Decrease decimal places

Decrease decimal places



This command, which is accessed through the Worksheet button bar, converts number cells in the selected range to floating point format and increases the number of decimal places displayed.

See also

Format|Cells

Increase decimal places

Format|Rows

This command is used to format an entire worksheet row, or group of rows.

For details on setting the display format, see Format|Cells

See also
    Format|Columns

Format|Columns

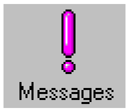
This command is used to format an entire worksheet column, or group of columns.

For details on setting the display format, see Format|Cells

See also

Format|Rows

Format|Grow

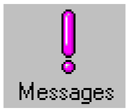


This command causes certain selected chart objects to grow in size by about 1/8.

The effect depends on the object selected, but any fonts, symbols and tick marks in the object will grow. The plot area of the chart is not changed in size by this command.

See also
    Format|Shrink

Format|Shrink



This command causes certain selected chart objects to shrink in size by about 1/8.

The effect depends on the object selected, but any fonts, symbols and tick marks in the object will shrink in size. The plot area of the chart is not changed in size by this command.

See also

Format|Grow

Format|Resize

This command is used to manually resize and/or locate a chart so that its plot area is precisely located, eg relative to others on the chart page. The command applies only to the plot area of a chart.

The command displays a dialog box allowing the user to set the coordinates of the bottom left corner of the plot area, and its width and height. The units used are millimetres.

NOTE: Internally, ViewFinder uses units of 0.01 mm for chart objects. To align objects to the nearest mm using the mouse, set the **Snap to grid** option in the Options|Chart dialog.

See also

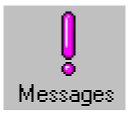
Moving a chart object
Resizing a chart object

Format|Align text

The Format|Align text command allows text objects on a chart page or cells in a worksheet to be displayed with different alignment:

Left the displayed text is left-aligned in the display space available to it;
Right the displayed text is right-aligned;
Centre the displayed text is centred.

These three sub-menu commands can also be accessed from the button bar in either the worksheet or chart windows (see Worksheet button bar, Chart button bar).



Left, Centre and Right Align buttons.

See also
Format Menu

Format|Align

The Format|Align command is used to align chart objects to the ruler guides.

Ruler guides are visible as a dotted line across the chart display. Both vertical and horizontal guides are possible.

To set a ruler guide to a particular position, click with the mouse left button on the appropriate ruler, and drag to the required position.

To remove a ruler guide, double-click with the left button on the ruler.

Once a ruler guide is visible, objects can be aligned. To align an object, select it and then choose the required form of alignment in the Format|Align popup menu. The possibilities are

For vertical guides:

Left	Left of bounding box lines up with ruler guide
Right	Right of bounding box lines up with ruler guide
Centre	Bounding box is centred horizontally on the ruler guide

For horizontal guides:

Top	Top of bounding box lines up with ruler guide
Bottom	Bottom of bounding box lines up with ruler guide
Centre	Bounding box is centred vertically on the ruler guide

See also
Chart Window

Format|Rotate

This command applies only to text objects (titles, axis captions, axis labels and text). The three options are

Rotate 90 degrees
Rotate 270 degrees
Set angle

In the last option, a dialog box is displayed for entering the angle.

The angle of a text object is reset to its default when <u>Format|Reset position</u> is selected.

See also
    <u>Format Menu</u>

Format|Flip

This command is used to reverse the direction of certain chart objects, either **horizontally** or **vertically**.

The command applies mainly to chart axes, and reverses the side of the axis on which the labels and caption appear.

See also

Format Menu

Format|Reset position

This command is used to reset the position of a chart object to its original, default value.

Use this command, for example, if you have messed up rearranging a chart and want to start again.

See also

Moving chart objects

Format|Border

This command determines whether or not a border is drawn around certain chart objects. These include all text labels, the legend and vector callouts.

If the object currently has a border, the menu command will be checked, otherwise not. To change the state, select the command.

See also

Format Menu

Format|Bring to front

This command brings the selected chart object to the front of the drawing, meaning that it is drawn last amongst the chart objects it belongs to. This is generally used to select which, among a group of chart vectors, is visible on top of the chart page.

See also

Format|Send to back

Format|Send to back

This command sends the selected chart object to the back of the drawing, meaning that it is drawn first amongst the chart objects it belongs to. This is generally used to select which, among a group of chart vectors, is visible on top of the chart page.

See also

Format|Bring to front

Format|Background

This command determines whether the background of the selected chart object is **transparent** or **opaque**. Whichever option is currently selected wll be check-marked in the menu. To change the selection, click on the desired choice.

When the background is opaque, objects such as text will be filled in with the chart background color before the text is drawn. When the background is transparent, no filling in occurs.

The desirable setting depends on whether the chart page background color and the plot area background pattern have been changed from the default values of paper white.

See also

Options|Chart

Format|Attach to page

This command detaches a chart object from its parent chart and places it, as an independent object, on the chart page. There is no change in position.

All objects inserted into a chart move with the chart when it is moved on the page, and can be considered 'attached' to the chart. Some objects can only be used inside a chart (eg axis, vector, legend), whereas some can also be used independently. This includes chart text, metafiles and bitmap pictures. In the latter case, these objects are attached to the chart page itself as independent objects.

If an independent object is inserted when a chart is selected, it will be attached to the chart. Otherwise, it will be attached to the chart page.

Whether a text paragraph or picture should be attached to the page, or to a specific chart, depends on the diagram being constructed.

Format|Fonts

This command allows the fonts used to display a chart or chart object to be changed or cleared.

See also

Format|Fonts|Edit
Format|Fonts|Clear
Use of fonts in charts

Format|Fonts|Edit

This command is used to change the font(s) used by charts and chart objects.

If the selected object uses more than one font, a dialog box first appears to select the font to be edited. This applies to charts and to axes.

Subsequently, the Windows common dialog for font editing appears. Use this to select the font type, point size, colour and special effects. Only TrueType fonts are used in ViewFinder. Other fonts will not appear in the dialog.

See also
Format|Fonts|Clear
Use of Fonts in Charts

Format|Fonts|Clear

This command clears any fonts that are attached to a chart or chart object so that the object will revert to the use of default fonts.

See also

Format|Fonts|Edit
Use of fonts in charts

Format|Pens

This command allows the 'pens' used to draw lines in a chart or chart object to be changed or cleared.

See also

- Format|Pens|Edit
- Format|Pens|Clear
- Line widths in charts

Format|Pens|Edit

This command is used to change the pen(s) used for drawing lines in charts and chart objects.

If the selected object uses more than one pen, a dialog box first appears to select the pen to be edited. This applies to charts and to axes.

Subsequently, a dialog for pen editing appears. Use this to select the pen type, width and color.

See also

Format|Pens|Clear
Line widths in charts

Format|Pens|Clear

This command clears any pens that are attached to a chart or chart object so that the object will revert to the use of default pens (see Options|Chart).

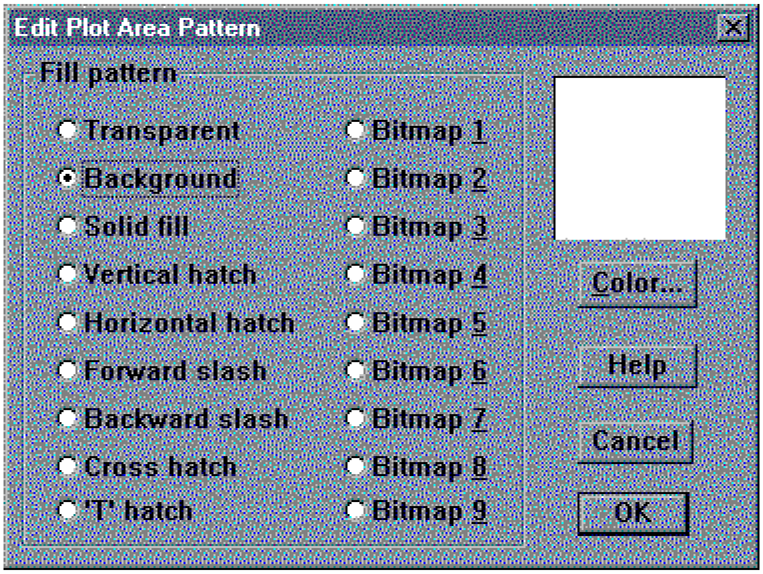
See also

Format|Pens|Edit
Line widths in charts

Format|Pattern

This command applies only to the plot area of a chart, and is used to set the fill pattern of the plot area. The default fill pattern is to fill with the chart page background color prior to drawing the chart vectors.

The command displays a dialog offering various fill pattern options:



Select the desired pattern. Press the **Color** button to edit the fill color when required.

See also

    Format Menu

Format|White on blue

This command converts a 'normal' chart page, drawn on paper-white background, into a white-on-blue drawing and back again.

The chart page background is made dark blue, and all black colors are converted to white (and vice-versa).

See also

Options|Chart

Data Menu

The Data Menu, which applies only when the worksheet window is active, is used to access commands that manipulate data in the worksheet.

Data|Recalc cell(s)	recalculate a block of cells
Data|Recalc all	recalculate all formulae in the worksheet
Data|Convert	convert formulae to constant numbers
Data|Sort	sort a block of cells into order
Data|Swap rows	swap the current row with the row below
Data|Swap columns	swap the current column with the column to the right

See also

Menu Commands

Data|Recalc cell(s)

This command is used to recalculate the formulae in one or more cells in the current worksheet.

To recalculate a rectangular block of cells, select it with the mouse and then choose the Data|Recalc cell(s) command.

To recalculate a single cell, put the cell cursor on it and then choose the Data|Recalc cell(s) command.

See also

Moving around the worksheet
Selecting cells
Data|Recalc all

Data|Recalc all

This command is used to recalculate all the formulae in the current worksheet.

See also
    Data|Recalc cell(s)

Data|Convert

This command is used to convert one or more cells containing a formulae to cells containing a number constant equal to the current value of the formula.

To convert a rectangular block of cells, select it with the mouse and then choose the Data|Convert command.

To convert a single cell, put the cell cursor on it and then choose the Data|Convert command.

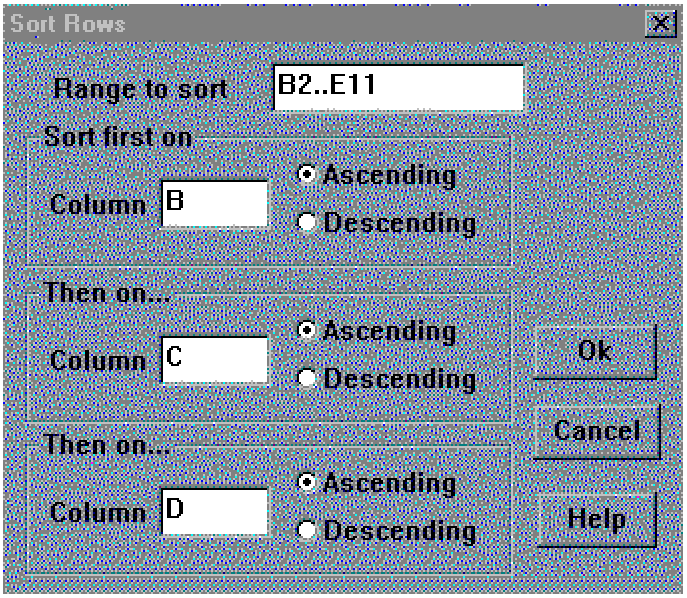
See also

Moving around the worksheet
Selecting cells

Data|Sort

This command is used to sort worksheet data into a specified order, eg alphabetical or numerical.

To sort the cells in a rectangular block, first select the cells required and then choose the Data|Sort command. A dialog box will appear allowing selection of the sorting options:



The **Range to sort** edit box displays the name of the cellrange to be sorted. Change this only if the displayed value is incorrect.

Sorting is carried out based on the values in cells in a particular column, with up to three columns allowed for a three-level sort.

The primary sorting is conducted using the values in the first column specified under **Sort on column** heading. Type in the required column name (ViewFinder chooses the first column of your selected range by default).

If a second sorting level is required, eg in cases where two cells in the primary column are identical, enter a column name in the first **Then on column** edit box.

Finally, if a third sorting level is required, eg in cases where two cells in the primary column are identical, and the two cells in the second column are also identical, enter a column name in the second **Then on column** edit box.

In each of the three cases, choose whether the sorting will be in **ascending** or in **descending** order.

Then press **Ok** to begin the sort.

Sorting method

ViewFinder sorts the cells based on the contents in the key columns described above. The type of comparison depends on the type of cell found at the top of the column when the search begins.

If a text cell is found, subsequent cells are compared alphabetically (without case sensitivity). If a numerical value is found, the cells are compared according to the numerical values. In the latter case, any non-numerical cells are sorted to the top of the row range. Generally speaking, every cell in a sort key column should be filled with the same type of contents (text or numeric).

See also

Selecting cells

Data|Swap rows

This command swaps the current row with the row below it in the worksheet.

See also

Data|Swap columns

Data|Swap columns

This command swaps the current column with that immediately to its right in the worksheet.

See also
 Data|Swap rows

Window Menu

The Window menu provides command for manipulating windows on the screen.

Window|Tile
Window|Cascade

Window|Save desktop
Window|Restore desktop

Window|Button bar
Window|Status line

Below these menu items, there are three numbered menu items corresponding to

1. The message window
2. The worksheet window (if a workbook is loaded)
3. The chart window (if a workbook is loaded)

See also

View|Toggle
Menu Commands

Window|Tile

Choose Window|Tile to tile open windows. This option arranges the windows so they cover the entire desktop without overlapping.

See also

Window|Cascade

Window|Cascade

Choose Window|Cascade to stack all edit windows. This option overlaps each window so they are the same size and only the title bar of each underlying window is visible.

See also

Window|Tile

Window|Save desktop

This command saves the current configuration of the desktop, including the name of the workbook file and the state of the worksheet, chart and message windows to disk as a file named VFW.DSK.

The desktop can be saved automatically to VFW.DSK when ViewFinder closes down and automatically restored next time it restarts by selecting the Restore desktop on Startup option in the Options|Worksheet menu.

See also

Window|Restore desktop

Window|Restore desktop

This command restores a previously saved configuration of the desktop, including the name of the workbook file and the state of the worksheet, chart and message windows by reading the disk file VFW.DSK.

The desktop can be saved automatically to VFW.DSK when ViewFinder closes down and automatically restored next time it restarts by selecting the Restore desktop on Startup option in the Options|Worksheet menu.

See also

Window|Save desktop

Window|Button bar

This command toggles whether the button bar is visible at the top of the client area (below the menu bar).

See also

- Worksheet button bar
- Chart button bar
- The ViewFinder screen

Window|Status line

This command toggles whether the status line is visible. The status line, which is located at the bottom of the ViewFinder screen, displays program prompts and a progress indicator for lengthy tasks such as file loading.

See also

The ViewFinder screen

Options Menu

This menu command allows customisation of worksheet or chart options.

These options are stored in the ViewFinder configuration file.

See also
    Options|Worksheet
    Options|Chart

Options|Worksheet

This command is used to configure options that apply either to the current worksheet, or all worksheets. The command used a multi-page dialog. To select the page to change, click on the page name at the top of the dialog. The pages are:

Options page
Display page
Printing page

The worksheet options are stored in the ViewFinder configuration file.

See also
    Options|Chart

Worksheet options page

This page of the Options|Worksheet dialog is used to set options that apply to worksheets.

Global Options

Restore desktop on startup
This option causes ViewFinder to save its screen configuration when it exits to a file VFW.DSK, and to restore it again when it is re-started.

Warn if deleting worksheet
This option means that every time a command is issued that would delete a whole worksheet, ViewFinder displays a warning first, allowing the user to back out if required.

Backup files on saving
When selected, this option means that every time a workbook file is saved, the old version of the file (if it exists), is re-named with a .BAK extension as a backup precaution.

Autosave interval
This is the time interval, in minutes, when ViewFinder makes an automatic save of the current workbook file if it has changed and not been saved. The automatic backup file is named with an .ASV filename extension and can be reloaded bu ViewFinder in the event of an inadvertent program crash or power loss.

Worksheet Options

Display formulae
By default, ViewFinder displays the value of a worksheet formula in the cell display area and the formula in the cell contents panel. Setting this option produces the reverse.

Automove on cell entry
If this option is checked, whenever a cell entry is made from the keyboard, the cursor advances automatically to the next cell down.

Auto-recalculate on cell entry
If this option is checked, whenever a cell entry is made from the keyboard, the whole worksheet is recalculated (see Data|Recalc all).

Recalculate constant formulae
If this option is set, those cell formulae that are constant values are recalculated whenever Data|Recalc all or Data|Recalc cells is called.

The **Default cell format** button is used to set the default display format for newly created cells. For details on how to set the cell format, see Format|Cells.

Apply to
The worksheet options described above can be applied either to the current worksheet, or as a default for all worksheets.

See also
Options|Worksheet

Worksheet display page

This page of the Options|Worksheet dialog is used to set options that affect the screen display of worksheets.

Show grid lines
If this option is set, grid lines separating the worksheet rows and columns are drawn on the screen display. This option does not affect whether grid lines are printed.

Syntax colors
If selected, this option allows syntax colors to be used for worksheet cells of different types.

The colors used may be customised using the color grid displayed on the page. Use the iten list to select the target display item, the set the foreground and background colors with the mouse.

Default column width
This control sets the default column width, in characters, for empty and newly-created columns in the worksheet (see Insert|Column).

Worksheet printing page

This page of the Options|Worksheet dialog is used to set various paraneters affecting printing of worksheets.

Each printed page can have a **header** and a **footer**, which may contain one or more of the page number, worksheet name, file (workbook) name and the current date. Both the header and the footer may be aligned to the left, right or centre of the page.

Overall options are to centre the printed output horizontally and/or vertically, whether to pront the grid lines between columns and rows, and whether or not to clip off completely empty columns and rows from the output.

The **Font** button is used to set the font for printed output.

NOTE: be sure to set the page orientation in the File|Printer setup dialog before printing.

See also
    Printing worksheets
    Options|Worksheet

Options|Chart

This command is used to configure options that apply either to the current chart page, or to all chart pages. The command used a multi-page dialog. To select the page to change, click on the page name at the top of the dialog. The pages are:

Page layout
Appearance
Chart options
Graphics options

The chart options are stored in the ViewFinder configuration file.

See also
    Options|Worksheet

Chart page layout options

This page of the Options|Chart dialog is used to set options that control how the the chart is printed.

The **Page Size** options allow a page size in the range ISO A1-A4, or ANSI A-D to be selected.

The **Orientiation** option can be portrait or landscape, and can also be set for the current chart in the View Menu.

The **Apply To** options allow the selections on this page to apply only to the current chart page, or to be the default for all chart pages.

Graphics options

These options apply globally to all chart pages.

Clip symbols inside chart plot area
When selected, this means that data point symbols are clipped within the chart plot area and do not overlap its edges.

Use external stroke fonts
When selected, this option means that for displaying text in charts, ViewFinder will use the disk file fonts (xxxx.FNT) that are functionally identical to the version 2 fonts, rather than Windows TrueType fonts.

Print colors as gray scale
When selected, this option means that all chart colors will be converted to gray scale at the time of printing.

Snap to rulers
When selected, this option means that when chart objects are moved or resized, all movement takes place in multiples of about 1mm, making it easier to line objects up (see also Format|Resize).

Ruler units
The units used in the rulers displayed at the edge of the chart page may be in millimetres or inches.

See also
    Options|Chart

Chart options

The options on this page of the Options|Chart dialog apply either to the current chart, or as the default for all charts.

The **Relative Sizes** of data symbols (default value), axis arrows, major and mnor tick marks relative to the chart plot area can be set using this set of edit controls. A sample of the current values is displayed in the sample panel.

Various options are available for when **Inserting vectors into a chart**. These include incrementing the symbol type, linestyle and color used by the vector tio distinguish it from other vectors.

The **Apply To** option allows the selections on this page to apply only to the current chart, or as the default for all charts.

Chart appearances

This page of the Options|Chart dialog is used to control the default appearance of charts.

Default line color sets the color used by default for drawing lines (see Format|Pens|Clear).

Default Font sets the font used by default for text objects (see Format|Fonts|Clear).

Background Color sets the color of the chart page background. By default, this is paper white.

Plot Area Fill allows the method used for filling the chart plot area to be selected. The options are Transparent, Background (uses the chart page background color) and solid fill (which uses the color set by the plot area **Fill Color** button. See also Format|White on blue.

Configuration file

The configuration file, named VFW.CFG, stores the various worksheet and chart options when ViewFinder closes and restores them the next time it is started up. The various options are set using Options|Worksheet and Options|Chart.

The configuration file is normally stored in the program startup directory, ie where VFW.EXE is located. If you want to store a different configuration for use elsewhere, then set the environment variable VFW to this directory in your autoexec file.

For example, to use the file located in C:\MYFILES\SHEET, include the following line in AUTOEXEC.BAT

set VFW=C:\MYFILES\SHEET

Help Menu

The Help menu provides access to online Help, which appears in a special Help window and is managed by the Windows WinHelp program.

The Help system provides information on virtually all aspects of ViewFinder. These are the Help menu commands:

Contents
Topic Search
Using Help
About...

See also
Menu Commands

Help|Contents

ViewFinder's online Help Contents summarizes the organization and contents of the Help system.

To access the Help system from Contents, choose one of the buttons or highlighted words or phrases in the Contents: click it, or Tab to it and then press Enter.

To get help on a specific topic, use the Help|Topic search menu command.

If you need help using a Help system under Windows, choose the Help|Using Help menu command.

Help|Topic Search

This menu command provides help on specific topics in ViewFinder.

Help|Using Help

The Help|Using Help command displays information on how to use ViewFinder's Help system (or any other Help system under Windows).

Help|About...

When you choose the Help|About... command, a dialog box appears showing copyright and version information for ViewFinder.

Press Esc or click OK to close the box.

Keyboard shortcuts

The following keyboard shortcuts are provided in ViewFinder:

Ctrl+N	Create a new workbook file
Ctrl+O	Open an existing workbook file
Ctrl+S	Save the current workbook to disk
Ctrl+P	Print current worksheet or chart page
Ctrl+A	Recall a previously-used workbook file
Alt+F4	Exit ViewFinder
Ctrl+X	Cut selection to clipboard
Ctrl+C	Copy selection to clipboard
Ctrl+V	Paste clipboard contents into current window
Ctrl+Enter	Edit the current cell or chart page selection
Ctrl+Del	Delete selected cells or chart page object
Del	Clear the contents and formatting of selected cells
F3	Toggle between worksheet, chart and message windows
F7	Select the next object on the chart page
Shift+F7	Select the previous object on the chart page

See also

Menu Commands
Worksheet button bar
Chart button bar

Upgrading from ViewFinder 2 for DOS

Welcome to all you faithful ViewFinder users (and thanks for the patience in waiting for the Windows version)!

Upgrading your version 2 worksheet files is relatively painless. Choose the File|Open command (or click on the button bar icon), and when the **Load File** dialog appears, click on the **List Files of Type** control and select the line

ViewFinder 2.0 .VFS files

Select your version 2 file in the file list window and click on the **Open** button. The selected file will be converted to a ViewFinder for Windows workbook (.VF3) file. Your original .VFS file remains unchanged.

The converted workbook will have only a single worksheet in it (since ViewFinder 2.x allowed only one), so you may wish to simplify your arrnagement by creating some extra worksheets.

It will also contain all the charts that you had. Since overlaying charts is done explicitly in ViewFinder for Windows, you may need to copy some charts onto the same chart page. Since there are no limits on the number of text items you can have on a page, you may also have *text paragraphs* on one chart page that need to be copied to the same page as their 'parent' chart.

Most other features of ViewFinder 2.x are retained. Notable exceptions are the new method for changing to subscripts and superscripts (\b, \p instead of ^b, ^p). These are translated by VFW. In addition, the *Greek* font has been replaced by the Windows *Symbol* font. Use the **Character Map** utility in Windows to see which keystrokes to use for these characters, which are preceded by the \s switch.

In ViewFinder 2.x, cell formulae were stored as text and were parsed and evaluated in one step. In VFW, they are compiled into Reverse Polish code when entered, and evaluated from this code. This greatly speeds up formula evaluation.

The worksheet size has been greatly increased in width (512 columns instead of 64), and there are still a massive 9999 rows. More importantly, a workbook file can have as many worksheets as memory permits, making calculation layouts much simpler. You are encouraged to use lots of worksheets for greater legibility.

Here are some of the completely new features:

In charts
An unlimited number of different axes per chart (ie no need to cheat by overlaying graphs);
Vector callouts to label data points;
You can control which vectors go in the legend;
Unlimited text labelling on charts;
FFT smoothing and Lowess curve fitting;
Insert metafile and bitmap pictures
Cut and paste graphics into other applications using the clipboard

In worksheets
The FFT and SmoothFFT procedures
Runge-Kutta integration
Simplex optimisation
Expanded range of statistics functions
Cut and paste to other applications (eg Excel) using the clipboard

Registration & Licensing

This is the official beta-test release of ViewFinder for Windows, version 3.24 released April 1998.

All users are entitled to use this version without restriction, provided they undertake to report bugs/errors/suggestions for improvement to the author, Keith A Hunter on

keith.hunter@xtra.co.nz

The official release of ViewFinder for Windows as a shareware product will take place later in 1998. All beta users who assist with bug detection and/or suggestions will receive a free upgrade at this time.