Calendar Magic

Introduction

Calendar Magic is an easy-to-use program that is entertaining, informative, educational and of equal applicability in the home and in the office. Calendar Magic has been tested on Windows 95, 98, Me, XP, Vista (32-bit) and Windows 7 (32-bit and 64-bit), and has also been reported to run without problems on other versions of Windows. Calendar Magic is "freeware" and may be distributed, without prior permission, provided that no alterations are made to any file contained within the product.

Features of Calendar Magic include:

- Full year and individual month Gregorian, Afghan, Armenian, Baha'i, Balinese Pawukon (full year only), Balinese Saka, Bangla, Chinese, Coptic, Egyptian, Ethiopic, French Revolutionary, Hebrew, Hindu lunisolar (3 variants), Hindu solar, Indian National, Islamic arithmetical (8 variants), Islamic Umm al-Qura, Julian, Revised Julian, Parsi Fasli, Parsi Kadmi, Parsi Shenshai, Persian (2 variants), Sikh Nanakshahi and Vietnamese calendars. A user option is provided to choose between displaying/printing calendars showing each week starting on a Monday (in line with the ISO 8601 international standard), on a Sunday for North American users, or on a Saturday for Middle East users.

- Various types of planning calendars.

- "Dual Calendars" – full year calendars in various calendar systems which show, not only the months and days for a year in any one of the calendar systems, but also the corresponding Gregorian dates.

- A month-by-month, side-by-side comparison of any two of the 25 calendar systems listed above. The display remains synchronised as you change day, month and year values in either calendar system being viewed. Again, users may choose between displaying each month with weeks starting on a Saturday, Sunday or Monday.

- Date conversions among the 25 calendar systems listed above, plus conversions to Aztec Tonalpohualli, Aztec Xiuhpohualli, Balinese Pawukon, Thai solar, old Hindu solar, old Hindu lunisolar and the three Mayan date formats. Mayan long count dates may also be input and converted. Julian day value, day of week and day of year information is also displayed.

  For Gregorian dates, many other facts are displayed, such as modified Julian day value, Lilian day value, Rata Die value and CEP countdown, and year related information including Roman numeral form, Dominical Letter(s), Dionysian Period , Julian Period, Golden Number, Solar Number, Roman Indiction and Epact. Various special days are also recognised (e.g. Halloween), as are modern Summer and Winter Olympic years, Commonwealth Games years, European Athletics Championship years, and World Athletic Championship years.

- Conversion of British sovereign regnal dates to historical Julian (years beginning on Jan. 1) or Gregorian dates, as appropriate.

- Conversion between ancient Greek Olympiad numbering and calendar years.

- Lists of Western Christian festivals, Eastern Orthodox festivals, Islamic festivals and Jewish festivals for any (Gregorian) year. Jewish festivals may also be listed for Julian years 7 to 1582. In addition, Hindu festivals may be listed for any year in the range 2000 to 2043, Baha'i festivals from 1845 onwards, Balinese Hindu festivals from 1816 onwards, Chinese and Buddhist festivals from 1645 to 3000, and Sikh Nanakshahi festivals from 1999 onwards.

- "Observed Days" for any year from 1990 for over 230 countries and dependencies worldwide.

- A "Date Detective" to tabulate the weekday on which a specified Gregorian date d/m occurs over a range of years.

- An "In Which Months?" facility to list, over a range of years, the months in which a specified day of the month falls on a specified weekday.

- The ability to create, display, update and delete date related reminders for events (birthdays, anniversaries, meetings etc.).

- A multi-sheet "Quick Notes" facility for holding miscellaneous plain text items.

- An "alarm clock" facility for defining an alarm for a given time on a given date. A user may specify the duration of the alarm which may be repeated, after a specified "quiet" period, up to five more times. A separate "stopwatch" function is also provided.

- "What Time is it in?" to calculate the current time and date for a world-wide location and to identify Time Zone abbreviations.

- "World Clocks" to display simultaneously the local times at any 12 world-wide locations.

- "This is your life" information including the day of the week on which you were born, number of days you have lived, your Zodiac sign, and the day of the week on which your next birthday falls. Your Chinese and Islamic calendar ages, and your date of birth in many other calendar systems, are also displayed.

- Continuously updated display of date, time and Julian day.

- Number of days between any two dates in the Gregorian calendar (and number of working days).

- Calculation of the date n days, weeks, months or years before or after a specified Gregorian date, where n is a whole number.

- An analysis of the Gregorian 400-year cycle, after which the Gregorian calendar repeats itself.

- Special Julian to Gregorian change-over calendars for Bulgaria, Czechoslovakia, Denmark, Estonia, Finland, France, Great Britain, Hungary, Ireland, Italy, Luxembourg, Norway, Poland, Portugal, Romania, Russia, Spain and Sweden.

- Dates and times of equinoxes, solstices and Moon phases for any year from 1583 to 3000.

- Solar and lunar eclipse data for any year up to 3000.

- Sunrise, sunset and solar noon information for any date up to the end of 2200 for around 8000 locations across the world.

- Moonrise and moonset information for any date up to the end of 2200 for around 8000 locations across the world.

- "Great circle" distances between any two of these 8000 locations across the world.

- A Unit Converter for converting among 1718 traditional and metric units in 82 different categories including length, area, volume, mass, temperature, time, velocity, energy, power, pressure, computer storage etc.

- A Time Calculator for performing simple arithmetic on times.

- A Geometry Calculator for evaluating key attributes (area, perimeter, volume, surface area etc.) of various 2D and 3D geometric shapes.

- A Factor Calculator for finding the prime factors of numbers and for calculating the Highest Common Factor (HCF) and Least Common Multiple (LCM) of lists of numbers.

- A stack based Scientific Calculator with a visible stack and button tool-tips to guide users

- An Expression Calculator for calculating the values of arithmetic expressions and statements entered in normal (infix) form.

- A Statistics Calculator for performing various statistical procedures.

- A Fraction Calculator for evaluating exactly expressions containing integers and fractions.

- A Continued Fractions Calculator for evaluating continued fractions and for converting arithmetic expressions of various types to continued fractions. The solution of Pell's equation is also supported.

- A Recurring Decimals capability for converting fractions to decimal form and vice-versa.

- A Big Numbers Calculator for performing arithmetic operations on very large numbers.

- A Number Base Converter for converting numeric values between different number bases.

- An implementation of a method for solving the Travelling Salesman problem.

- A Financial Calculator for performing various financial calculations.

- A Currency Converter

- Average speed based calculations.

- A Fuel Consumption Calculator.

- An Ovulation Calculator for predicting maximum fertility days.

- A Pregnancy Calculator for calculating the due date of a pregnancy and other pregnancy related dates.

- A Blood Alcohol Content (BAC) Calculator.

- A Body Mass Index (BMI) Calculator.

- A Biorhythm Calculator

- A Paper Weight Converter for converting between metric paper weights and American paper basis weights.

- A Magic Square generator.

- A Reaction Timer.

- Colour customisation of screen backgrounds, non-button text and button backgrounds.

- Support for printing any lengthy output displayed and for copying output to another program via the Windows clipboard using the usual Ctrl+A , Ctrl+C, Ctrl+X and Ctrl+V keyboard commands.

What's New in Version V17.6?

My thanks to Dave Gordon, Kaj Nielsen, Edwin Kugler, Kathryn Darrah and Roel Parmaers for suggesting many of the enhancements implemented in this release and for acting as beta testers.

Currency Converter
In response to a user suggestion, implemented a Currency Converter (Utilities > Currency Converter). When invoked, the Currency Converter automatically downloads up-to-date currency conversion rates from the European Central Bank (ECB).

ECB currency conversion rates are updated daily (Monday to Friday), usually by 3 p.m. CET, and currently cover 34 different currencies.

The two currencies chosen are "sticky" values.

Easter Dates
Added some new functionality (Dates > Easter Dates) concerning the date of Easter in the Gregorian and Julian calendars. It may be used (a) to find the date of Easter in either calendar system for any specified year and (b) to list the years in which Easter occurs on a specified date.

The range of years covered is 1583 to 9999 for the Gregorian calendar and 600 to 9999 for the Julian calendar.

Out-of-Date Reminders
You may now list out-of-date reminders directly in Calendar Magic (Reminders > List Out-of-Date Reminders), avoiding the need to use a separate text editor to examine the contents of the file purged.dat. Out-of-date reminders are listed in reverse date order with the most recent at the top of the list.

Main Screen Find Capability
In connection with the above, a main screen find function is now available for finding occurrences of specified text strings. To initiate a new search, use the Ctrl+F key combination and input the text to be found. Use the "Find Next" button to run through the various occurrences. Alternatively, having found the first occurrence, exit the search form and press the F3 function key repeatedly.

New Version Check
You can now check (Help > Check for Updates) if a new version of Calendar Magic is available.

Biorhythm Calculator
In response to another user suggestion, implemented additional biorhythm functionality in the form of a Biorhythm Calculator (Utilities > Biorhythm Calculator). However, users of this calculator should be aware that many scientific experts regard the theory of biorhythms as a dubious pseudo-science.

Input to the calculator consists of a date of birth and a target date. Biorhythm results can then be calculated for the target date or, alternatively, a 28-day biorhythm plot may be generated starting from the target date.

For more details, consult the Biorhythm Calculator section later in this document. The limited biorhythm results generated by This is Your Life in earlier versions have also been removed to avoid duplication of output.

Religious Festivals
Based on input from Edwin Kugler and Robert Stockman, the listing of Baha'i religious festivals has been updated and improved.

"Options > Calendar" Menu Item
The name of this menu item has been changed to Options > General and the title of the corresponding form has been changed from "Calendar Options" to "General Options". This name change provides a more logical place in which to add the two new options described below.

Opening Screen

You may now choose the screen (form) displayed initially when Calendar Magic is opened via a new option "Opening Screen" (<u>O</u>ptions > <u>G</u>eneral > Opening Screen). For example, if you frequently use the Scientific Calculator, you may use this option to have it immediately displayed whenever Calendar Magic is opened.

Favourite Calendar System

Added a new option "Favourite Calendar System" (<u>O</u>ptions > <u>G</u>eneral > Favourite Calendar System). As suggested by a user, this option allows the specification of the calendar system to be displayed initially when Year Calendars and Month Calendars are invoked.

Calendar Comparison

Satisfying another user request, the left and right calendar names are now "sticky" values. There is one exception to this – any use of the French Revolutionary calendar is not remembered.

Installing Calendar Magic

If you currently have a 32-bit version of Calendar Magic (V14.2 onwards) installed, it is safe, and indeed recommended, to install any new version on top of the older version, in order that personal reminders and user specified option values are not (normally) overwritten. You should, however, uninstall older 16-bit versions (versions up to and including V14.1) but, when prompted, do not delete any of the files calmag.dat, person.dat and purged.dat, since these files contain any reminders which have been created.

To install Calendar Magic on a Windows 95, 98, Me, XP, Vista or 7 based system, ***close down all running applications*** and then run the Calendar Magic setup.exe program. The default installation folder is c:\EuroSoft\Calendar Magic but you are given the opportunity to specify another folder and/or drive. However, on both Windows Vista and Windows 7, *do not* install Calendar Magic as a sub-folder of c:\Program Files or c:\Program Files (x86).

The following files should be present.

calendar.exe	Main executable
calmag.ini	Initialisation file for "sticky" data
factor.exe	Factorisation program from Shamus Software
qpi.exe	QuickPi program from Steve Pagliarulo
qpi readme.txt	QuickPi documentation
BACdata.dat	BAC limits for various countries
country.dat	Country data
cities.dat	Location data
capitals.dat	Capital cities and towns
TZA.dat	Time zone abbreviation data
primes.dat	Small primes data
regnal.dat	British sovereign regnal year data
solar.dat	Solar eclipse data
lunar.dat	Lunar eclipse data
ummalqur.dat	Umm al-Qura calendar data
category.dat	Unit converter category data
convert.dat	Unit converter data
unit.dat	Unit converter unit data
CEDates.csv	Date information data
COEDates.csv	Date information data
EDates.csv	Date information data
EPHDates.csv	Date information data
FDates.csv	Date information data
FBDates.csv	Date information data
FCDates.csv	Date information data
FEBDates.csv	Date information data
FHDates.csv	Date information data
FIDates.csv	Date information data
FODates.csv	Date information data
FRDates.csv	Date information data
FSDates.csv	Date information data
FWBDates.csv	Date information data
HinDates.csv	Date information data
MOVDates.csv	Date information data
OEDates.csv	Date information data
VDates.csv	Date information data
VSDates.csv	Date information data
WDates.csv	Date information data
Torah.csv	Torah readings tables
hmove.cur	Mouse hand cursor

alarm.wav	Sound file
calculator.wav	Sound file
reminder.wav	Sound file
DayTips.dat	File containing tips of the day
mycountry.dat	Default personal country file
mycities.dat	Default personal locations file
mycategory.dat	Default personal unit converter category data
myconvert.dat	Default personal unit converter data
myunit.dat	Default personal unit converter unit data
readme.pdf	Read Me file in Adobe PDF format
MenuBar.pdf	Menu bar help in Adobe PDF format
SpecKeys .pdf	Special keyboard key combinations help in Adobe PDF format
2DGeoObj.pdf	2D geometric shapes help in PDF format
3DGeoObj.pdf	3D geometric shapes help in PDF format
history.pdf	File containing history of enhancements, changes, bug fixes etc.
license.txt	Conditions of use text file
moon.ttf	Moon phases TTF font
richtx32.ocx	Rich textbox control
spin32.ocx	ActiveX control for spin buttons
sprinter.ocx	VBGold's Smart Print control

These files, with the exception of the last four, are installed in the folder you have specified, plus two files containing uninstall information and a shortcut to the EuroSoft Web site. The font Moon Phases (moon.ttf) is automatically installed on your system, if necessary, and the remaining files, richtx32.ocx, spin32.ocx and sprinter.ocx, are installed in your \windows\system32 folder, unless newer versions of these files already exist in that folder. Other Visual Basic 6 support files are similarly installed in the same folder, if necessary.

Some sample Expression Calculator saved history (.shf) files are also provided. Topics covered include body mass index, cube roots, decimal degrees to degrees, minutes and seconds (and vice-versa), screen resolution calculations, and the solution of quadratic equations. You are invited to contribute other examples for future releases.

Note that the Microsoft Visual Basic 6 runtime files are required and, if necessary, may be downloaded from many Web sites, for example:

http://www.karenware.com/powertools/runtimes.asp

After installation for the first time, in order for various functions to work properly, you must set up your country and location correctly via the Location menu item (Options > Location). In addition, your PC's system clock must be showing correct local time. If your town or city is not in Calendar Magic's database, choose one nearby in the same time zone. On request, additional towns and cities can be added to Calendar Magic's database.

About EuroSoft

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Problems, Comments and Suggestions

EuroSoft is committed to ensuring that its products are of the highest quality. Any problems reported will be investigated fully, and any comments and suggestions submitted will be carefully evaluated.

All problem descriptions, comments and suggestions should be reported to EuroSoft using the contact details given earlier in this document.

Calendar Magic as a Company Promotional Item

Calendar Magic is a highly cost effective way of promoting any company and maintaining contact details on clients' PCs. Would your company like to distribute copies of Calendar Magic to its clients, showing your company name and contact details on the main Calendar Magic screen?

EuroSoft is able to produce customised versions of Calendar Magic for any company. Contact EuroSoft with your requirements. Additional company or country specific dates and events can easily be incorporated, as can longer lists of contact names, phone numbers etc.

Menu Bar Summary

The table below summarises the effects of the various menu items.

Menu	Menu Item	Effect
File	Save Ctrl+S	Save main screen output to a text file.
	Print Ctrl+P	Print main screen output to any attached printer.
	Backup	Create backup copies of important data files.
	Restore All	Restore all backed up data files.
	Restore Initialisation File	Restore backed up copy of initialisation file (calmag.ini).
	Restore Quick Notes	Restore backed up copy of Quick Notes.
	Restore Reminders	Restore backed up copy of Reminders.
	Exit	Close Calendar Magic.
Favourites		Display your favourite items as specified via Options > Favourites.
Calendars	Dual Calendars	Display full year calendars with equivalent Gregorian dates.
	Month Calendars	Display month calendars for any supported calendar system.
	Planning Calendars	Generate various types of planning calendars.
	Special Calendars	Display Julian to Gregorian change-over calendars for various countries.
	Year Calendars	Display full year calendars for any supported calendar system.
	Calendar Comparison	Show a month-by-month, side-by-side comparison of any two of the supported calendar systems.
	Gregorian Analysis	Show an analysis of the Gregorian 400-year cycle plus various related facts.
Dates	Before and After	Calculate the date y years, m months, w weeks and d days before or after a specified Gregorian date.
	Date Conversions	Perform date conversions among the supported calendar systems.
	Date Detective	Tabulate the weekdays on which the date d/m falls in each of the Gregorian years y1 to y2.
	Days between Dates	Calculate the number of days between two specified Gregorian dates.
	Easter Dates	Perform Easter related date calculations.
	Greek Olympiad Conversion	Convert between ancient Greek Olympiad numbering and calendar years.
	In Which Months?	For a given range of Gregorian years, list the months in which a specified day of the month falls on a specified weekday.
	Regnal Dates	Convert British regnal dates to historical Julian or Gregorian form.
	New Year's Days	List when each of the supported calendar systems commences in any specified Gregorian year.
	Observed Days	List dates of observed days for around 230 countries.
	On This Date	List country events occurring on a specified Gregorian date.
	Religious Festivals	List Gregorian dates of festivals for various religions.
	This is Your Life	Calculate various Gregorian date-of-birth related facts and figures.

Menu	Menu Item	Effect
Time	Time Calculator	Perform arithmetic with times.
	What Time is it in?	Calculate the current time and date for a world-wide location; identify Time Zone abbreviations.
	World Clocks	Display simultaneously the local times at 12 different world-wide locations.
	Alarm Clock	Set or turn off an alarm.
	Reaction Timer	Test your reaction time.
	Stopwatch	Display the stopwatch.
Reminders	List Reminders Ctrl+L	Display active reminders.
	Add Reminders	Create new reminders.
	Edit Reminders	Update or delete active reminders.
	Reminders by Month	Display active and out-of-date reminders on a month-by-month basis.
	List Out-of-Date Reminders	Display reminders which are no longer active.
	Reminder Utilities Ctrl+U	Show Reminder Utilities screen.
Quick Notes		Show, edit, add and delete miscellaneous plain text items.
Utilities	Big Numbers Calculator	Perform arithmetic operations on arbitrary long non-negative numbers.
	Continued Fractions Calculator	Evaluate CFs and convert various types of expressions to CFs.
	Expression Calculator	Evaluate mathematical expressions.
	Factor Calculator	Factorise numbers and calculate HCFs and LCMs.
	Financial Calculator	Perform various financial calculations.
	Fraction Calculator	Evaluate exactly expressions containing integers and fractions.
	Geometry Calculator	Calculate key attributes of various 2D and 3D geometric objects.
	Number Base Converter	Convert numbers between different number bases.
	Recurring Decimals	Convert fractions to recurring decimals and vice-versa.
	Scientific Calculator	Use a stack based scientific calculator.
	Statistics Calculator	Perform various statistical procedures on data in .csv format.
	Time Calculator	Perform arithmetic with times.

Menu	Menu Item	Effect
Utilities cont.	Average Speed	Calculate distance travelled, time taken or average speed.
	Currency Converter	Convert currency amounts using ECB exchange rate data.
	Fuel Consumption	Calculate fuel consumption based on distance travelled and volume of fuel used.
	Global Distances	Calculate distance between any two of 8000 cities and towns across the world.
	Magic Squares	Create a magic square of a specified order.
	Paper Weight Converter	Convert between metric and American paper weights.
	Sun and Moon Data	Display sun and moon data at any location and worldwide.
	Travelling Salesman Problem	Use simulated annealing to solve this well known problem.
	Unit Converter	Convert among 1724 units in 83 different categories.
	BAC Calculator	Estimate Blood Alcohol Content (BAC).
	Biorhythm Calculator	Generated biorhythm information for a given target date and plot biorhythm curves for a target month.
	BMI Calculator	Estimate a Body Mass Index (BMI).
	Ovulation Calculator	Predict dates of maximum fertility days.
	Pregnancy Calculator	Estimate important pregnancy related dates.
Options	Location	Specify your country and town or city.
	Calendar	Choose from various calendar related options.
	Colour	Personalise screen colours.
	Favourites	Choose items to be listed in Favourites menu.
	Password Manager	Password protect your copy of Calendar Magic.
	Display Fonts	Specify fonts for formatting main output text boxes.
	User Fonts	Specify fonts for formatting user created text.
Help	General Help F1	Display the bookmarked PDF help file.
	Menu Bar Summary	Display this table.
	Special Keys Summary	Display a table of special keyboard key combinations.
	2D Geometric Shapes	Display the 2D shapes supported by the Geometry Calculator.
	3D Geometric Shapes	Display the 3D shapes supported by the Geometry Calculator.
	Tip of the Day	Display the next tip of the day.
	Version History	Display the version history file.
	Check for Updates	Check whether a new version of Calendar Magic is available.
	About Calendar Magic	Display Calendar Magic version number, contact details etc.
	About My Location	Display information about the user's chosen location.

Hints and Tips

General

After installation for the first time, in order for various functions to work properly, you must set up your country and location correctly via the Location menu item (Options > Location). In addition, your PC's system clock must be showing correct local time. If your town or city is not in Calendar Magic's database, choose one nearby in the same time zone. On request, additional towns and cities can be added to Calendar Magic's database.

Calendars may be displayed using Saturday, Sunday or Monday as the first day of each week. Use the Calendar menu item (Options > General) to indicate your preference.

A key design criterion for Calendar Magic is "ease of use". With this in mind, many of the command buttons, text boxes and other controls have been provided with explanatory tool-tips. For example, to display the tool-tip (if it exists) for a button on a form, simply move your mouse cursor over the button.

When entering dates *in this century*, the year value may be entered with two digits (or even one, if it makes sense). Thus 23/5/80 is interpreted as 23/5/2080, and 6/11/02 or 6/11/2 as 6/11/2002.

The numeric input fields in many parts of Calendar Magic will accept not only numeric values, such as 123, 89.762 and 1.25E4, but also simple *arithmetic expressions*. Such an arithmetic expression may contain numeric values, rounded parentheses ( ), and the arithmetic operators + - * / and ^, representing respectively addition, subtraction, multiplication, division and raising to a power. Examples are 5 * 23.79, 11 * 14 + 6 and (2 ^ 0.5) * (7 / 8). The space characters on either side of an arithmetic operator are optional. Note that the Big Numbers Calculator does not support the use of simple arithmetic expressions for input values.

Many of the command buttons in Calendar Magic have associated "access keys" defined, indicated by an underlined character in a button caption – for example "Main Screen". Users who prefer using the keyboard, rather than a mouse, may trigger the command by holding down the Alt key and pressing the corresponding underlined letter key – for example Alt+M.

The F11 function key may be pressed to produce an "enlarged view" of any lengthy output produced by Calendar Magic. To exit the enlarged view, press the F11 function key again or left-click the appropriate command button to return to the previous or main screen.

"Enlargeable" output text-boxes are identifiable by the tool-tip "Press F11 for an enlarged view of the output" when a user's mouse cursor is hovered over a text-box. To make the tool-tip disappear, move the mouse cursor out of the text-box.

Closing any screen (form) in Calendar Magic other than the main screen, by left-clicking on the "X" button in the upper right corner of the screen, returns the user to the previous screen. Note that this is not quite the same as using the "Main Screen" and "Previous Screen" buttons. These hide the form but it remains in memory, whereas the close button removes the displayed component from memory. Returning to a closed form will obviously therefore cause the displayed component to be reloaded. Returning to a hidden form reveals it in its previous state, but with results automatically recalculated in cases where changes to optional settings (country, location, week start day etc.) might have impacted output.

The Esc key may also be used as an alternative to clicking the "Main Screen" command button or pressing the Alt+M keyboard key combination.

Similarly, to display the documentation for Calendar Magic, the F1 key may be used as an alternative to selecting the General Help menu item (Help > General Help) on the main screen. This key may also be used to display the documentation for Calendar Magic from *any* screen.

Opening Screen

You may choose the screen (form) displayed initially when Calendar Magic is opened via the option "Opening Screen" (Options > General > Opening Screen). For example, if you frequently use the Scientific Calculator, you may use this option to have it immediately displayed whenever Calendar Magic is opened.

Note that, if you are displaying the "tip of the day" at start up, the normal Calendar Magic opening screen will always take precedence.

Password Protection

You may password protect your copy of Calendar Magic by means of the Password Manager (Options > Password Manager). Using it, passwords may be created, changed and removed. Any password created must be at least eight characters long and must consist of a combination of letters (a to z, A to Z) and/or digits (0 to 9).

If a password has been created, whenever anyone attempts to open that copy of Calendar Magic, he/she is prompted to input the password and Calendar Magic will not open until this has been done successfully.

Do not attempt to use password protection on a system on which more than one copy of Calendar Magic is installed. Also, if you decide to uninstall Calendar Magic completely (including deleting the folder in which it is installed*), remove any set password first before beginning the uninstall.*

Use of Colour

Flexible options are available for customised colouring of Calendar Magic screens including:

- Screen backgrounds

- Non-button text

- Button backgrounds

These are accessed through the Colour menu item (Options > Colour) on the main screen.

All Calendar Magic screens may be colour customised simultaneously by choosing "All screens" from the drop-down list. Screens may also be colour customised individually – simply select the screen you wish to customise from the drop-down list and then select which component you wish to customise – either screen background, non-button text or button background.

Two additional command buttons are available, one to restore Calendar Magic's "classic grey" appearance and the other to restore Calendar Magic's default colour appearance.

Colour choices are "sticky", i.e. remembered once chosen.

Note that, with some screens, for example the Calendar Comparison screen, some non-button text occurs on a white background, so that it would be unwise to choose white, or something close to white, as the non-button text colour.

Use of Sound

Three default WAV files are provided – alarm.wav, calculator.wav and reminder.wav – for use by the alarm clock, scientific calculator and imminent reminders warning respectively. You may replace the default files with other WAV files (named identically) and future installations of Calendar Magic will not overwrite your preferences.

Note that Calendar Magic must be running at the time of an alarm for the alarm to sound.

You may also specify the music file to be played when a set alarm goes off. A combo box on the Alarm Clock form (Time > Alarm Clock) lists the names of all cda, mp3, m4p, ogg, wav and wma files in the folder in which Calendar Magic is installed, so that you may choose any favourite music file you have copied to this folder. The file name chosen is "sticky".

To play a music file, other than a wav file, Calendar Magic uses the music player software on your PC associated with the file extension.

Changing Fonts

For users who dislike the Courier New and Arial fonts, you may specify the fixed width and proportional width "display fonts" used by Calendar Magic via a new menu item Options > Display Fonts. These fonts are "sticky" and are used to format the results displayed in the main output text boxes on various forms in Calendar Magic.

Similarly, you may specify the fixed width and proportional width "user fonts" used by Calendar Magic via a new menu item Options > User Fonts. These fonts are also "sticky" and are used to format user created text such as Quick Notes and reminder messages. This second facility is particularly useful to users who wish, for example, to create text in a language other than English.

You are advised to experiment with some caution when changing the Calendar Magic font defaults. For example, too large a font size may impact the appearance of output on certain screens and exotic fonts may not contain all the characters used in Calendar Magic. A "Reset Defaults" button is provided in both cases as an "insurance policy".

Backing Up and Restoring Important Data Files

As with any application program, it is sensible to make regular backup copies of important data files and a facility (File > Backup) has been provided in Calendar Magic for this purpose. The files backed up, if they exist, are:

1. The Calendar Magic initialisation file – calmag.ini

2. Set reminders information – calmag.dat, person.dat, purged.dat

3. Quick Notes text – mynotes.txt

4. Personalised Unit Converter information – myconvert.dat , mycategory.dat, myunit.dat

5. Personalised country and city data – mycountry.dat, mycities.dat

6. Local holidays information – localhols.dat

7. Expression Calculator saved history files – *.shf (all files with the file extension shf)

8. Fraction Calculator saved history files – *.sff (all files with the extension sff)

9. Travelling Salesman Problem saved location lists – *.tsp (all files with the file extension tsp)

10. Statistics Calculator data files – *.sta (all files with the extension sta)

The backed up files are stored in the folder \backup in the folder in which Calendar Magic is installed. You are advised to copy the contents of this folder to a second disk drive or to a USB memory stick.

Backed up files may be restored, either totally or selectively, via other items on the File Menu. These are:

1. Restore All

2. Restore Initialisation File

3. Restore Quick Notes

4. Restore Reminders

Using Drop-down Lists

Calendar Magic makes extensive use of drop-down lists (combo boxes) of items such as calendar types, country names etc. The items in a drop-down list may be displayed by left-clicking the downwards pointing arrow head at the right of the drop-down list, then any item selected by left-clicking it. You *must* left-click the item to select it – typing in its name or value will not work.

However, to avoid tedious scrolling to near the end of any drop-down list, display the drop-down list, type in the first one or two letters or digits of the desired item, then select it.

Using Spin Buttons

When a form in Calendar Magic contains a single spin button (double red arrowhead in appearance), the keyboard key combinations Ctrl++ and Ctrl+- may be used as alternatives to clicking the red arrowheads. Ctrl++ increases the value controlled by the spin button and Ctrl+- decreases the value.

Note that this will not work with the forms (Calendar Comparison and Month Calendars) containing more than one spin button. In such cases, the field controlled by any spin button must have "the focus" before using Ctrl++ or Ctrl+- .

Improving The Appearance of Calendars

Calendars may be printed directly from Calendar Magic, using VBGold's Smart Print control, or copied and pasted via the Windows clipboard to a word processor, for example Microsoft's Word for Windows. Remember to format the calendar using a *fixed width font* such as Courier New. Below is an example of what can be easily done.

Calendar for 2010

```
         January                    February                    March
 M  T  W  T  F  S  S         M  T  W  T  F  S  S         M  T  W  T  F  S  S
             1  2  3         1  2  3  4  5  6  7         1  2  3  4  5  6  7
 4  5  6  7  8  9 10         8  9 10 11 12 13 14         8  9 10 11 12 13 14
11 12 13 14 15 16 17        15 16 17 18 19 20 21        15 16 17 18 19 20 21
18 19 20 21 22 23 24        22 23 24 25 26 27 28        22 23 24 25 26 27 28
25 26 27 28 29 30 31                                   29 30 31

          April                        May                        June
 M  T  W  T  F  S  S         M  T  W  T  F  S  S         M  T  W  T  F  S  S
             1  2  3  4                     1  2            1  2  3  4  5  6
 5  6  7  8  9 10 11         3  4  5  6  7  8  9         7  8  9 10 11 12 13
12 13 14 15 16 17 18        10 11 12 13 14 15 16        14 15 16 17 18 19 20
19 20 21 22 23 24 25        17 18 19 20 21 22 23        21 22 23 24 25 26 27
26 27 28 29 30             24 25 26 27 28 29 30        28 29 30
                           31

          July                       August                   September
 M  T  W  T  F  S  S         M  T  W  T  F  S  S         M  T  W  T  F  S  S
             1  2  3  4                        1            1  2  3  4  5
 5  6  7  8  9 10 11         2  3  4  5  6  7  8         6  7  8  9 10 11 12
12 13 14 15 16 17 18         9 10 11 12 13 14 15        13 14 15 16 17 18 19
19 20 21 22 23 24 25        16 17 18 19 20 21 22        20 21 22 23 24 25 26
26 27 28 29 30 31          23 24 25 26 27 28 29        27 28 29 30
                           30 31

         October                    November                   December
 M  T  W  T  F  S  S         M  T  W  T  F  S  S         M  T  W  T  F  S  S
             1  2  3         1  2  3  4  5  6  7            1  2  3  4  5
 4  5  6  7  8  9 10         8  9 10 11 12 13 14         6  7  8  9 10 11 12
11 12 13 14 15 16 17        15 16 17 18 19 20 21        13 14 15 16 17 18 19
18 19 20 21 22 23 24        22 23 24 25 26 27 28        20 21 22 23 24 25 26
25 26 27 28 29 30 31        29 30                       27 28 29 30 31
```

Special Key Combinations

Component	Key Combination	Effect
Output text-boxes	Ctrl+A	Select all text.
	Ctrl+C	Copy selected text to clipboard.
	Ctrl+P	Print output to any attached printer.
	Ctrl+X	Cut selected text to clipboard.
	F11	Show/hide enlarged view of output.
All screens	F1	Show Help file
Main screen	Ctrl+F	Find text.
	Ctrl+L	List set reminders.
	Ctrl+S	Save output to a text file.
	Ctrl+U	Show Reminders Utility screen.
	F3	Repeat last find.
Screens with a single spin button	Ctrl++	Increase the value controlled by the spin button.
	Ctrl+-	Decrease the value controlled by the spin button.
Other screens	Alt+<access key>	Simulate left-click of corresponding command button.
	Esc	Return to previous screen.
Big Numbers Calculator	Ctrl+T	Terminate any unacceptably long operation.
Calendar Comparison	Ctrl+T	Terminate any unacceptably long operation.
Continued Fraction Calculator	Ctrl+T	Terminate any unacceptably long operation.
Recurring Decimals	Ctrl+T	Terminate any unacceptably long operation.
Travelling Salesman Problem	Ctrl+T	Terminate any unacceptably long operation.

Component	Key Combination	Effect
Edit Reminders	Ctrl+U	Show Reminders Utility screen.
Quick Notes	Ctrl+F	Find text.
	Ctrl+R	Find and replace text.
	Ctrl+S	Save Quick Notes contents.
	F3	Repeat last find.
	F12	Move to next tabbed sheet.
	Shift+F12	Move to previous tabbed sheet.
Scientific Calculator	Esc	Clear any displayed error message. If no displayed error message, return to main screen.

Calendars and Dates

Old Style and New Style Dates

Genealogists and historians often encounter Old Style (Julian) and New Style (Gregorian) dates. Calendar Magic handles both types of date using *historical* years, i.e. years commencing on January 1. Care must be taken, however, in interpreting Old Style (O.S.) dates since, depending on the country and the year, the *civil* year may have started on a date other than January 1.

For further information see, for example:

> http://www.cree.ie/genuki/dates.htm

Before and After

"Before and After" (Dates > Before and After) supports the calculation of the date y years m months w weeks d days before or after a given date. This helps to answer questions such as the one posed by a keen user – if Uncle Fred died on March 22, 2007 at age 92 years, 10 months and 27 days, when was he born? Note that this is not always a precisely defined mathematical problem since months in the Gregorian calendar vary in length.

In "Before and After", in order to provide consistent results, working backwards is done in the order days, weeks, months and years, while working forwards is done in the order years, months, weeks and days. A warning message is also issued if the resulting date does not exist, for example 1 year after Feb. 29, 2000.

In "Before and After", double-clicking either output text-box will re-apply the specified time interval to the calculated date. This is useful for rapidly calculating a series of dates separated by the same time interval.

Calendar Comparison

The Calendar Comparison facility (Calendars > Calendar Comparison) allows you to set up two calendar systems side-by-side and to compare them on a month-by-month basis. If you set up any date in one of the calendar systems, the corresponding date in the other calendar system is automatically displayed.

Setting dates is a reasonably intuitive process but, if you manually edit either year field, remember to press the keyboard Enter key afterwards. Also keep an eye on the Information box, at the bottom of the Calendar Comparison screen, for helpful advice and an indication of the outcome of any operation. For example, if any operation cannot be completed, the message "Unable to complete operation - ready" will be displayed in the Information box.

The left and right calendar names are "sticky" values. There is one exception to this – any use of the French Revolutionary calendar is not remembered.

Remember also that, in order to compare two calendars, they must both exist at the point in time at which the comparison is to be made. For example, if you wish to compare the Gregorian calendar with the French Revolutionary calendar, since the French Revolutionary calendar only existed from 22/9/1792 to 31/12/1805 (Gregorian), you will have to move the Gregorian calendar back to some year in that time range, say 1794, before any comparison can be made.

The two buttons "Next Similar Year" and "Last Similar Year", and the check box "Ensure same day of week", were added to address a user request and their use is most easily explained by example. If the Calendar Comparison screen is set up with the Gregorian and Chinese calendars side-by-side and the Gregorian date Saturday, Feb. 1, 2003 selected, it is evident that the Chinese New Year occurs on that date in 2003. Two natural questions are "When will the Chinese New Year again occur on Feb. 1?" and "When will the Chinese New Year again occur on *Saturday*, Feb. 1?"

To answer these questions, do the following.

- Click the "Next Similar Year" button to find out when the Chinese New Year will next occur on Feb. 1. The answer is in Gregorian year 2022.

- Click the "Last Similar Year" button to return to 2003.

- Check the "Ensure same day of week" box and then click the "Next Similar Year" button to find out when the Chinese New Year will next occur on Saturday, Feb. 1. The answer is in Gregorian year 2098.

After such an operation, it is also important to read the Information box at the foot of the Calendar Comparison screen to verify whether or not the operation has completed successfully.

Tool-tips have been provided for the two buttons to explain their purpose. Also, depending on the two calendar systems chosen and the date correspondence set up, "same day" calculations may require significant amounts of processor time. With this in mind, the Ctrl+T keyboard key combination may be used to terminate any unacceptably long operation.

A current restriction, which may be addressed in a future release, is that the "Next Similar Year" and "Last Similar Year" buttons will not lead to a successful outcome if:

1. *Both* dates specified involve leap days (e.g Feb. 29, 2004 in the Gregorian calendar) and/or leap months (e.g. Adar II 12, 5768 in the Hebrew calendar).

2. One date specified involves a leap day or a leap month and the other calendar system specified is a Hindu lunisolar variant.

This restriction is unlikely to be a problem for the vast majority of users.

Days between Dates

For "Days between Dates" (Dates > Days between Dates) you may create a text file, localhols.dat, containing the dates of "non-business" days, for example local holidays. When calculating the number of business days between two dates, Calendar Magic will deduct any relevant "non-business" days listed in that file.

A simple example of the structure and format of the text file localhols.dat is as follows.

d/m/y
2/1/2006
14/4/2006
17/4/2006
8/5/2006
29/5/2006

In this example, the first line "d/m/y" defines the format of the subsequent dates in the file, i.e. day, month, year order in this case. All six possible date formats d/m/y, m/d/y, y/m/d, y/d/m, d/y/m and m/y/d are acceptable. The remaining lines in the file indicate "non-business" days, each date being listed in the specified date format. Year values in this century may be entered using two digits only, for example 8/5/06 instead of 8/5/2006.

Once created, the file localhols.dat should be placed in the folder in which Calendar Magic is installed.

To improve readability, blank lines in the file are ignored, as are lines beginning with the character ">" – to support the insertion of comments. Here is an example of a commented localhols.dat file for England and Wales from 2010 to 2012.

> Local holiday dates 2010 to 2012, England and Wales

> Date format
d/m/y

> 2010
1/1/2010
2/4/2010
5/4/2010
3/5/2010
31/5/2010
30/8/2010
27/12/2010
28/12/2010

> 2011
3/1/2011
22/4/2011
25/4/2011
2/5/2011
30/5/2011
29/8/2011
26/12/2011
27/12/2011

> 2012
2/1/2012
6/4/2012
9/4/2012
7/5/2012
4/6/2012
5/6/2012
27/8/2012
25/12/2012
26/12/2012

Fiscal Calendars

Calendar Magic contains a highly flexible capability for creating *fiscal calendars* with fiscal week numbers. To access this capability, select the Planning Calendars menu item on the main screen (Calendars > Planning Calendars) and choose "Fiscal calendar" from the drop-down list of types of planning calendar.

Four parameters must be specified to create a fiscal calendar:

1. The year in which the fiscal calendar begins

2. The starting day of each fiscal week

3. The first month of the fiscal calendar. Clearly, any fiscal calendar starting in a month other than January will spread across two years.

4. How fiscal week number 1 is determined. Currently the possibilities are "Week with first day of first month", "First full week of first month" and "First week with at least 4 days".

The Balinese Saka Calendar

This description of the Balinese Saka calendar is based on email correspondence with a Balinese Hindu – Ida Bagus Suradarma. Please contact me about any errors or additions.

The Balinese Saka calendar is a lunisolar calendar going back to 78 C.E.. A system of leap months is used to keep the calendar in line with the Gregorian calendar. It is an arithmetic calendar – no astronomical observations or calculations are used.

Locally in Bali, the 12 normal lunisolar months are numbered thus – (1) Kasa, (2) Karo, (3) Katiga, (4) Kapat, (5) Kalima, (6) Kanem, (7) Kapitu, (8) Kaulu, (9) Kasanga, (10) Kadasa, (11) Jesta, and (12) Sada. Despite this, the Balinese Saka calendar year value changes, not at the beginning of Kasa, but at the beginning of *Kadasa*.

Before 1815 C.E., leap months appear to have been added on an irregular basis. However, from around that time onwards, the following method was adopted. Let Y be a Balinese Saka year value and define:

$$r = Y \bmod 19$$

Then:

If r = 0, 6 or 11, a leap month Mala Jesta is added after the month Jesta.

If r = 3, 8, 14 or 16, a leap month Mala Sada is added after the month Sada.

There are obviously 7 leap months in each Balinese Saka 19-year cycle.

All months (non-leap and leap) have nominally 30 days but a day is omitted from the calendar every 64 days. For example, Kalima 12, 1929 is followed by Kalima 14, 1929. In Bali, a pair of dates such as Kalima 12/13, 1929, where the second date is missing, is called a *pengunalatri*. The date conversion routines in Calendar Magic will detect when a pengunalatri occurs and will return an error message for the second date in any pengunalatri.

As with many Hindu lunisolar calendars, the first 15 days before the full moon in any month are said to be on the "bright side" of the moon and are referred to as penanggal or suklapaksa days. The second 15 days are said to be on the "dark side" of the moon and are referred to as pangelong or kresnapaksa days. Locally, these second 15 days are numbered 1 to 15 again, rather than 16 to 30, but in Balinese Saka year calendars, month calendars, dual calendars and calendar comparisons this convention is not followed in Calendar Magic.

The mean Balinese Saka year length is around 365.2551 days, to be compared with the mean tropical year length of 365.242189 days. This means that the Balinese Saka calendar keeps very closely in synch with the solar year over short periods of years with Kadasa 1 usually occurring in March. However, over longer periods of years, this small difference of around 0.013 days per year will start to accumulate and, eventually, the two calendars will be badly out of synch. An occasional adjustment therefore has to be made to the Balinese Saka calendar, the last such adjustment occurring at the beginning of the end of Gregorian year 1999 with Kapitu 8, 1921 being followed by Kapitu 10, 1921. Formally, in Bali at that time, the name of the Balinese Saka calendar algorithm was changed from "Eka Sungsang to Pon" to "Eka Sungsang to Pahing".

There is an old MS-DOS based program BALICAL written by American Fred B. Eiseman, Jr.. This program was very helpful in checking Balinese Saka date conversions before January 1, 2000.

Regnal Dates

The menu item "Regnal Dates" (Dates > Regnal Dates) may be used to convert British sovereign regnal dates to *historical* Julian (years beginning on Jan. 1) or Gregorian form, as appropriate. The starting and ending dates for any regnal year specified are also displayed.

This facility is primarily of interest to historians and other researchers studying old Acts of Parliament, wills, deeds etc. It should be noted, however, that the conversion of regnal dates is by no means an "exact science". Caution should therefore be exercised by anyone converting regnal dates and results verified by alternative means, if possible.

The following points should also be noted.

1. Not all reference sources are in complete agreement with regard to regnal year starting and ending dates. The reference source used by Calendar Magic is the 1999 text "The Oxford Companion to the Year" by Blackburn and Holford-Strevens.

2. Some of John's regnal years are longer than calendar years, with the result that various regnal dates during his reign are ambiguous. In such cases, the regnal dates converter will display both possibilities.

3. A similar situation can arise with dates in George II's 26th regnal year. Also, in this year, September 3 to 13 do not exist because of the transition from the Julian calendar to the Gregorian calendar in Great Britain.

4. For Edward III, use his English regnal year values.

5. For Philip and Mary, use Philip's regnal year values.

6. For James I, use his English regnal year values.

7. Charles II counted his regnal years from 30 January 1649 (the date of the execution of Charles I) but did not reign in England until his restoration on 29 May 1660. During the intervening period, in which Oliver Cromwell ruled as Lord Protector of the Commonwealth of England, Scotland and Ireland, public documents were not dated using regnal years.

The menu item Date Conversions (Dates > Date Conversions) will also convert "in the other direction", i.e. from Gregorian and Julian dates to regnal dates. More precisely, if a Gregorian date in the range September 14, 1752 to today's date is converted, the output includes the British monarch's regnal year in which the date occurred. Similarly, if a Julian date in the range December 25, 1066 to September 2, 1752 is converted, the output also includes the British monarch's regnal year in which the date occurred. The two date ranges are handled separately because of the change-over in Great Britain in 1752 from the Julian calendar to the Gregorian calendar.

Interregnal dates are also handled in Date Conversions.

Religious Festivals and Observed Days

The default calendar for calculating the dates of Islamic religious festivals and Islamic observed days in various countries is whichever variation of the Islamic arithmetical calendar you have chosen. However, in the Gregorian year range 1938 to 2076, the dates of Islamic religious festivals are calculated using the Umm al-Qura calendar. Similarly, the dates of Islamic related observed days in Saudi Arabia, Bahrain and Qatar, up to 2076, are also calculated using the Umm al-Qura calendar.

When a Religious Festivals or Observed Days list is generated, the relevant output data is also stored in the CSV (Comma Separated Variable) text file results.csv. You may manipulate this file, using a text editor or spreadsheet program, to customise the output for your own specific requirements. In addition, when a list of Jewish festivals is generated for any year in the range 1583 to 3000, the local starting and ending sunset times (unadjusted for DST, if any) for each date are added to each line in this file.

In addition to the above, the relevant output data is also stored in the text file newrems.txt with each line having the format:

      day, month, year, description

The advantage of this is that reminders can then be easily created for these special days using the "Import reminders" function on the "Reminder Utilities" form. You may, of course, manipulate this file using a text editor, for example to delete any special days for which you do not wish reminders created.

Some editing of the file newrems.txt will be needed for the following types of religious festivals:

1. Buddhist and Sikh – in these cases some of the religious festival descriptions exceed 40 characters in length and will be truncated to 40 characters by the "Import reminders" function.

2. Baha'i – the file newrems.txt contains both Western and Middle-East dates for certain religious festivals.

3. Orthodox – the file newrems.txt contains both "new style" and "old style" dates.

Reminders and Quick Notes

Reminder Capabilities

When Calendar Magic is initiated, all active reminders are displayed. You may also hear a short sound file being played to indicate that one or more reminders are imminent within the next seven days. In addition, a red or orange diamond shape may be visible in the top right-hand corner of the main screen output text-box. Red indicates the existence of a set reminder for the current date and orange the existence of a set reminder less than 1 week away. You can get rid of the red or orange diamond by left-clicking it.

The checks for imminent reminders (and the provision of audio and visual warnings when reminders are imminent) are also performed, if Calendar Magic is running, at one second after midnight each day. In addition, if any set reminder is imminent, an appropriate message box is displayed. This extra functionality is required by users who do not switch off their PCs and who keep Calendar Magic permanently running in the background.

In addition via the "Reminders by Month" menu item (Reminders > Reminders by Month), a calendar for any month, in this year or next year, may be displayed with day numbers highlighted in red for those days in the month for which reminders have been set. Left-clicking on any "red day" will cause the reminder(s) set for that day to be listed. Similarly, day numbers, in this year or last year, associated with out-of-date reminders are highlighted in blue and left-clicking on any "blue day" will cause the out-of-date reminder(s) for that day to be listed. The current date is also highlighted in green, provided that it has no associated reminders.

There are two methods in Calendar Magic for adding reminders. One is to use the Add Reminders menu item (Reminders > Add Reminders). The other is to use the "Reminders by Month" menu item followed by double-clicking any day for which a new reminder is to be set.

Out-of-date reminders are also automatically purged by Calendar Magic and appended to a text file, purged.dat, for later reference, if needed. The menu item Reminders > List Out-of-Date Reminders may be used to list such reminders in reverse date order with the most recent at the top of the list. A main screen find function is also available for finding occurrences of specified text strings. To initiate a new search, use the Ctrl+F key combination and input the text to be found. Use the "Find Next" button to run through the various occurrences. Alternatively, having found the first occurrence, exit the search form and press the F3 function key repeatedly.

To update or delete any reminder, use the Edit Reminders menu item (Reminders > Edit Reminders). To select the reminder, left-click it in the reminder list, then either (a) update one or more of its fields and press the "Save Updated Reminder" button, or (b) press the "Delete Reminder" button. The selected reminder is highlighted by the presence of a ">" sign at the extreme left. Note also that, when using Edit Reminders, reminders are sorted in ascending order of month and day-of-month only.

Apart from entering a simple reminder for one date, support is provided for easily defining a reminder for a series of dates. Three types of date series may be defined. Examples of the three types are:

- November 17, 2005 and every 10 days thereafter to the end of September, 2006.

- The second Thursday in every month from December, 2005 to June, 2006. The selection options include first, second, third, fourth, fifth, second last, last and every. If, for example, the "fifth Friday" does not exist in a month, the month is simply ignored.

- Day 5 of every month from January, 2006 to November, 2006. In specifying the day value, apart from the obvious choices of 1, 2, 3, ………, 31, other available options are second last, last and every. If a day value does not exist in any month specified, for example day 31 in November, the month is ignored.

Out-of-date reminders in a series are also ignored, but an error message is displayed if *all* the reminders specified in a series are out-of-date.

Once defined, the reminders within all three types of series are treated by Calendar Magic as being independent of each other, enabling individual reminders in the series to be updated and deleted. However, a checkbox "All reminders containing selected message" is available through which all reminders containing a selected message may be deleted in a single operation. This is particularly useful when you create a series of reminders and discover "after the event" that you have made a mistake in the series definition.

Three utility functions are available for reminders from the Reminder Utilities screen, displayed by pressing the Ctrl+U key combination when the main Calendar Magic screen or Edit Reminders screen is visible. The first utility function prints reminder internal data structure information. The second compacts the main reminders file, person.dat, to reduce its size. The third supports the importation of reminder information from other programs via a text file (see next section). Users will rarely require to use these reminder utilities in normal circumstances.

It is recommended that you make an occasional back-up copy of your reminder files. The files to back-up are calmag.dat, person.dat and purged.dat. Note that this can easily be done by selecting the menu item File > Backup, which creates back-up copies of these three files plus other important data files.

Importing Reminders into Calendar Magic

Reminders may be imported from other programs into Calendar Magic using the Import Reminders utility available from the Reminder Utilities screen. To access this screen, use Reminders > Reminder Utilities, or press the Ctrl+U key combination when the main Calendar Magic screen or Edit Reminders screen is visible.

The reminders to be imported must be defined in a text file, newrems.txt, located in the folder in which Calendar Magic is installed. Each line of this text file must contain four fields defining a reminder. One of three *field orders* must be selected, namely:

1. day month year message

2. month day year message

3. year month day message

In addition, the same *field separator* must be used throughout the file, chosen from:

1. Comma ,

2. Forward Slash /

3. Hyphen –

4. Semicolon ;

5. Tab

or, alternatively, a character specified by the user.

A simple example file, using "day month year message" order and the comma as a separator, is:

23,1,2008,School re-union
5,12,2007,Village meeting
17,4,every,Joe's birthday

Note the use of the word "every" in a year field to indicate an "every year" reminder. Note also that text fields do not have to be surrounded by quotation marks.

Any reminder message with more than 40 characters is automatically truncated to 40 characters, the maximum currently permitted in Calendar Magic.

Out-of-date reminders are automatically rejected, as are reminders with year values more than 1 year ahead of the current year.

When the Import Reminders utility is run, the lines in the file newrems.txt are processed sequentially and any errors detected are displayed while processing continues. Afterwards, the file rejects.txt, in the same folder, will contain all reminder lines rejected during the importation process, each one followed by a brief description of the reason for rejection.

Exporting Reminders from Calendar Magic

Reminder information may be exported from Calendar Magic to the text file myrems.txt using the Export Reminders utility available from the Reminder Utilities screen. To access this screen, use Reminders > Reminder Utilities , or press the Ctrl+U key combination when the main Calendar Magic screen or Edit Reminders screen is visible.

As in the previous section, one of three *field orders* must be selected, namely:

1. day month year message

2. month day year message

3. year month day message

and a *field separator* must also be chosen from:

1. Comma ,

2. Forward Slash /

3. Hyphen –

4. Semicolon ;

5. Tab

or, alternatively, a character specified by the user.

When the Export Reminders utility is run, a copy of each active reminder in Calendar Magic is added to the file myrems.txt using the field order and field separator chosen by the user. In the case of an "every year" reminder, the corresponding year field in the file myrems.txt will contain the text string "every" (without the surrounding quotes.)

Quick Notes

A Quick Notes facility with 15 tabbed sheets is provided for miscellaneous plain text items, entered through the keyboard or pasted from the Windows clipboard. To bring up Quick Notes, left-click the Quick Notes menu item on the main screen. If some Quick Notes items already exist, they will be displayed on the appropriate tabbed sheets. If no such items exist, the tabbed sheets are readied to receive new items. Each sheet can hold a maximum of 65535 characters.

Quick Notes sheets may be edited, items copied or deleted, new items added etc. The standard Windows keys Ctrl+A, Ctrl+C, Ctrl+P, Ctrl+V and Ctrl+X may be used. The contents of Quick Notes are "sticky", being automatically saved in the text file mynotes.txt when the Quick Notes facility is closed or when Calendar Magic is exited. You may also initiate a manual save at any time via the Ctrl+S keyboard key combination. The identity of the last sheet used is also "sticky".

The contents of a Quick Notes sheet may be edited in "enlarged view" (press the F11 key) and any changes made are automatically retained on exiting "enlarged view". Also, pressing Ctrl+S in "enlarged view" causes a return to "normal view" followed by a save of sheet contents.

The names of the 15 tabs may be changed. If the tab name to be changed is not in the "front row", click on it to bring it to the front. Then double-click the tab name and provide a new name when prompted. Tab names are also "sticky" items.

The F12 function key may also be used to move forward through the tabbed sheets in order. To move backwards through the tabbed sheets, use the Shift+F12 keyboard key combination.

When creating a new tab name, you can create a keyboard "access key" for the tab by preceding any character in the name by an ampersand (&). For example, if you type in:

&To Do List

as a tab name, it will appear on the tab as:

To Do List

and you can access the tab by using the Alt+T keyboard key combination. Fairly obviously, access keys for controls on any screen should be unique, i.e. no two controls should have the same access key. Note that the characters "M", "O" and "P" are already being used for access keys for controls on the Quick Notes screen.

A "Sort Sheets by Name" button has also been provided to put the sheets into logical order based on tab names.

Quick Notes incorporates a find function for finding occurrences of specified text strings. To initiate a new search, use the Ctrl+F key combination and input the text to be found. Use the "Find Next" button to run through the various occurrences. Alternatively, having found the first occurrence, exit the search form and press the F3 function key repeatedly.

A find and replace function (Ctrl+R) is also available for systematically replacing text strings. Once the "Find what" and "Replace with" text strings have been specified, use the "Find Next" and "Replace" buttons to make text replacements. Alternatively, use the "Replace All" button to change every occurrence of the "Find what" text string.

By default, find and find & replace searches operate on the contents of the *active* tab only. To apply to the contents of all tabs, uncheck the relevant check box "Active tab only." In both cases (Ctrl+F and Ctrl+R), any search made may be specified as "case sensitive".

Uses of Quick Notes range from the creation of simple "to do" lists to acting as an extended Windows clipboard for multiple plain text items. For example, one sheet might be reserved for regularly used text snippets such as your name and address.

All Quick Notes contents are stored in the text file mynotes.txt. If the information is important to you, you may wish to make regular back-up copies of this file.

Time

Time Calculator

The Time Calculator (Time > Time Calculator) may be used to perform simple arithmetic on times entered using one of the four formats d:h:m:s, h:m:s, m:s, s where d is the number of days, h the number of hours, m the number of minutes and s the number of seconds. Currently:

1. Two times may be added together.

2. One time may be subtracted from another, with the positive difference being returned.

3. A time may be multiplied or divided by a positive number.

Any time result produced is rounded to the nearest second and must be less than 2147483648 days, with larger values generating an (integer) overflow error message.

The value of d in an input string must not exceed 2147483647, the maximum long integer in Visual Basic 6. When the value of h, m or s is at the extreme left of an input string, it may be as large as 32767 the maximum normal integer value Visual Basic 6 can handle. Otherwise, in line with the usual conventions for writing a time, h must be less than 24, and m and s less than 60.

When using the Time Calculator, the keyboard Enter key may be used as an alternative to left-clicking the "Calculate" button. Also, when performing addition:

1. If the right data input box contains a time, the times in the two data input boxes are added together to produce a *new result*.

2. If the right data input box is empty, the time in the left input box is added to any *previously calculated result*.

These features facilitate the rapid addition of a list of times by entering each one in the left data input box and then pressing the keyboard Enter key.

If the left data input box is left empty for a calculation, the current time is assumed.

The Time Calculator may also be used to calculate the positive difference between two date related times, for example 15:45:20 on Dec. 15, 2004 and 21:20:35 on Feb. 27, 2010. This mode of operation is invoked by selecting the "Date related times" option.

What Time is it in?

In "What Time is it in?" (Time > What Time is it in?) you may use your own personal selection of favourite countries and locations instead of Calendar Magic's worldwide locations database. There are two methods for creating a personal selection. One method is via the command button "Add to Personal Database" which will add any selected location from Calendar Magic's worldwide location database to your list of favourites. The second is to use a text editor to edit the two supplied default personal files mycountry.dat and mycities.dat (see next paragraph). Note that any country or location added must already exist in Calendar Magic's worldwide locations database.

Default personal files, covering the *capital* cities and towns in the world, are provided but, during installation, they will never *normally* overwrite existing versions. However, there are occasions when it is necessary to overwrite existing versions of mycountry.dat and mycities.dat, for example when country name changes have been incorporated into Calendar Magic's worldwide country and locations database. **As a result, always make a back-up copy of any personal versions you produce of these two files.**

To remove items from your list of favourites, either use the "Remove from Personal Database" command button, visible when you have selected a favourite location, or edit the files mycountry.dat and mycities.dat to achieve the same result.

Note that using a text editor to create and update files may lead to incorrectly specified files. The first method described above is therefore much safer.

Utilities

Blood Alcohol Content (BAC) Calculator

The formula used in the BAC Calculator (Utilities > BAC Calculator) is that recommended by the United States National Highway Traffic Safety Administration (NHTSA) and is based on Widmark's formula. However, rather than using mean values for the Widmark factor r (0.68 for men and 0.55 for women), r is computed from formulas due to Seidl et al, namely:

r = 0.3161 - 0.004821W + 0.004632H (for men)

r = 0.3122 - 0.006446W + 0.004466H (for women)

where W is the person's weight in kilograms and H the person's height in centimetres.

BAC legal limits in around 80 countries have been incorporated and others can be added on request. The input data values sex, weight, weight unit, height, height unit and country are all "sticky" values.

WARNING   Any calculated BAC is approximate and should never be used to   **WARNING**
                determine whether you are legally sober or fit to drive a car etc.

Big Numbers Calculator

The "Big Numbers Calculator" (Utilities > Big Numbers Calculator) may be used to perform arithmetic calculations involving very large non-negative numbers.

The calculations supported are described in the following table and via tool-tips on the Big Numbers Calculator form.

Calculation	Description	Example
x + y	Addition	5.12 + 4.7 = 9.82
x - y	Positive difference	4.5 – 9.72 = 5.22
x * y	Multiplication	7.1 * 8.6 = 61.06
x / y	Division	1 / 8 = 0.125
x \ y	Quotient from integer division	29 \ 7 = 4
x mod y	Remainder from integer division	29 mod 7 = 1
x ^ n	Raising to a power	1.2 ^ 3 = 1.728
sqrt(x)	Square root	sqrt(81) = 9
hcf(x, y)	Highest common factor	hcf(28, 63) = 7
lcm(x, y)	Least common multiple	lcm(14,12) = 84
n!	Factorial	4! = 4*3*2*1 = 24
pi	Constant	pi = 3.14159…
e	Constant	e = 2.71828…
phi	Constant (golden ratio)	phi = 1.61803…

In the above table, x and y are arbitrary long non-negative numbers and n is an integer in the range 0 to 30000. In addition, when calculating x \ y, x mod y, hcf(x, y) and lcm(x, y), x and y must be *integers*.

The values of the mathematical constants pi, e and phi are calculated using Steve Pagliarulo's super-fast QuickPi program, distributed as part of Calendar Magic with Steve's approval.

Note also that arithmetic expressions may *not* be used when providing input values to the Big Numbers Calculator. You can however, when entering values for x and y, use "E notation". For example, 1.7E6 is equivalent to 1.7 times 10^6 – that is the number 1700000. Similarly, 2.57E-8 is equivalent to 2.57 times 10^{-8} – that is the number 0.0000000257.

When performing a division x / y, the result may not terminate in a finite number of digits, for example 1 / 7 = 0.142857142857142857… An input box has therefore been provided where you may specify the maximum number of digits to be calculated for the fractional part of such a result. The same input box may be used in conjunction with sqrt(x) and when calculating the values of pi, e and phi.

You should proceed with some caution before attempting to generate results with thousands of digits. By way of example, on the developer's PC, calculating 10000! takes around 1 second to generate the 35660 digit result. Similarly, calculating 123456789^10000 takes around 5 seconds to generate the 80916 digit result. Because of the use of QuickPi, the calculation of pi, e or phi is incredibly fast – around 2 seconds to calculate pi to 1 million decimal places!

Immediately after keying in the value of y (or n), pressing the keyboard Enter key has the same effect as clicking the Calculate button.

Whenever a result will contain more than 5000 digits, you are prompted to confirm that you wish to proceed. The keyboard key combination Ctrl+T may also be used to terminate some calculations taking an unacceptably long time. The "Please wait" message makes it clear when this can be done.

Biorhythm Calculator

Biorhythm functionality is available in the form of a Biorhythm Calculator (Utilities > Biorhythm Calculator). However, users of this calculator should be aware that many scientific experts regard the theory of biorhythms as a dubious pseudo-science.

Input to the calculator consists of a date of birth and a target date. Biorhythm results can then be calculated for the target date or, alternatively, a 28-day biorhythm plot may be generated starting at the target date.

Biorhythm results may be saved to a text file and printed out. Also, any plot generated is automatically saved as a .bmp file, BioPlot.bmp, in the folder in which Calendar Magic is installed.

The F11 function key may be used to enlarge both output text and output plots.

Any date of birth entered is a "sticky" value.

Continued Fraction Calculator

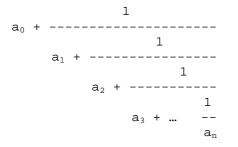The main capabilities provided by this calculator (Utilities > Continued Fraction Calculator) are:

1. Evaluate a continued fraction (CF).

2. Convert a decimal value x to a CF.

3. Convert a normal fraction x / y to a CF.

4. Convert sqrt(x) to a CF.

5. Convert quadratic irrationals of the forms (x + sqrt(z)) / y and (x - sqrt(z)) / y to CFs.

6. Solve linear Diophantine equations ax – by = c.

7. Solve Pell's equation $x^2 - ny^2 = 1$.

In each case, choose the desired option, provide the requested input and then left-click the Calculate button.

If you are unfamiliar with continued fractions and would like to learn more about them, there is a good introduction at http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/cfINTRO.html.

Evaluating a Continued Fraction

The continued fraction to be evaluated should be input using the usual linear form $[a_0; a_1, a_2, \ldots a_n]$ for the continued fraction:

```
                  1
    a₀  +  --------------------
                       1
        a₁  +  ----------------
                        1
            a₂  +  ----------
                         1
                a₃  +  …     --
                            aₙ
```

$a_1, a_2, a_3 \ldots a_n$ must be positive integers and a_0 must be a non-negative integer.

If the CF has a repeating periodic part, it must be delimited using rounded parentheses, for example [3; 5, 7, 4, 4, (2, 1,1, 11, 4, 6)].

You may also specify the number of decimal places to be displayed in the calculated result. The default is 10.

On left-clicking the Calculate button (or pressing the keyboard Enter key after inputting the CF), the CF is evaluated and the result displayed both as a normal fraction and as a decimal value. A table of convergents for the CF is also generated.

Example

If the CF [3;7,15,1,292,1,1,1,2,1,3,1,14,2,1,1,2,2,2,2,1,84] is input and 20 decimal places specified, the following output is generated.

```
*** Continued Fraction Calculator ***

Evaluation of a CF

CF = [3;7,15,1,292,1,1,1,2,1,3,1,14,2,1,1,2,2,2,2,1,84]

Value = 1783366216531 / 567663097408
      = 3.14159265358979323846

Convergents

-----------------------------------------------------------
 N              P              Q    P/Q
-----------------------------------------------------------
 0              3              1    3
 1             22              7    3.14285714285714285714
 2            333            106    3.14150943396226415094
 3            355            113    3.14159292035398230088
 4         103993          33102    3.14159265301190260407
 5         104348          33215    3.1415926539214210447
 6         208341          66317    3.14159265346743670552
 7         312689          99532    3.14159265361893662339
 8         833719         265381    3.1415926535810777712
 9        1146408         364913    3.14159265359140397848
10        4272943        1360120    3.1415926535893891 7154
11        5419351        1725033    3.14159265358981538324
12       80143857       25510582    3.14159265358979265937
13      165707065       52746197    3.14159265358979340254
14      245850922       78256779    3.14159265358979316028
15      411557987      131002976    3.14159265358979325782
16     1068966896      340262731    3.14159265358979323539
17     2549491779      811528438    3.14159265358979323901
18     6167950454     1963319607    3.14159265358979323838
19    14885392687     4738167652    3.14159265358979323849
20    21053343141     6701487259    3.14159265358979323846
21  1783366216531   567663097408    3.14159265358979323846
-----------------------------------------------------------
```

Clearly the CF provides a very good rational expansion for pi and, among its convergents, are the well known approximations for pi – 22/7 and 355/113.

Converting x to a CF

This option enables positive decimal numbers to be converted to CFs.

Example

Inputting 2.718281828459045 for x and clicking the Calculate button (or pressing the keyboard Enter key) produces the following output.

```
*** Continued Fraction Calculator ***

Conversion of x to a CF

x = 2.718281828459045

CF = [2; 1, 2, 1, 1, 4, 1, 1, 6, 1, 1, 8, 1, 1, 10, 1, 1, 12, 1, 1, 10, 2,
1, 3, 1, 2, 2, 1, 2, 1, 1, 2, 1, 1, 7, 4, 1, 8]
```

Converting x / y to a CF

This option allows the conversion of any normal fraction x / y to a CF, where x, y are positive integers.

Example

Inputting 1363 for x, 422 for y and clicking the Calculate button (or pressing the keyboard Enter key) produces the following output.

```
*** Continued Fraction Calculator ***

Conversion of x / y to a CF

x = 1363

y = 422

CF = [3; 4, 2, 1, 5, 1, 4]
```

You can easily check the result by evaluating [3; 4, 2, 1, 5, 1, 4]

Converting sqrt(x) to a CF

Unless x is a perfect square, the continued fraction expansion for sqrt(x) does not terminate but, after the first term, consists of a periodic part which repeats indefinitely. For example, the CF for sqrt(19), namely:

> [4; 2, 1, 3, 1, 2, 8, 2, 1, 3, 1, 2, 8, 2, 1, 3, 1, 2, 8, 2, 1, 3, 1, 2, 8 …]

contains the periodic part 2, 1, 3, 1, 2, 8.

The Continued Fraction Calculator displays the CF for sqrt(x) up to the end of its periodic part and also indicates the length of the period – 6 in the example above. The periodic part is also delimited by rounded parentheses.

Example

Here is the output when x = 1927.

```
*** Continued Fraction Calculator ***

Conversion of sqrt(x) to a CF

x = 1927

CF = [43; (1, 8, 1, 3, 3, 1, 1, 3, 1, 1, 1, 1, 2, 4, 2, 43, 2, 4, 2, 1, 1,
1, 1, 3, 1, 1, 3, 3, 1, 8, 1, 86), ...]

Period length = 32

The periodic part is delimited by rounded parentheses.
```

Note that some square root CFs can have significantly long periods leading to non-trivial computation times – for example the CF for sqrt(1234567891) has period length 47374. If such a calculation is taking too long, you may terminate it at any point using the Ctrl+T keyboard key combination.

Converting Quadratic Irrationals to CFs

The Continued Fraction Calculator can also be used to convert quadratic irrationals of the forms (x + sqrt(z)) / y and (x - sqrt(z)) / y to CFs, where:

1. x is an integer (possibly zero or negative).

2. y and z are positive integers.

3. z is not a perfect square.

4. The numerator of the quadratic irrational must be positive.

Typically the continued fraction expansion of such a quadratic irrational contains, after its first term, several non-repeating terms followed by a periodic part which repeats indefinitely. For example the CF expansion for the quadratic irrational (25 + sqrt(77)) / 37 is:

[0; 1, 10, (2, 8, 1, 2, 22, 1, 5, 2, 8, 2, 3, 3, 1, 1, 4, 9), ...]

where rounded parentheses have again been used to indicate the periodic part.

The Continued Fraction Calculator displays the CF for a quadratic irrational up to the end of its periodic part and also indicates the length of the period – 16 in the example above.

Example

Here is the output when (-13 +sqrt(177)) / 46 is converted to a CF.

```
*** Continued Fraction Calculator ***

Conversion of (x + sqrt(z))/y to a CF

x = -13

y = 46

z = 177

CF = [0; 151, (4, 50, 1, 2, 1, 152), ...]

Period length = 6

The periodic part is delimited by rounded parentheses.
```

Note that the CF expansions of quadratic irrationals can also have significantly long periods leading to non-trivial computation times. If such a calculation is taking too long, you may terminate it at any point using the Ctrl+T keyboard key combination.

Solving Linear Diophantine Equations of the Form ax – by = c

Given positive integer values for a, b and c, this option finds a solution in positive integers of the linear Diophantine equation in two variables ax – by =c.

Example

Here is the output when the equation 175x – 457y = 1237 is solved.

```
*** Continued Fraction Calculator ***

Solution of ax - by = c

a = 175
b = 457
c = 1237

x = 1072479

y = 410684
```

Solving Pell's Equation

The Continued Fraction Calculator also provides an option for finding the fundamental solution of Pell's equation $x^2 – ny^2 =1$ where n is any positive integer other than a perfect square.

Example

Here is the output when n = 12379.

```
*** Continued Fraction Calculator ***

Fundamental Solution of Pell's Equation x^2 - n*y^2 = 1

n = 12379

x =
4260686772096659501020805272151619148400220091059236743129698117779983648118
849785818030650

y =
3829453729386703832395464407638265498154332869965483690510870390560578925104
0945071589659
```

Again, if any calculation is taking too long, you may terminate it using the Ctrl+T keyboard key combination.

Currency Converter

The Currency Converter (Utilities > Currency Converter) will convert between various popular currencies. When invoked, the Currency Converter automatically downloads up-to-date currency conversion rates from the European Central Bank (ECB). These conversion rates are updated daily (Monday to Friday), usually by 3 p.m. CET, and currently cover 34 different currencies. The two currencies chosen are "sticky" values.

Any downloaded ECB file has to be unzipped and this is performed "behind the scenes" using efficient and compact unzip software (unzip.exe) from Info-ZIP at http://www.info-zip.org/.

Expression Calculator

The Expression Calculator (Utilities > Expression Calculator) may be used to calculate the values of arithmetic expressions entered in normal (infix) form such as:

(1.973 * 23.987) / (67.987 - 23.854)

and

[2 * pi + sqrt(19.75) + 17 * ln(23.3)] / (pi ^ 2 + 0.987)

Any arithmetic expression to be calculated may be entered using the keyboard or a mouse, or a combination of both. Tool-tips are also provided to improve ease-of-use.

Three types of parentheses – ( ), [ ], { } – may be freely used to improve readability and to over-ride operator precedence (see below). Space characters may also be manually inserted to improve readability, although not strictly necessary because the Expression Calculator adds spaces automatically during processing of the input.

Once input has been completed, click the "Calculate" button or press the keyboard Enter key to initiate the calculation of the result. The result is displayed immediately below the input. Results lines always begin with the characters "==>" to distinguish them from input lines.

You may choose the number of significant digits to display in results. The number of significant digits chosen is "sticky", i.e. remembered by Calendar Magic until subsequently changed.

Multiple expressions may be entered on consecutive lines, each one being evaluated before the next one is entered. An example is:

```
log10(sqrt(17)) + 10          [Enter key or "Calculate" button]
==> 10.615224
4 * arctan(1)                 [Enter key or "Calculate" button]
==> 180
pi / e + e / pi + 2 * pi * e  [Enter key or "Calculate" button]
==> 19.100452
```

Constants

Three built-in constants are available, namely pi = 3.14159265358979, e = 2.71828182845905 and the golden ratio phi = 1.61803398874989.

Operators

The following arithmetic operators are supported.

Operator	Description	Example
+	Addition	1.75 + 2.78 = 4.53
-	Subtraction	7.89 - pi = 4.748407
*	Multiplication	3.45E4 * 98.765 = 3407392.5
/	Division	pi / e = 1.155727
^	Raising to a power	2 ^ 10 = 1024
\	Integer division	29 \ 13 = 2
mod	Remainder on integer division	29 mod 13 = 3

Note that, when the operators \ and mod are used, the relevant operands must be exact integers.

Operators also possess a "precedence level" as indicated in the following table.

Operator	Precedence Level
+, -	1
*, /, \, mod	2
^	3

with "3" being the highest precedence level.

Precedence levels are used when evaluating arithmetic expressions containing several operators. The rules may be summarised thus:

1. Operators with a higher precedence level are performed before operators with a lower precedence level. As an example, the arithmetic expression 2 + 3 * 5 evaluates to 17 because the multiplication is performed before the addition.

2. When several operators in an arithmetic expression have equal precedence, they are performed from *left to right*. Thus 8 / 4 * 5 evaluates to 10, with the division being performed before the multiplication.

3. Parentheses may be used to override the normal rules of precedence. Hence (2 + 3) * 5 evaluates to 25.

Functions

32 inbuilt functions are currently provided. They are summarised in the table below.

Function	Description	Example
abs(x)	Absolute value (magnitude) of x	abs(-2.89) = 2.89
arcos(x)	Inverse cosine of x (-1<=x<=1)	arcos(0.5) = 60 (see note 1)
arccosh(x)	Inverse hyperbolic cosine of x (x>=1)	arccosh(1) = 0
arcsin(x)	Inverse sine of x (-1<=x<=1)	arcsin(1) = 90 (see note 1)
arcsinh(x)	Inverse hyperbolic sine of x	arcsinh(0) = 0
arctan(x)	Inverse tangent of x	arctan(1) = 45 (see note 1)
arctanh(x)	Inverse hyperbolic tangent of x (-1<x<1)	arctanh(0) = 0
ceiling(x)	Smallest integer greater than or equal to x	ceiling(3.2) = 4
cos(x)	Cosine of x	cos(90) = 0 (see note 1)
cosh(x)	Hyperbolic cosine of x	cosh(1) = 1.543081
exp(x)	Exponential of x	exp(2) = 7.389056
fact(n)	Factorial n, where n is an integer (n>=0)	fact(6) = 6*5*4*3*2*1 = 720
fib(n)	nth. Fibonacci number (n>=0)	fib(10) = 55
floor(x)	Largest integer less than or equal to x	floor(-3.4) = -4
frac(x)	Fractional part of x	frac(2.736) = 0.736 (see note 2)
int(x)	Integer part of x	int(2.736) = 2 (see note 2)
invert(x)	1 if x=0; 0 if x<>0	invert(0)=1 and invert(-5)=0
ln(x)	Log to base e of x (x>0)	ln(pi) = 1.14473
log10(x)	Log to base 10 of x (x>0)	log10(2) = 0.30103
luc(n)	nth. Lucas number (n>=1)	luc(20) = 15127
rand	Random number in range 0<=x<=1	0.4297502040863

recip(x)	Reciprocal of x (x<>0)	recip(4) = 0.25
round(x)	x rounded to nearest integer	round(2.6) = 3
sign(x)	Sign of x (-1 if x<0; 0 if x=0; 1 if x>0)	sign(-e) = -1
sin(x)	Sine of x	sin(45) = 0.7071068 (see note 1)
sinh(x)	Hyperbolic sine of x	sinh(1) = 1.175201
sqrt(x)	Square root of x (x>=0)	sqrt(1048576) = 1024
square(x)	Square of x	square(7) = 49
tan(x)	Tangent of x	tan(45) =1 (see note 1)
tanh(x)	Hyperbolic tangent of x	tanh(1) = 0.7615942
userfuncs	Lists user defined function names	
uservars	Lists user defined variable names	

Notes

1. These examples assume that you are working in degrees and not radians.

2. int(x) is the same as floor(x), i.e. the largest integer less than or equal to x. frac(x) is defined to be x – int(x).

User Defined Variables

In addition to evaluating arithmetic expressions, you may work with *variables* and use *assignment statements* to assign values to them, for example:

r = sqrt(17)

h = pi * ln(13)

Vol = pi * r^2 * h

In this example three variables have been defined, named r, h and Vol, and values assigned to them using statements of the form:

variable name = arithmetic expression

Variable names must begin with a letter and must contain only letters and digits. Other examples of valid variable names are X1, temp5, a5b and temp25. Variable names are not case sensitive – for example x1 and X1 are regarded as the same variable name. To avoid conflicts, the names of inbuilt constants, operators and functions must not be used for variable names.

Fairly obviously, a variable must be assigned a value before it appears on the right side of any assignment statement.

When a series of expressions and assignment statements have been entered and calculated, for example:

```
log10(sqrt(23))                             [Enter key or "Calculate" button]
==> 0.68086392
a = 2                                       [Enter key or "Calculate" button]
==> a = 2
b = -7                                      [Enter key or "Calculate" button]
==> b = -7
c = 5                                       [Enter key or "Calculate" button]
==> c = 5
X1 = (-b + sqrt(b ^ 2 - 4 * a * c)) / (2 * a)  [Enter key or "Calculate" button]
==> X1 = 2.5
X2 = c / (a * X1)                           [Enter key or "Calculate" button]
==> X2 = 1
```

only the last expression or statement entered may be edited and recalculated using the "Calculate" button. Changes to other expressions and statements are ignored.

However, it is permissible to carry out more extensive editing and recalculation by using the "Recalc All" button. For example, given the following series of assignment statements to calculate the area of a triangle:

```
a = 10                                      [Enter key or "Calculate" button]
==> a = 10
b = 17                                      [Enter key or "Calculate" button]
==> b = 17
c = 12                                      [Enter key or "Calculate" button]
==> c = 12
s = (a + b + c) / 2                         [Enter key or "Calculate" button]
==> s = 19.5
Area = sqrt(s * (s - a) * (s - b) * (s - c))  [Enter key or "Calculate" button]
==> Area = 58.935876
```

you may edit the values of a, b and c to give say (where the edited values are coloured red):

```
a = 25
==> a = 10
b = 15
==> b = 17
c = 18
==> c = 12
s = (a + b + c) / 2
==> s = 19.5
Area = sqrt(s * (s - a) * (s - b) * (s - c))
==> Area = 58.935876
```

Then left-click the "Recalc All" button to obtain:

```
a = 25
==> a = 25
b = 15
==> b = 15
c = 18
==> c = 18
s = (a + b + c) / 2
==> s = 29
Area = sqrt(s * (s - a) * (s - b) * (s - c))
==> Area = 133.65628
```

Note that you may terminate any input line with the symbol # and there is a checkbox "Ignore # lines" below "Recalc All". If this checkbox is turned on, lines terminated by the symbol # *are not recalculated* during a Recalc All operation – useful, for example, when performing an iterative calculation in which various initial estimates are to be ignored after the first iteration. For an example, load the file NewtonRaphson.shf from the Calendar Magic installation folder.

Apart from its use in conjunction with the "Ignore # lines" checkbox, the symbol # at the end of any input line has no other effect.

Another use of Recalc All is when you have a multi-line mathematical expression already prepared using a text editor or word processor. Simply copy and paste it into the Expression Calculator and then press "Recalc All". Of course, any such mathematical expression must conform to the syntactic rules of the Expression Calculator. An added bonus is that, if you use the Ctrl+V keyboard key combination to paste, decimal points will be automatically converted into commas, or vice-versa, depending on your Windows settings.

As an example, copy this expression, say from Word for Windows, into the Expression Calculator.

    x= -0.072183436
    357.52911 + 35999.05029 * x - 0.0001537 * x ^ 2 + 2520
    280.46646 + 36000.76983 * x + 0.0003032 * x ^ 2 + 2520

Then press "Recalc All" to obtain:

    x = -0.072183436
    ==> x = -7.2183436E-2
    357.52911 + 35999.05029 * x - 0.0001537 * x ^ 2 + 2520
    ==> 278.993967
    280.46646 + 36000.76983 * x + 0.0003032 * x ^ 2 + 2520
    ==> 201.807197

User Defined Functions

The Expression Calculator also supports user defined functions. Examples of function definitions are:

    poly(x) = x^3 +2*x^2 - 3*x +7

    Area(r) = pi*r^2

    ToCelsius(F) = 5*(F - 32)/9

Each function definition is of the form:

    function name(parameter name) = arithmetic expression

As with variable names, function names and parameter names must begin with a letter and must contain only letters and digits. Function names and parameter names are not case sensitive – for example, area and Area are regarded as the same function name. To avoid conflicts, the names of inbuilt constants, operators and functions must not be used for the names of user defined functions.

Once defined, user defined functions may be used in exactly the same manner as inbuilt functions, for example

    poly(3)

    Area(2.5)

    Temp = ToCelsius(212)

    y = poly(sqrt(2) + pi)

Saving and Loading User Defined Variable and Function Definitions

After calculating the values of various expressions and defining some variables and functions, the "Save" button may be used to save a "session history" in a text file. The standard Windows dialogue is used for naming and saving such files with the extension .shf.

At some later time, you may use the "Load" button to replay a "session history" to re-establish the various user defined variables and functions. You are prompted to provide a name for the .shf session file you wish to use via the standard Windows dialogue for opening files.

Note that, if you have created session files using any version of Calendar Magic before V16.3, you will need to manually change the file extensions to .shf.

From V16.5, when saving a session history as an .shf file, the angle measure (degrees or radians) used during the session is stored in the file. When the file is subsequently reloaded, the required angle measure is automatically selected. "Older format" .shf files may still be loaded and the format of such a file will be updated on a subsequent save operation.

Caution should also clearly be exercised when loading several .shf files into a single session – they may not be compatible if some require radian angle measure and others degree angle measure.

A number of sample .shf files are provided in each release of Calendar Magic. Topics covered include body mass index, cube roots, decimal degrees to degrees, minutes and seconds (and vice-versa), Newton-Raphson iteration, screen resolution calculations, and the solution of quadratic equations. You are invited to contribute other examples for future releases.

Using Comments

Explanatory comments may be inserted in input, any text starting with the character ' being ignored.

An example of input containing comments is:

```
' Set values
h = 30 ' height
==> h = 30
r = 17 ' radius
==> r = 17
' Calculate volume V of cone
V = pi * r ^ 2 * h / 3
==> V = 9079.2028
```

leading to the result V = 9079.2028.

Current Limits

Any expression or statement is currently limited to a maximum of 300 "tokens", a token being defined as a number, constant, operator, function name, = sign, parenthesis, user defined variable name or user defined function name. The number of user defined variables is also currently limited to a maximum of 50, as is the number of user defined functions.

These internal limits can easily be increased, on request, if any user needs to create longer expressions or assignment statements.

There is also a limitation in Visual Basic restricting the total number of characters in the text-box used for input and output to a maximum of 65535 characters.

Factor Calculator

The Factor Calculator (<u>U</u>tilities > <u>F</u>actor Calculator) may be used to find:

1. The prime factors of any integer up to 60 digits in length. This uses highly efficient code for factorising integers (factor.exe) developed by Shamus Software (http://www.shamus.ie/).

2. The Highest Common Factor (HCF) and Least Common Multiple (LCM) of a list of up to 20 integers separated by commas. There is a size limitation of 2147483647 on any integer listed and on any calculated LCM. However, if a calculated LCM is too large, its factors can be deduced from the table of prime factors produced for the various integers in the input list.

   Note that the term Greatest Common Divisor (GCD) is sometimes used instead of Highest Common Factor (HCF).

A reasonably fast CPU is required for factorising large integers quickly. The following timings were obtained using an Intel Core 2 Quad Q6600 based system and Windows Vista (32-bit).

Prime Factorisation of 725341325678914253647489123399771135600712345911773265311721

```
7^2 * 19 * 149 * 9739 * 2908371742488203793377 *
18460446033700127211914870 3653

Number of digits input = 60
Time taken in seconds  = 1
```

Prime Factorisation of 135797531713579753171357975317135797531713579753

```
17 * 101 * 8351243600544529229 * 9470445933687178682972921

Number of digits input = 48
Time taken in seconds  = 5
```

Prime Factorisation of 9215991985973749404377929670460177922546120205801

```
29813294563215798123 77573 * 3091235678912391363277237

Number of digits input = 49
Time taken in seconds  = 8
```

Prime Factorisation of 191827263546171822635464718191818227717721371391919237771171

```
236627 * 4156332758772148500 1447 * 1950454051221919806750380485 4759

Number of digits input = 60
Time taken in seconds  = 15
```

Prime Factorisation of 123818282774644474659917563739386146348468291833099097613223

```
1993 * 49854970126074513841289 76337 * 12461462573486632094160122303

Number of digits input = 60
Time taken in seconds  = 23
```

Prime Factorisation of 71641520761751435455133616475667090434063332228247871795429 (rsa-59)

```
200429218120815554269743635437 * 35744050410138836561078 5389017

Number of digits input = 59
Time taken in seconds  = 44
```

Immediately after keying in the input, pressing the keyboard Enter key has the same effect as clicking the Calculate button.

If a factorisation process is taking too long, the execution of factor.exe may be terminated by a user via the Windows Task Manager (use Ctrl+Shift+Esc to invoke). Calendar Magic is able to detect such an event and displays an appropriate message.

Users who wish to factorise integers larger than $10^{60} - 1$ may also run factor.exe from a command prompt for integers up to $10^{80} - 1$.

Financial Calculator

The Financial Calculator (Utilities > Financial Calculator) supports nine different types of financial calculation:

1. Annuities

2. Bonds

3. Compound interest

4. Fixed rate (declining balance) depreciation

5. Straight-line depreciation

6. Sum-of-years digits (SOYD) depreciation

7. General payments

8. Margins (retail)

9. Mortgages and loans

10. Regular investments

In line with the Geometry Calculator, when a result is calculated, the colour of label text associated with the calculated result changes to red, in order to distinguish more clearly between data input and calculated results. Also any input value may be specified as a simple arithmetic expression containing numeric values, rounded parentheses ( ), and the arithmetic operators + - * / and ^, representing respectively addition, subtraction, multiplication, division and raising to a power. Examples are 5 * 23.79, 11 * 14 + 6 and (2 ^ 0.5) * (7 / 8). The space characters on either side of an arithmetic operator are optional.

When a number of years n is provided as input, the value specified must be a positive integer. However, when n is being calculated from other input data, Calendar Magic is able to compute non-integer values for n, where appropriate.

Not all variables may be assigned input values and those which may not are "greyed out" (disabled) to identify them, making it impossible to copy such a calculated variable value to the Windows clipboard using the usual Ctrl+A and Ctrl+C keyboard commands. To copy the value of any "greyed out" variable to the clipboard, left-click the corresponding label description (this actually works for all variable values).

Because input data values and output results are distributed over multiple text-boxes, two capabilities are provided to integrate and consolidate the information:

1. A "Print" button for outputting a summary of input and output to any attached printer.

2. A "Save" button for copying the same information to any text file.

"Show Table(s)/Hide Table(s)" Command Button

Once a financial calculation has been performed, the "Show <u>T</u>able(s)" command button may be used to display a year by year summary table for the calculation and, where appropriate, a period by period summary table . When clicked, the button caption changes to "<u>H</u>ide Table(s)", so that the same button may be used to return to the normal display of input data and results.

If no detailed summary table exists for a calculation, the "Show <u>T</u>able(s)" button is temporarily "greyed out" (disabled).

General Payments

The Financial Calculator "General Payments" routine solves the equation connecting a present value PV, regular fixed payments PMT, a periodic interest rate r% for n periods, and a final value FV, for any one of the five variables involved. It uses the convention that positive values of PV, PMT and FV represent money you receive, whereas negative values represent money you pay out.

Example 1

A development company would like to purchase a group of apartments with an annual net cash flow of $17,500. The expected holding period is 5 years and the estimated selling price after that time is $540,000. Calculate the maximum amount the company can pay for the apartments in order to realise at least a 12% annual yield.

In this case:

> PV is to be calculated.
>
> r = 12
>
> PMT = 17500
>
> Regular payment frequency = Yearly
>
> Regular payments made at End of each period
>
> n = 5
>
> FV = 540000

and, on pressing the "Calculate" button, PV is calculated to be -369494.08562908. This indicates that the development company cannot afford to *pay out* more than $369494 for the apartments.

Fraction Calculator

The Fraction Calculator (<u>U</u>tilities > F<u>r</u>action Calculator) may be used to calculate exactly the values of arithmetic expressions containing integers and fractions, such as:

22/7 - 355/113

and

13 + (2/3 + 5/9) / (3/4 + 2/7)

Three types of parentheses – ( ), [ ], { } – may be freely used to improve readability and to over-ride operator precedence (see below). Space characters may also be manually inserted to improve readability, although not strictly necessary because the Fraction Calculator adds spaces automatically during processing of the input.

Once input has been completed, click the "<u>C</u>alculate" button or press the keyboard Enter key to initiate the calculation of the result. The result is displayed immediately below the input. Results lines always begin with the characters "==>" to distinguish them from input lines.

Multiple expressions may be entered on consecutive lines, each one being evaluated before the next one is entered. An example is:

22/7 - 355/113   [Enter key or "Calculate" button]
==> 1/791
1/3 + 1/5 + 1/7 + 1/9 + 1/11 + 1/33 + 1/35 + 1/45 + 1/55 + 1/77 + 1/105 [Enter key …]
==> 1
3 * (3/4 + 5/12) / (2/7 - 1/9)   [Enter key or "Calculate" button]
==> 441/22
{(7/8 - 3/7) * (7/8 + 3/7)} ^ 3   [Enter key or "Calculate" button]
==> 6078390625/30840979456

Each result is also automatically copied to the Windows clipboard, making it easy to re-use.

Operators

The following arithmetic operators are supported.

Operator	Description	Example
+	Addition	7/3 + 5/6 = 19/6
-	Subtraction	5/7 - 3/28 = 17/28
*	Multiplication	(4/7) * (3/4) = 3/7
/	Division	(2/3) / (5/9) = 6/5
^	Raising to a power	(4/7)^3 = 64/343

Note that, when raising to a power, the exponent must simplify to an *integer* and be no greater than 30000 in magnitude .

Operators also possess a "precedence level" as indicated in the following table.

Operator	Precedence Level
+, -	1
*, /	2
^	3

with "3" being the highest precedence level.

Precedence levels are used when evaluating arithmetic expressions containing several operators. The rules may be summarised thus:

1. Operators with a higher precedence level are performed before operators with a lower precedence level. As an example, the arithmetic expression 2 + 3/7 evaluates to 17/7 because the division is performed before the addition.

2. When several operators in an arithmetic expression have equal precedence, they are performed from *left to right*. Thus 2/3/5/7 evaluates to 2/105.

3. Parentheses may be used to override the normal rules of precedence. Hence (2/3 + 3/7) * 5 evaluates to 115/21.

Whenever in doubt, use parentheses to specify how you wish an expression to be evaluated.

User Defined Variables

In addition to evaluating arithmetic expressions containing integers and fractions, you may work with variables and use assignment statements to assign values to them, for example:

X1 = (2/3 + 4/7)/(5/11 -1/17)

EstPi = 355/113

eProx = 2 + 1/2 + 1/6 + 1/24 + 1/120 + 1/720 + 1/5040

In this example, three variables have been defined, named X1, EstPi and eProx, and values assigned to them using statements of the form:

variable name = arithmetic expression

Variable names must begin with a letter and must contain only letters and digits. Other examples of valid variable names are Z, y3, Frac10 and OutVal. Variable names are not case sensitive – for example x1 and X1 are regarded as the same variable name. Fairly obviously, a variable must be assigned a value before it appears on the right side of any assignment statement.

When a series of expressions and assignment statements have been entered and calculated, for example:

a = 2	[Enter key or "Calculate" button]
==> a = 2	
b = 3	[Enter key or "Calculate" button]
==> b = 3	
c = 5	[Enter key or "Calculate" button]
==> c = 5	
d = 7	[Enter key or "Calculate" button]
==> d = 7	
X = (a / b – c / d)/(a / b + c / d)	[Enter key or "Calculate" button]
==> X = -1 / 29	

only the last expression or statement entered may be edited and recalculated using the "Calculate" button. Changes to other expressions and statements are ignored.

However, it is permissible to carry out more extensive editing and recalculation by using the "Recalc All" button. For example, given the above series of assignment statements, you may edit the values of a, b, c and d to give (where the edited values are coloured red):

a = 5
==> a = 2
b = 7
==> b = 3
c = 3
==> c = 5
d = 4
==> d = 7
X = (a / b – c / d)/(a / b + c / d)
==> X = -1 / 29

Then left-click the "Recalc All" button to obtain:

a = 5
==> a = 5
b = 7
==> b = 7
c = 3
==> c = 3
d = 4
==> d = 4
X = (a / b - c / d) / (a / b + c / d)
==> X = -1 / 41

You may also terminate any input line with the symbol # and there is a checkbox "Ignore # lines" below "Recalc All". If this checkbox is checked, lines terminated by the symbol # are not recalculated during a Recalc All operation – useful, for example, when performing an iterative calculation in which various initial estimates are to be ignored after the first iteration. For an example, input the statements:

N = 2
==> N = 2
X = 1 #
==> X = 1
X = (X + N / X) / 2
==> X = 3 / 2

Now check the "Ignore # lines" checkbox and press the Recalc All button twice to obtain:

N = 2
==> N = 2
X = 1 #
X = (X + N / X) / 2
==> X = 577 / 408

The value of X is a good rational approximation to the square root of 2 (577/408 = 1.41421…).

Apart from its use in conjunction with the "Ignore # lines" checkbox, the symbol # at the end of any input line has no other effect.

Another use of Recalc All is when you have a multi-line mathematical expression already prepared using a text editor or word processor. Simply copy and paste it into the Fraction Calculator and then press "Recalc All". Of course, any such mathematical expression must conform to the syntactic rules of the Fraction Calculator.

Saving and Loading User Defined Variables

After calculating the values of various expressions and defining some variables, the "Save" button may be used to save a "session history" in a text file. The standard Windows dialogue is used for naming and saving such files with the extension .sff.

At some later time, you may use the "Load" button to replay a "session history" to re-establish the various user defined variables etc. You are prompted to provide a name for the .sff session file you wish to use via the standard Windows dialogue for opening files.

Although it is possible to load several .sff files into a single session, you should proceed with caution because of potential variable name clashes etc.

Using Comments

Explanatory comments may be inserted in input, any text starting with the character ' being ignored. An example of input containing comments is:

```
' Rational approximation to the square root of N by iteration
'
N = 2            ' Value of N
==> N = 2
X = 1 #          ' Initial approximation
==> X = 1
'
' Newton-Raphson iterative formula for square root of N
' Use Recalc All to improve estimate
' Check "Ignore # lines" checkbox after first pass
'
X = (X + N / X) / 2
==> X = 3 / 2
```

Current Limits

Any expression or statement is currently limited to a maximum of 300 "tokens", a token being defined as a number, operator, = sign, parenthesis, or user defined variable name. The number of user defined variables is also currently limited to a maximum of 50. These internal limits can easily be increased, on request, if any user needs to create longer expressions or assignment statements.

There is also a limitation in Visual Basic restricting the total number of characters in the text-box used for input and output to a maximum of 65535 characters.

Geometry Calculator

The Geometry Calculator (<u>U</u>tilities > <u>G</u>eometry Calculator) may be used to evaluate key attributes (area, perimeter, volume, surface area etc.) of various 2D geometric objects:

- Circle
- Circular ring (annulus)
- Ellipse
- Parallelogram
- Rectangle
- Regular polygon
- Sector of a circle
- Segment of a circle
- Square
- Star polygon {n/k} (see http://mathworld.wolfram.com/StarPolygon.html)
- Television screen
- Trapezium (Trapezoid in the United States)
- Triangle

and 3D geometric objects:

- Buckminster ball
- Cone
- Cube
- Cuboid
- Cylinder
- Ellipsoid
- Frustum of a cone
- Frustum of a pyramid on a square base
- Regular dodecahedron
- Regular icosahedron
- Regular octahedron
- Regular pyramid on a polygonal base
- Regular pyramid on a square base
- Regular tetrahedron
- Sphere
- Spherical dome
- Spherical triangle
- Torus

Not all object attributes may be assigned input values and those which may not are "greyed out" (disabled) to identify them, making it impossible to copy such an attribute value to the Windows clipboard using the usual Ctrl+A and Ctrl+C keyboard commands. To copy the value of any "greyed out" attribute to the clipboard, left-click the descriptive text to the left of the value (this actually works for all attribute values).

When object attribute values are calculated in the geometry calculator, the colour of label text associated with calculated results changes to red, in order to distinguish more clearly between data input and calculated results.

Any input value may be specified as a simple arithmetic expression containing numeric values, rounded parentheses ( ), and the arithmetic operators + - * / and ^, representing respectively addition, subtraction, multiplication, division and raising to a power. Examples are 5 * 23.79, 11 * 14 + 6 and (2 ^ 0.5) * (7 / 8). The space characters on either side of an arithmetic operator are optional.

When more than one solution exists, a message in the Status Display highlights the fact and a command button "<u>O</u>ther Solution" is enabled for toggling between the solutions.

Switching between degrees and radians does not cause input and output boxes to be cleared. Instead, all angle values (input and results) are converted accordingly.

When working in degrees, tool-tips are created during the calculation process for all enabled text-boxes displaying angle values. Each tool-tip shows the corresponding decimal angle value converted to degrees, minutes and seconds.

Because input data values and output results are distributed over multiple text-boxes, two capabilities are provided to integrate and consolidate the information:

3. A "Print" command button for outputting a summary of input and output to any attached printer.

4. A "Save" command button for copying the same information to any text file.

Note that accurately calculating the surface area of an ellipsoid, in the general case where the semi-axes a, b and c are all of different lengths, is a non-trivial task. The following remarkable formula, due to Knud Thomsen, is used to obtain an *approximate* result:

$$\text{Surface area} = 4\pi\{(a^p b^p + b^p c^p + c^p a^p) / (3 - k(1 - 27abc / (a + b + c)^3))\}^{1/p}$$

where k = 3/32 and p = ln(2)/ln(π/2). The absolute relative error is less than 0.21%. As an example, when a = 1.2, b = 1.1, c = 4.7, Thomsen's formula yields 54.6833 to be compared with the accurate result 54.6901 to 4 decimal places.

Global Distances

The Global Distances menu item (Utilities > Global Distances) supports the calculation of distances between locations all over the world. Any calculated value is the "great circle" distance between two locations, computed from their respective latitudes and longitudes. Note that, since any road route between the locations is unlikely to be optimal, driving distances may be significantly greater than the results produced.

A location may be specified by entering its latitude and longitude, or by selecting it from Calendar Magic's inbuilt worldwide locations database. This database currently contains around 8000 cities and towns in over 230 different countries and dependencies. Computed distances may be displayed in kilometres, miles or international nautical miles.

Also calculated is the direction of each chosen location from the other as a number of degrees East or West of true North. This is useful for followers of the Islamic and Jewish faiths who wish to pray facing in the direction of Mecca and Jerusalem respectively.

Hint – to avoid tedious scrolling to near the end of a long drop-down list, display the drop-down list, key in the first one or two letters of the desired country, city or town, then select it.

Magic Squares

The Magic Squares menu item (Utilities > Magic Squares) may be used to generate a *magic square* of order N, where N lies in the range 3 to 100. The numbers forming the magic square are the integers 1, 2, 3, … N^2. The algorithms used are described at:

http://mathworld.wolfram.com/MagicSquare.html

It should be noted that magic squares of orders greater than 31 are difficult to print "nicely" even in landscape mode. However, the relevant output data is also stored in the CSV (Comma Separated Variable) text file magsq.csv which you may manipulate, using a text editor or spreadsheet program, to customise and/or print the output for your own specific requirements.

Number Base Converter

The "Number Base Converter" (Utilities > Number Base Converter) may be used to convert numbers between any two number bases in the range 2 (binary) to 100. A number to be converted may be of arbitrary length and may also be non-integer.

For inputting numbers in number bases greater than 16, Neugebauer's notation must be used. In this notation, when inputting a number in base B, the individual numerical base B digits in the number are separated by commas and, if the number has both integer and fractional parts, they are separated by a semicolon. Thus, for example, in base 60 the number 6,47,13, 4 in Neugebauer form represents the number $6*60^3 + 47*60^2 + 13*60 + 4$. Similarly in base 7, the Neugebauer form 5,2;4,0,6 represents the number $5*7 + 2 + 4/7 + 0/7^2 + 6/7^3$.

For inputting numbers in number bases from 2 to 16, you may use either Neugebauer form or normal mathematical form. Thus, in base 16, the Neugebauer form 10,2,12 and the normal mathematical form A2C are equivalent where, as usual, A=10, B=11, C=12, D=13, E=14, F=15 in hexadecimal numbers.

Immediately after keying in the value of the number to be converted, pressing the keyboard Enter key has the same effect as clicking the Calculate button.

When a number to be converted contains a fractional part, the converted result may not terminate in a finite number of digits, for example the base 10 number 0.1 when converted to binary equals 0.00011001100110011 … An input box has therefore been provided where you may specify the maximum number of digits to be calculated for the fractional part in a result.

Pregnancy Calculator

The Pregnancy Calculator (Utilities > Pregnancy Calculator) is used to calculate significant pregnancy related dates. Normally, the user will enter the date of the first day of the last menstrual period before pregnancy and the calculator will automatically compute significant pregnancy related dates including the approximate date of conception, the current age of the foetus, and the estimated due date. Alternatively, a desired due date may be entered and the calculator will "compute backwards" to estimate the date of the first day of the last menstrual period before pregnancy etc.

The date at which the individual is n weeks pregnant may also be calculated where n is in the range 0 to 44. Simply select the desired value for n from the drop-down list of possible values.

Note that the medical profession usually calculates pregnancy related dates from the first day of the last menstrual period before pregnancy. Thus, if a foetus is estimated to have a current age of four weeks, it is likely that conception only occurred around two weeks ago.

Recurring Decimals

This capability (Utilities > Recurring Decimals) may be used to convert fractions of the form a/b, where a and b are integers, to their equivalent decimal values and vice-versa. Some fractions have an exact decimal equivalent; others convert to decimal values containing a *periodic part* which repeats indefinitely. An example of the former is 47/3200 which converts to exactly 0.0146875. On the other hand, 18/2900 converts to 0.00(6206896551724137931034482758), with rounded parentheses being used to indicate the ever repeating periodic part.

An example "in the reverse direction" is 0.(142857) which converts to the fraction 1/7.

The Recurring Decimals capability can handle periodic parts containing thousands of digits. For example, 1/983 converts to:

0.(0010172939979654120040691759918616480162767039674465920651068158697863682604272
6347914547304170905391658189216683621566632756866734486266531027466937945066124109
8677517802644964394710071210579857578840284842319430315361139369277721261444557477
1108850457782299084435401831129196337741607324516785350966429298067141403865717192
2685656154628687690742624618514750762970498474059003051881993896236012207527975584
9440488301119023397761953204476093591047812817904374364191251271617497456765005086
4699898270600203458799593082400813835198372329603255340793489318413021363173957273
6520854526958290946083418107833163784333672431332655137334689725330620549338758901
3224821973550356052899287894201424211597151576805696846388606307222787385554425228
8911495422177009155645981688708036622583926754832146490335707019328585961342828077
3143438453713123092573753814852492370295015259409969481180061037639877924720244150
5595116988809766022380467955239064089521871820956256358087487283825025432349949135
3)

In this case, the periodic part contains 982 digits.

In some cases, lengthy processing times may occur and, if unacceptably long, may be terminated using the Ctrl+T keyboard key combination.

For further information on recurring decimals, see:

Scientific Calculator

The Scientific Calculator (<u>U</u>tilities > <u>S</u>cientific Calculator) is an easy-to-use stack based scientific calculator, as pioneered by the Hewlett-Packard family of scientific calculators. However, what makes it different is that the stack is visible and tool-tips are provided for the various buttons, making it simpler to learn and use.

The main features of the calculator include:

- Stack based operation with a visible stack

- Seven stack-independent memories

- Input via keyboard or by clicking on-screen buttons

- Precision of 15 decimal digits

- Decimal, binary, octal and hexadecimal arithmetic

- Squares, cubes and arbitrary powers

- Square roots, Nth. roots and reciprocals

- Natural logs, common logs and exponentials

- Trigonometric and inverse trigonometric functions

- Hyperbolic and inverse hyperbolic functions

- Integer and fractional parts

- Factorials, permutations and combinations

- Remainders on division

- Stack based operators such as negate, duplicate, swap, rotate, pop and clear stack

- Bit-by-bit logical operators - Not, And, Or, Xor, Imp and Eqv

- Conversion from rectangular to polar co-ordinates and vice-versa

- One-click entry of π and e to 15 decimal digits

- On-screen display of stack size

- Tool-tips for the various command buttons

Using the Scientific Calculator

Numbers may be input using the keyboard or by clicking on the appropriate on-screen buttons with a mouse, or by using a combination of both approaches. Results are displayed to a precision of 15 decimal digits.

While in data entry mode, the digits being entered appear in blue in the main display and may be edited using the keyboard "backspace" key or the equivalent on-screen button to the left of the "Enter" button. The keyboard "Enter" key or the equivalent on-screen "Enter" button may then be used to put the number entered on the top of the stack, at which point the colour of the number changes to black to confirm that it can no longer be edited.

With a stack based calculator, all numbers entered are stacked on top of each other, as may be easily seen by keying in:

    123
    Press "Enter" key
    78
    Press "Enter" key
    76
    Press "Enter" key

At this stage, the visible stack looks like:

    76
    78
    123

and the main display also shows the number at the top of the stack, namely 76.

To perform arithmetic and other more complex operations, the appropriate on-screen button is clicked. For example, to add the two numbers at the top of the stack, click the on-screen "+" button. Immediately, the numbers 76 and 78 are replaced on the stack by their sum, 154, and the main display updated accordingly.

Some operators, such as + - X and /, affect the top two items of the stack. Others, such as x^2, affect only the top of the stack. In the case of x^2, for example, the top of the stack is replaced by its square. Try:

    16
    Press "Enter" key
    Click "x^2" button

The top of the stack is now 256, the square of 16. Note that it was actually unnecessary to press the "Enter" key in the above sequence, since the various operators cause an implicit save to the stack prior to execution.

When a user attempts to perform an invalid operation, an appropriate error message in red is displayed. Try:

    1
    Press "Enter" key
    0
    Click "/" button

The error message:

    Denominator = 0 Error

is displayed, indicating an illegal attempt to divide by 0. To clear the error message, press the Escape key, click the "Pop" button or click the "Clear Stack" button, the latter emptying the stack completely.

Use of the Windows Clipboard

To copy any result **to** the Windows clipboard, simply left-click on it in the calculator's main display.

To copy **from** the Windows clipboard into the main display as input data, use the usual Ctrl+V command for pasting. Such clipboard input is appended at the right to any existing input data in this field which has not yet been stacked.

Calculator On-Screen Buttons

This section provides a summary of the actions performed by the various on-screen buttons in the calculator.

0, 1, 2, ... 9 Buttons

Used for entering the digits 0, 1, 2, ... 9. The keyboard may also be used for this purpose.

A, B, C, D, E, F Buttons

Used for entering the hexadecimal (base 16) digits A, B, C, D, E and F. Only activated when the "Hex" radio button has been selected (see later). The keyboard may also be used for this purpose.

Decimal Point Button

Used to enter a decimal point. It may also be entered via the keyboard.

In countries where a comma is used as the decimal point, the relevant scientific calculator data input button displays a comma. In addition in such countries, when entering numbers into the calculator via the keyboard, either the comma or full stop key may be used to input a decimal point.

Exponent E Button

Used to enter a power of 10. For example, entering:

      1.5E6

is equivalent to entering:

      1500000

since it represents 1.5 times 10 to the power 6.

An exponent E may also be entered from the keyboard.

CHS Button

Used to change the sign of the number being entered. However, if clicked immediately after the exponent "E" button, changes sign of the exponent.

Backspace Button

Located to the left of the "Enter" button. Has same effect as keyboard "Backspace" key during data entry.

Enter Button

Stacks number being entered. Colour of main display changes to black.

The keyboard "Enter" key may also be used.

Pi and e Buttons

Stack respectively the mathematical constants $\pi = 3.14159265358979$ and $e = 2.71828182845905$.

Arithmetic Operator Buttons + - * / and ^

Let x and y represent respectively the next-to-top and top-of-stack values. Then these buttons perform the following actions:

Button	Action
+	Remove x, y from stack; stack x+y
-	Remove x, y from stack; stack x-y
*	Remove x, y from stack; stack x*y
/	Remove x, y from stack; stack x/y
^	Remove x, y from stack; stack x^y

where x*y means "x multiplied by y" and x^y means "x raised to the power of y".

Function Buttons 1/x, Square Root, x^2, x^3 and 10^x

Let x represent the top-of stack value. Then these buttons perform the following actions:

Button	Action
1/x	Replace top-of-stack by 1/x
√	Replace top-of-stack by the square root of x
x^2	Replace top-of-stack by the square of x
x^3	Replace top-of-stack by the cube of x
10^x	Replace top-of-stack by 10 to the power x

Function Buttons Sin, Cos, Tan , Exp, Ln and Log10

Let x represent the top-of stack value. Then these buttons perform the following actions:

Button	Action
Sin	Replace top-of-stack by sin(x)
Cos	Replace top-of-stack by cos(x)
Tan	Replace top-of-stack by tan(x)
Exp	Replace top-of-stack by exp(x)
Ln	Replace top-of-stack by the natural logarithm of x
Log10	Replace top-of-stack by the base 10 logarithm of x

Note carefully that:

1. The "Rad" and "Deg" radio buttons determine whether the top-of-stack value x is interpreted as being in radians or degrees.

2. Click on the "Inv" button, then on the "Sin", "Cos" or "Tan" button, to evaluate the corresponding inverse trigonometric function. The "Rad" and "Deg" radio buttons determine whether the result is given in radians or degrees.

3. Click on the "Hyp" button, then on the "Sin", "Cos" or "Tan" button, to evaluate the corresponding hyperbolic function.

4. Click on the "Inv" button and on the "Hyp" button, then on the "Sin", "Cos" or "Tan" button, to evaluate the corresponding inverse hyperbolic function.

Max Button

Stacks the greatest positive value the calculator can handle. The value stacked depends on which number base radio button (Dec, Bin, Oct, or Hex) has been selected:

Number Base	Value Stacked
Decimal	1.79769313486232E+308
Binary	111111111111111111111111111111
Octal	17777777777
Hexadecimal	7FFFFFFF

The last three values are all equivalent to 2^31-1 = 2147483647.

Nth. Root Button

Let x and n represent respectively the next-to-top and top-of-stack values, where n is a positive integer greater than unity. Then clicking on the Nth. root button, N√, removes x and n from the stack and stacks the nth. root of x, i.e. x^(1/n). For example, if the top of the stack looks like:

> 5
> 32
> 3.89

then clicking on the "N√" button yields:

> 2
> 3.89

since the fifth root of 32 is 2.

n! Button

Replaces top of stack n by its factorial, defined by:

> n! = n*(n-1)*(n-2)*(n-3)* ...... 3*2*1, if n>0

> 0! = 1

n must be a non-negative integer no greater than 170.

As an example, key in 5 and click the n! button. The top of the stack becomes 120, because:

> 5! = 5*4*3*2*1
>   = 120

nPr and nCr Buttons

Let n and r represent respectively the next-to-top and top elements of the stack. Then the "nPr" button stacks the number of permutations of n items taken r at a time, and the "nCr" button stacks the number of combinations of n items taken r at a time. In both cases, the values of n and r are removed from the stack. r and n must also, of course, be non-negative integers.

Mathematically:

> nPr = n!/(n-r)!, if r<=n; 0, if r>n

> nCr = n!/(r!*(n-r)!), if r<=n; 0, if r>n

where n, r are non-negative integers.

By way of example, key in:

> 10
> Press "Enter" key
> 3
> Click "nPr" button

to produce 10!/7! = 10*9*8 = 720 on the top of the stack, and:

5
Press "Enter" key
3
Click "nCr" button

to produce 5!/(3!*2!) = 120/(6*2) = 10 on the top of the stack.

Int and Frac Buttons

Replace the top of the stack x by its integer and fractional parts respectively, where the integer part of a number x is defined to be "the greatest integer less than or equal to x", and the fractional part of x is defined to be:

x - integer part of x

As examples, key in:

13.6
Click "Int" button

to produce 13; key in:

13.6
Click "Frac" button

to produce 0.6; key in

13.6
Click "CHS" button
Click "Int" button

to produce -14, since the greatest integer less than or equal to -13.6 is -14; key in:

13.6
Click "CHS" button
Click "Frac" button

to produce 0.4, since -13.6 -(-14) = 0.4.

Mod Button

Let m and n be the next-to-top and top elements of the stack respectively. Then clicking the "Mod" button removes m and n from the stack and stacks the remainder on dividing m by n.

As an example. key in:

39
Press "Enter" key
9
Click "Mod" button

to produce 3 on the top of the stack, because the remainder on dividing 39 by 9 is 3.

Note that non-integer values of m and n are rounded to the nearest integer prior to performing the operation.

Neg, Swap, Rot, Dup, Pop and Clear Stack Buttons

These buttons all manipulate the stack in some fashion, namely:

Button	Effect on Stack
Neg	Changes sign of item at the top of the stack.
Swap	Interchanges the two items at the top of the stack.
Rot	Rotates the three items at the top of the stack by bringing the third item to the top and moving the first and second items down.
Dup	Duplicates the item at the top of the stack.
Pop	Removes the item at the top of the stack.
Clear Stack	Removes all items from the stack.

As mentioned earlier, the "Pop" or "Clear Stack" button may be clicked to remove any red error message from the main display. Alternatively press the Escape key.

R>P and P>R Buttons

Used to convert rectangular co-ordinates (x, y) to polar co-ordinates (r, θ) and vice-versa, where $x = r*\cos(\theta)$, $y = r*\sin(\theta)$.

For example, key in:

    4
    Press "Enter" key
    3
    Click "Deg" radio button
    Click "R>P" button

The top of the stack now looks like:

    36.869897645844
    5

since:

$$r = \sqrt{(4^2 + 3^2)} = 5$$

$$\theta = \tan^{-1}(3/4) = 36.86989 \ldots \text{ degrees.}$$

Dec, Bin, Oct and Hex Radio Buttons

Click one of these buttons to change the number base (10, 2, 8, 16) used for entering numbers and for showing the top of the stack in the main display. Try:

    Click "Dec" radio button
    45
    Press "Enter" key
    Click "Hex" radio button

to display 2D, the hexadecimal equivalent of 45 in base 10.

When working in base 2, 8 or 16, only integer values may be manipulated. Also, if the main display is showing the top of the stack in base 10 notation and one of the other number base buttons is clicked, the top of the stack is rounded to the nearest integer prior to redisplaying in the new number base. For example:

> Click "Dec" radio button
> Click "e" button
> Click "Bin" radio button

to produce 011, the binary equivalent of 3, obtained by rounding 2.718281828 ..... to the nearest integer. The reason for the superfluous 0 at the extreme left is explained below.

When working in base 2, 8 or 16, negative integers are displayed in "2's complement" form. To avoid confusion, when working in binary (base 2), a zero bit is shown at the extreme left of any positive number to distinguish it immediately from a "2's complement" negative value which always begins with a 1 bit. For example:

> Click "Dec" radio button
> 7
> Click "CHS" button
> Press "Enter" key
> Click "Bin" radio button

to produce 11111111111111111111111111001, the "2's complement" version of -7.

To verify this, key in:

> 111   (Note 7 in binary = 111)
> Click "+" button

to produce 0, as expected.

When working in base 2, 8 or 16, a number of function buttons become unavailable for obvious reasons. In addition, any results produced are, of course, integers.

When attempting to convert a decimal value, say to base 2, the calculator may display an error message because the converted value is out of range. If the error message is then cleared by "popping the stack", the calculator will remove items from the stack until it finds one which can be successfully converted. For example, key in:

> Click "Dec" radio button
> 79
> Press "Enter" key
> 54
> Press "Enter" key
> 1E100
> Press "Enter" key
> 1E200
> Press "Enter" key
> Click "Bin" radio button

to produce the error message:

> Number Out-of-Range Error

When the Escape key is pressed or the "Pop" button is clicked to remove the error message, both 1E200 and 1E100 are removed from the stack, being both out-of-range, leaving 54 and 79 on the stack and the main display showing the binary equivalent of 54.

Not, And, Or, Xor, Imp and Eqv Buttons

These buttons become operative in base 2, 8 or 16.

The Not operator changes every 0 bit in the top-of-stack value to 1, and every 1 bit to 0.

The other logical operators all perform a "bit by bit" comparisons of the top two stack values, to produce a result as follows.

And	Top-of-Stack	Next-to-Top	Resulting Bit
	0	0	0
	0	1	0
	1	0	0
	1	1	1

Or	Top-of-Stack	Next-to-Top	Resulting Bit
	0	0	0
	0	1	1
	1	0	1
	1	1	1

Xor	Top-of-Stack	Next-to-Top	Resulting Bit
	0	0	0
	0	1	1
	1	0	1
	1	1	0

Imp	Top-of-Stack	Next-to-Top	Resulting Bit
	0	0	1
	0	1	0
	1	0	1
	1	1	1

Eqv	Top-of-Stack	Next-to-Top	Resulting Bit
	0	0	1
	0	1	0
	1	0	0
	1	1	1

Using the Stack Independent Memories

The scientific calculator contains seven independent memory locations for storing values and seven related calculator buttons labelled M1, M2, M3, …………. M7. To put the contents of any memory location on the top of the stack, left-click the relevant M-button. For example, to stack the value in memory location 7, left-click the "M7" button.

Note that any unstacked input in the main display is automatically added to the stack before the contents of the memory location.

Save to Mem Command Button

To save a copy of the top-of-stack value to a memory location, firstly stack the number of the memory location, then left-click the "Save to Mem" button. For example, if the top-of-stack value is 23.7, to save a copy to memory location 5, key in:

5
Click "Save to Mem" button

Note that there is no need to explicitly stack the memory location number – it is implicitly done for you.

You can check that memory location 5 does indeed contain 23.7 by:

Click "Pop" button
Click "M5" button

Add to Mem Command Button

To add a copy of the top-of-stack value to the value in a memory location, firstly stack the number of the memory location, then left-click the "Add to Mem" button. For example, if the top-of-stack value is 91.7, to add 91.7 to the value in memory location 6, key in:

6
Click "Add to Mem" button

Again there is no need to explicitly stack the memory location number – it is implicitly done for you.

Clear Mem Command Button

To clear (set to zero) the value in a memory location, firstly stack the number of the memory location, then left-click the "Clear Mem" button. For example, to clear the value in memory location 2, key in:

2
Click "Clear Mem" button

Again there is no need to explicitly stack the memory location number – it is implicitly done for you.

Note that, when using any one of the three command buttons described above, the number of the memory location, either explicitly or implicitly stacked, is removed from the stack at the end of the operation.

Statistics Calculator

The Statistics Calculator (Utilities > Statistics Calculator) may be used to perform various statistical procedures on data. The current version contains procedures for the basic statistics of ungrouped data, the basic statistics of grouped data and several types of 2-variable regression (linear, logarithmic, exponential, power, quadratic). Depending on user feedback, other statistical procedures will be implemented in the future.

Data files must be in CSV (comma separated variable) format, although a comma should not be used as the data separator in countries where a comma is used as the decimal point. The default file extension is .sta. A simple Data Editor is provided for creating such files but any text editor, CSV file editor or spreadsheet program may be used. Various sample data files have been provided.

Using the Statistics Calculator is straightforward.

1. Open a correctly structured data file (see below for details). The contents of the file are immediately displayed. Various sample data files have been provided.

2. Select the variable(s) of interest by means of the two main drop-down combo boxes.

3. Optionally, plot the data using either of the menu commands Plot > Box Plot (Grouped Data), Plot > Box Plot (Ungrouped Data) or Plot > XY Plot. Any data plot created is automatically (a) copied to the Windows clipboard as a bitmap, and (b) stored as an image file, BoxPlot.bmp or DataPlot.bmp respectively, in the folder in which Calendar Magic is installed.

4. Select one of the available statistical procedures, for example linear regression (Regression > Linear Regression). The results from carrying out the statistical procedure are immediately displayed.

5. Optionally, in the case of running a regression calculation, plot the calculated regression line using the menu item Plot > Plot Regression Line. Any line plot created is automatically (a) copied to the Windows clipboard as a bitmap, and (b) stored as an image file, LinePlot.bmp, in the folder in which Calendar Magic is installed.

Data File Structure

Variable names may be any combination of letters (a to z, A to Z) and digits (0 to 9), and must begin with a letter.

All variable names and values must be separated by a *field separator* such as a colon, semicolon, hard Tab etc. The first data line must contain the names of the various data variables. Subsequent data lines must contain corresponding data values for these variables. This is a simple example.

X1;X2
9.13;12.23
15.28;16.85
19.11;23.54
24.52;29.62
30.97;33.19
35.33;40.07
39.48;42.68

In this case, the two variables are X1 and X2, and the file contains 7 pairs of values for X1 and X2. The field separator is a semicolon.

Almost any character may be used as the field separator other than a letter, digit or space character. However, the field separator and decimal point characters used must not be identical and a colon should not be used as the field separator if the data file contains time values (see below).

In order to support the input of data grouped into intervals, it is permissible to represent intervals using the "a to b" syntax shown in the following example:

X;F
1 to 20;16
21 to 40;19
41 to 60;21
61 to 80;16
81 to 100;6
101 to 140;7
141 to 180;10
181 to 220;2
221 to 260;3

Additional columns of data values must not occur in data files containing data grouped into intervals.

Similarly, in order to support the input of times, it is permissible to specify times in HH:MM:SS format as shown in the following example:

T; Val
3:23:47; 8.65
5:42:09; 9.14
8:05:07; 11.36
13:17:41; 16.98
17:05:35; 18.22

During input, such times are converted into decimal hours. Fairly obviously, if times occur in a data input file, the field separator must *not* be a colon.

Note also that when a data file is opened, its contents are displayed "as is" in the main text box on the Statistics Calculator form. However, behind the scenes, the decimal point character used in the file may be "fixed" so that, for example, a file created using a period as the decimal point character will be processed correctly in a country using a comma as the decimal point character.

Box Plots

The Box Plots produced by Calendar Magic are in line with those described in the following Wikipedia article:

http://en.wikipedia.org/wiki/Box_plot

"Mild" outliers are displayed as blue dots and "extreme" outliers are displayed as red dots.

Current Limits

Currently the number of data lines in any data file must not exceed 2000 and the number of variables must not exceed 10. These limits are easy to change if any user so requests.

Sun and Moon Data

The "Solar Chart" command button on the Sun and Moon Data form may be used to create a 1-year graphical plot of sunrise, solar noon and sunset times for any specified year and location. Any solar chart created is automatically (a) copied to the Windows clipboard as a bitmap, and (b) stored as an image in the file SolarChart.bmp in the folder in which Calendar Magic is installed.

Similarly the "Daylight Chart" command button on the Sun and Moon Data form may be used to create a 1-year graphical plot of numbers of daylight hours for any specified year and location. Any daylight chart created is automatically (a) copied to the Windows clipboard as a bitmap, and (b) stored as an image in the file DaylightChart.bmp in the folder in which Calendar Magic is installed.

The F11 key may be used, as per normal, to display an enlarged view of a solar or daylight chart. In line with the above paragraphs, the enlarged chart is automatically (a) copied to the Windows clipboard as a bitmap, and (b) stored as an image in the file SolarChart.bmp or DaylightChart.bmp, overwriting the smaller version.

To provide an easy way to add the dates of Moon phases to stored reminders, whenever the Sun and Moon Data utility is run with a date in "this year" or "next year", a text file newrems.txt is automatically generated containing moon phase date records of the form:

day, month, year, moon phase description

an example being

4, 1, 2009, First Quarter

The data in this file can then be added to your reminders by using the "Import reminders" utility (Reminders > Reminder Utilities).

It should be noted that the visual display of the current moon phase is *approximate* and can be in error by up to a day. However, accurate moon phase information is always available in the tabulated data.

Travelling Salesman Problem

Calendar Magic contains an implementation (Utilities > Travelling Salesman Problem) of an algorithm for solving the Travelling Salesman problem. The problem concerns a salesman who has to visit a number of cities/towns by air and who is keen to minimise the total distance travelled.

The algorithm used is called "simulated annealing" and is based on the approach "nature uses" when a metal anneals or when a crystal forms. It was described by Shawn Carlson in the March, 1997 issue of Scientific American.

Data files must be in CSV (comma separated variable) format. The default file extension is .tsp. A simple Data Editor is provided for creating such files but any text editor, CSV file editor or spreadsheet program may be used. Several sample data files have been provided.

Using this utility is straightforward.

1. Open a correctly structured data file (see below for details). The contents of the file are immediately displayed.

2. Choose the type of calculation you wish performed. The utility will then calculate a near-optimal path and display the results. Of particular interest is the table listing the order in which the locations should be visited and the various location-to-location distances in kilometres.

Types of Calculation

Three types of calculation are available.

1. **Closed Path** – the calculated route must return finally to the first location listed in the file.

2. **Open Path (Fixed end points)** – the calculated route must start at the first location listed and finish at the last location listed.

3. **Open Path (No fixed end points)** – the calculated route may start at any location and end at any other location.

Data Editor

Using the Data Editor you can select the locations the salesman is to visit from the 8000 locations in Calendar Magic's world-wide locations database. To choose a location, first choose the country, left-click any location available in that country and press the Add button. To choose multiple locations, hold down the Ctrl key or Shift key while left-clicking and then press the Add button.

Alternatively, you can load the contents of an existing tsp file via the Load button. You can also combine both approaches, additional locations being appended to those already listed in the "Chosen locations" text-box. You must choose at least 10 locations from one or more countries.

Each line in the "Chosen locations" text-box has the format:

        <location name>,<country name>,<latitude>,<longitude>

You may edit this text-box to remove any locations chosen in error, or to move a location to the beginning or end of the list. A "decimal point" and not a "decimal comma" must be used in latitude and longitude values for fairly obvious reasons.

Once you are satisfied with your list of chosen locations, click the Save button to save your list to a text file. The standard Windows dialogue is used for naming and saving such files with the extension .tsp. Finally, use the Previous Screen button to return to the Travelling Salesman Problem form.

Recalculating a Route

The simulated annealing algorithm does not guarantee finding the absolute minimum route length although it typically produces a result which is very close to it. If you would like to rerun the simulation, simply choose the same type of calculation again. The random number sequences generated by the program code during the course of each simulation can lead to slightly different results.

Unit Converter

The Unit Converter (Utilities > Unit Converter) may be used to convert among 1718 units of measurement in 82 different categories including length, area, volume, mass, temperature, time, velocity, energy, power, pressure, computer storage etc. A complete list of the 82 categories of units is given later in this file and additional categories and units can be easily added on request.

The Unit Converter has been designed to be extremely easy to use:

1. Choose a category of units (e.g. area or temperature) from a drop-down list.

2. Choose the unit to be "converted from" from a drop-down list.

3. Enter the amount to be converted.

4. Press the "Convert" button to convert the amount into every other unit in the category selected.

Hint – to avoid tedious scrolling to near the end of any drop-down list, display the drop-down list, key in the first one or two letters of the desired category or unit, then select it.

A detailed print-out of any conversion is available at the press of a button and results may be copied via the clipboard to other programs using the familiar Ctrl+C (to copy) and Ctrl+V (to paste) mechanisms.

The amount specified may be a simple arithmetic expression using not more than one of the arithmetic operators + - * / and ^ representing respectively addition, subtraction, multiplication, division and raising to a power. Examples are 5 * 23.79, 2.57 / 2 and 2 ^ 0.5. The space characters on either side of an arithmetic operator are optional.

Note that the conversion factors used by the Unit Converter have been input using 15 significant digits where known although, of course, the values of many factors are not known with this degree of precision. As with an electronic calculator, discretion must be exercised when interpreting results given to many significant figures. They may, or may not, be meaningful. For example, if a value being converted is only known to 4 significant figures, there is no sense quoting results to more than 4 significant figures.

Note also that the definitions of computer storage units are in conformance with an International Electrotechnical Commission (IEC) standard. According to this standard, the prefixes kilo, mega, giga, tera, peta and exa are to be used for powers of 1000, whereas the new prefixes kibi, mebi, gibi, tebi, pebi and exbi are to be used for powers of 1024. Thus, for example, 1 megabyte = 1000000 bytes and 1 mebibyte = 1048576 bytes. The Unit Converter handles both.

For further information, see http://physics.nist.gov/cuu/Units/binary.html.

Categories of Units

As mentioned earlier, the Unit Converter handles 82 different categories of units. These are as follows:

Acceleration	Luminous Flux
Amount Concentration	Luminous Intensity
Amount of Substance	Magnetic Field Strength
Angular Acceleration	Magnetic Flux
Angular Momentum	Magnetic Flux Density
Angular Velocity	Magnetomotive Force
Area	Mass (or Weight)
Area - Second Moment of	Mass Density
Computer Storage	Mass Linear Density
Cost per Area	Miscellaneous Amounts
Cost per Length	Moment of Inertia
Cost per Mass	Momentum
Cost per Volume	Old British Currency
Coverage - Area per Mass	Plane Angle
Coverage - Area per Volume	Power
Coverage - Mass per Area	Pressure and Stress
Coverage - Volume per Area	Radiation Absorbed Dose
Electric Capacitance	Radiation Activity
Electric Charge	Radiation Equivalent Dose
Electric Conductance	Roman Numerals
Electric Current	Sheets of Paper
Electric Dipole Moment	Solid Angle
Electric Field Strength	Specific Energy by Mass
Electric Inductance	Specific Energy by Volume
Electric Potential	Specific Heat Capacity by Mass
Electric Resistance	Specific Heat Capacity by Volume
Energy and Work	Specific Volume
Energy Density	Surface Tension
Euro Currencies	Telecommunications Traffic
Flow Rate by Mass	Temperature
Flow Rate by Volume	Thermal Conductance
Force	Thermal Conductivity
Frequency	Time
Fuel Consumption by Distance	Torque
Fuel Consumption by Volume	Velocity (or Speed)
Heat Flux Density	Viscosity - Dynamic
Heat Transmission	Viscosity – Kinematic
Illumination	Volume
Irradiance	Wavelength and Frequency
Length and Distance	Wine Bottles
Luminance	Yarn Density

Notation and Abbreviations Used

To simplify the entry of very large or very small amounts, exponential or "E notation" may be used to represent powers of 10. For example, 2E6, representing 2 times 10 to the power 6, may be entered rather than 2000000. Other examples are:

2.345678E5	representing	234567.8
123.9E6	representing	123900000
1.4E-4	representing	0.00014
1E-6	representing	0.000001

If you feel uncomfortable with "E notation", it does not have to be used. However, you will sometimes see results displayed in the same notation, when very large or small numbers are involved.

Amounts to be converted should normally be entered as positive numbers. The one exception to this rule occurs with temperature conversions, where negative values may, of course, be entered.

In the drop-down lists for units, the symbol ^ is often used. By way of explanation, Yards^2, for example, represents "yards squared" or "square yards". Similarly Metres^3/second represents "cubic metres per second" etc..

Other abbreviations you may encounter include:

A	Ampere
BTU	British Thermal Unit
C	Celsius (Centigrade)
F	Fahrenheit
IT	International Table
kg	Kilogram
m	Metre
s	Second
th	Thermochemical
UK	United Kingdom
US	United States

In cases where the word "calorie" or "calories" is not qualified further, International Table (IT) calories should be assumed.

Personalising the Unit Converter Database

You can create your own personal unit converter database. Initially this personal database is identical to Calendar Magic's unit converter database but two command buttons have been provided to add, delete and update categories and units in your personal database. Option buttons have also been provided to switch between using Calendar Magic's unit converter database and any personal version.

The "Add Categories and Units" button enables you to add new categories and units to your personal unit converter database. To add a new category, left-click the "New category" option button and then specify the name of the new category and the name of its base unit – the fundamental unit in the new category used to define all other units in the category. For example, if you were defining a new category "Time", you could define its base unit to be "Seconds" and then define other units of time in seconds.

Note that, for any new category added, all the units in the category must be expressible as simple numerical multiples of its base unit. The use of more complex inter-unit relationships is not supported.

To add a new unit, left-click the "New unit" option button, choose its category, enter the name of the new unit, and then enter the numerical "factor" which defines it in terms of the category base unit. Thus, continuing the above example, you could define a new unit "Minutes" with a numerical factor of 60, since the number of seconds in a minute is 60.

The names of new categories, units and base units are restricted to a maximum of 30 characters. Also numerical factors may be specified with a precision of up to 15 digits.

The "Edit Categories and Units" button supports the editing and deletion of existing categories and units in your personal database. The four option buttons near the top of the "Edit Categories and Units" screen enable you to specify one of four updates, namely "edit unit", "edit category", "delete unit" and "delete category". For example, if you choose to edit a unit, select that option, then choose the category, then the unit you wish to edit, and then make any desired changes to the unit name and its numerical factor. Finally left-click the "Save Edited Unit" button.

Eagle eyed users may spot the absence of the categories "Roman Numerals", "Speed", "Temperature", "Wavelength and Frequency" and "Weight" from category drop-down lists in both the "Add Categories and Units" and "Edit Categories and Units" screens. Conversions associated with these categories are handled by special code in Calendar Magic, preventing any personalisation from being possible.

A "Show Statistics" command button is also provided in the Unit Converter to display unit converter statistics for the currently selected unit converter database.

The last category and unit selected for either unit converter database are "sticky values".

To back-up your personal unit converter database, make a copy of the files mycategory.dat, myconvert.dat and myunit.dat.

Note that any new release of Calendar Magic may contain additions and changes to Calendar Magic's unit converter database. When the new release is installed, these additions and changes are *not* automatically applied to any personal unit converter database.

Automating the Update Process

Rather than making the updates to your personal unit converter database one-by-one and manually, you may automate the process by creating a database update file myconvdata.dat. This is a *plain text* file with the following structure.

Six types of records are supported and the first field in any record indicates the type of update to be performed. Valid first field values in records are AC, AU, EC, EU, DC and DU, where:

    AC = "Add Category"
    AU = "Add Unit"
    EC = "Edit Category"
    EU = "Edit Unit"
    DC = "Delete Category"
    DU = "Delete Unit"

The six record formats are:

    AC, category name, base unit name

    AU, category name, unit name, factor

    EC, old category name, new category name

    EU, category name, old unit name, new unit name, new factor

    DC, category name

    DU, category name, unit name

As a simple example of an update file, consider:

    AC,Old British Currency,Pence
    AU,Old British Currency,Shillings,12
    AU,Old British Currency,Pounds,240

AU,Old British Currency,Florins,24
AU,Old British Currency,Crowns,60
AU,Old British Currency,Half-crowns,30
AU,Old British Currency,Farthings,0.25
AU,Old British Currency,Halfpence,0.5
AU,Old British Currency,Guineas,252

This defines a new category "Old British Currency" with a base unit "Pence" and eight other old British currency units – shillings, pounds, florins, crowns, half-crowns, farthings, halfpence and guineas.

To apply the updates, defined in the file myconvdata.dat, to an existing personal unit converter database:

1. Click the "Add from File" button on the Add Categories and Units screen to process any line in the file with first field AC or AU. If a category or unit already exists in the personal unit converter database, the corresponding line in the file is simply ignored.

2. Click the "Edit from File" button on the Edit Categories and Units screen to process any line in the file with first field EC, EU, DC or DU.

To improve readability, blank lines in the file myconvdata.dat are ignored, as are comment lines beginning with the character ">".

As mentioned in the previous section, any new release of Calendar Magic may contain additions and changes to Calendar Magic's unit converter database. When the new release is installed, these additions and changes are *not* automatically applied to any personal unit converter database. To circumvent this problem using a myconvdata.dat file:

1. Before installing a new version of Calendar Magic, back up and then delete your personal unit converter database files (mycategory.dat, myconvert.dat and myunit.dat) from the folder in which you installed Calendar Magic.

2. Install the new version. The installation process creates a new personal unit converter database identical to Calendar Magic's unit converter database.

3. Use the "Add from File" and "Edit from File" buttons, as described above, to re-apply your updates.

Calendar Ranges and Other Factors

Calendar Magic is designed to handle Gregorian calendar dates from October 15, 1582 to December 31, 9999 and can produce:

1. Afghan calendars for Afghan years 1 to 9377

2. Armenian calendars for Armenian years 1 to 9453

3. Baha'i calendars for Baha'i years 1 to 8155 B.E.

4. Balinese Saka calendars for Balinese Saka years 1737 to 9920.

5. Bangla calendars for Bangla years 1374 to 9405 B.S.

6. Chinese calendars from cycle 72, year 22 to cycle 94, year 57 (1645 to 3000 Gregorian)

7. Coptic calendars for Coptic years 1 to 9715 A.M.

8. Egyptian calendars for Egyptian years 755 to 10753

9. Ethiopic calendars for Ethiopic years 1 to 9991 E.E.

10. French Revolutionary calendars for French Revolutionary years 1 to 14

11. Hebrew calendars for Hebrew years 3768 through 13759 A.M.

12. Hindu lunisolar calendars for Hindu years 64 to 10055 V.E.

13. Hindu solar calendars for Hindu years 1 to 9920 S.E.

14. Indian National calendars for Indian National years 1879 to 9920 S.E.

15. Islamic arithmetical calendars for Islamic years 1 through 9665 A.H.

16. Islamic Umm al-Qura calendars for Islamic years 1356 through 1500 A.H.

17. Julian calendars for Julian years 7 through 9999 C.E.

18. Revised Julian calendars from 1924 to 9999 C.E.

19. Parsi Fasli calendars for Parsi Fasli years 1276 to 9368

20. Parsi Kadmi calendars for Parsi Kadmi years 500 to 9373

21. Parsi Shenshai calendars for Parsi Shenshai years 500 to 9373

22. Persian Arithmetic calendars for Persian years 1 to 9377 A.P.

23. Persian Astronomical calendars for Persian years 1 to 2500 A.P.

24. Sikh Nanakshahi calendars for Sikh Nanakshahi years 531 to 8530

25. Vietnamese calendars from cycle 72, year 22 to cycle 94, year 57 (1645 to 3000 Gregorian)

The selection of Observed Days, however, is only produced for Gregorian years in the range 1990 to 3000, because of the dangers of producing such information for years over a wider range. The dates of observed days in any year should also be treated with some caution. For example, a reference source may state that a particular observed day always occurs on March 4, but what happens if March 4 falls on a Sunday? Depending on the observed day and the country, it may be (a) allowed to take place on the Sunday, (b) changed to Monday that year, (c) left to occur on the Sunday but an

additional holiday granted on the Monday etc. Reference sources are often unclear on such situations and indeed, in some cases, ad hoc decisions may be taken at a government level.

With regard to Islamic arithmetical calendars, you may choose via Options > General from four different leap year schemes and one of two calendar epochs, Thursday, July 15, 622 and Friday, July 16, 622 (Julian). As a result, eight variants of the Islamic arithmetical calendar are supported. The most popular variant (the default in Calendar Magic) uses the second leap year scheme from the drop-down list and the "Friday epoch". For further information, see:

http:\\www.phys.uu.nl\~vgent\islam\islam_tabcal.htm

Note that the "arithmetical" Islamic calendars calculated in Calendar Magic may vary slightly from the "religious" Islamic calendars in various countries. In practice, there is no complete consensus among Islamic countries, religious leaders and scientists with regard to how the Islamic calendar should be defined.

Variations of the Hindu lunisolar calendar also exist, so that Hindu lunisolar calendars produced by Calendar Magic may not be in total agreement with those from other sources. The three Hindu lunisolar variants in Calendar Magic are identical except that the start of a new year in each calendar occurs at a different point. In the North Indian version (Hindu lunisolar Chaitra), a new year begins at the start of the month Chaitra; in the Saurashtra version (Hindu lunisolar Ashada), a new year begins at the start of the month Ashada; in the Gujarat version (Hindu lunisolar Kartika), a new year begins at the start of the month Kartika.

In the case of the Mayan calendar, there is some disagreement about when the current long count began. Calendar Magic uses as a default the Goodman-Martinez-Thompson correlation constant 584283 which corresponds to September 6, 3114 BC (Julian), but an option is provided to specify an alternative constant. Also, in converting dates in other calendar systems to Mayan long count format, Calendar Magic does not reset to 0 the number of baktuns (periods of 144000 days) at the end of the current great cycle although, according to the Mayans, the world is destroyed and then recreated with the beginning of a new great cycle!

In the case of date conversions to the Aztec Tonalpohualli and Xiuhpohualli calendars, the implementation and naming conventions used in Calendar Magic are in line with the Aztec calendar description and calculator at http://www.azteccalendar.com/. For example, the following names and name order are used for Xiuhpohualli months.

1   Izcalli
2   Cuauhuitlehua
3   Tlacaxipehualiztli
4   Tozoztontli
5   Hueitozoztli
6   Toxcatl
7   Etzcualiztli
8   Tecuilhuitontli
9   Hueitecuilhuitl
10 Tlaxochimaco
11 Xocolhuetzi
12 Ochpaniztli
13 Teotleco
14 Tepeilhuitl
15 Quecholli
16 Panquetzaliztli
17 Atemoztli
18 Tititl
19 Nenmontemi

Conversion from and to French Revolutionary calendar dates is only supported for dates in the first 14 years of the French Revolutionary calendar. The epoch of this calendar system is Sept. 22, 1792 (Gregorian). It began being used in Oct. 10, 1793 (Gregorian) and it's use essentially ceased after Dec. 31, 1805 (Gregorian).To extend the French Revolutionary calendar forward beyond its first 14 years is non-trivial because two different versions would have to be provided, one of which is complex. The important requirement is for researchers, librarians and others to be able to convert French Revolutionary calendar dates in the period in which it was actually used in France.

With regard to the signs of the Zodiac, different reference sources provide slightly different versions of the starting and ending dates for the periods covered by the various signs. For example, one reference source may state that the period covered by Taurus starts on April 20 and another may indicate April 21. As a result, Calendar Magic provides alternatives in these borderline situations.

In "This is Your Life", the Chinese year in which you were born (Rooster, Dog, Pig etc.) is calculated from the (Gregorian) date of the Chinese New Year in your year of birth. There is an older Chinese tradition of calculating it from the date of Li Chun (start of Spring). The date of Li Chun for any Gregorian year is given in the list of Observed Days for China. My thanks to Peng Foong for this information.

The Buddhist festivals and dates listed are based on fixed dates in the Chinese lunisolar calendar. However, Buddhist festivals and dates vary from country to country and between different branches of the Buddhist faith, with local lunar calendar systems often being used. The information must therefore be treated with considerable caution.

Explanation of Some Terms

Chinese Age

In China, a person has an age of 1 at birth, and his/her age increases by 1 each Chinese New Year.

Countdown to Equinoctial Planetary Alignment (CEP)

A countdown in days to/from March 20, 2675 (Gregorian). For the significance of this date see:

> http://www.calendersign.ric.at/en/calendar-science/cep-pec/

Delta-T

The difference between dynamical time and universal time (see below).

Dionysian Easter Period

A cycle of 532 years related to the 19-year lunar and 28-year solar cycles (see below), the period after which Easter Sunday dates repeat in the Julian calendar. For example, 1672 was the first year of a new Dionysian cycle, and of new 19-year lunar and 28-year solar cycles.

Dominical Letter(s)

The Dominical Letter for a year is A if the first of the year is a Sunday, B if the second of the year is a Sunday etc. A leap year has two Dominical Letters, the first calculated as just described, the second being the preceding letter (with G "preceding" A).

Dynamical Time (TD)

A uniform time scale used by astronomers to support accurate calculations. Defined by atomic clocks. See also Universal Time below.

Epact

The approximate age of the Moon at the start of a year and important historically in connection with the calculation of the date of Easter. The value of Epact is an integer in the range 1 to 30.

Fibonacci Numbers

F_0, F_1, F_2, F_3, ….. defined by:

> $F_0 = 0$
>
> $F_1 = 1$
>
> $F_n = F_{n-1} + F_{n-2}$, n>=2

For further information see:

> http://mathworld.wolfram.com/FibonacciNumber.html

Golden Number (G)

The Golden Number for a year indicates its position within the 19-year Metonic (lunar) cycle. This is the period after which the phases of the Moon repeat (approximately) on the same calendar dates.

GPS Week Number

The GPS Week Number is one of the system parameters transmitted by Global Positioning System (GPS) satellites and is a count of the number of weeks (starting at 0) from January 6, 1980 up to a specified date. The count "rolls over" to 0 and starts again every 1024 weeks, i.e. the count cycles through the values 0, 1, 2, 3, 4, ... 1023 repeatedly.

Highest Common Factor (HCF)

The Highest Common Factor (HCF) of two or more positive integers is the largest number which will divide exactly into all the integers. For example, the HCF of 14, 35 and 91 is 7.

The term Greatest Common Divisor (GCD) is sometimes used as an alternative.

Julian Day, Modified Julian Day, Lilian Day and Rata Die Numbers

The Julian Day (JD) number for a given date is the number of days which have elapsed since January 1 of the year 4713 BC (Julian calendar). Since this number is rather large, astronomers often use the Modified Julian Day (MJD) number defined by MJD = JD – 2400000.5. Note that Julian days are measured from noon and modified Julian days from midnight.

A Julian Day value may also be displayed continuously as a decimal number with the part after the decimal point indicating the fraction of the day which has elapsed since noon UT (Universal Time). It is displayed in this manner on the main Calendar Magic screen.

The Lilian Day number for a given Gregorian date counts the number of days from the start of the Gregorian calendar. Thus October 15, 1582 has Lilian Day number 1 etc..

The Rata Die (RD) number for a given Gregorian date counts the number of days from the start of a Gregorian calendar extended backwards to January 1 of the year 1. Thus January 1 of the year 1 has RD number 1 etc. See Calendrical Calculations by Dershowitz and Reingold, Cambridge University Press, 2001.

Julian Period

A cycle of 7980 years devised by the mathematician Scaliger in the sixteenth century by taking the product of the three G, I and S cycle values (19x15x28 = 7980). For its starting point, Scaliger picked the last year in which the values of G, I and S were all equal to 1, namely 4713 BC. The next time these values will all return to 1 is therefore -4712 + 7980 = 3268. Try using the Date Conversions menu item (Dates > Date Conversions) with 1/1/3268 and look at the values of G, I and S and the Julian Period.

Least Common Multiple (LCM)

The Least Common Multiple (LCM) of two or more positive integers is the smallest number which is exactly divisible by all the integers. For example, the LCM of 15, 24 and 60 is 120.

Lucas Numbers

L_1, L_2, L_3, L_4 ….. defined by:

$$L_1 = 1$$

$$L_2 = 3$$

$$L_n = L_{n-1} + L_{n-2}, n >= 3$$

For further information see:

http://mathworld.wolfram.com/LucasNumber.html

Ordinal Date Format

YYYY-DDD or YYYYDDD where YYYY indicates a year and DDD a day in that year, with the days being numbered 001, 002, 003, … , 365 (366 in leap years). For example, February 3, 2008 in ordinal date format is 2008-034 or 2008034.

Roman Indiction (I)

This value indicates the position of a year within an ancient Roman 15-year tax cycle.

Solar Number (S)

This value indicates the position of a year within the 28-year solar cycle. This is the period after which week days and calendar dates repeat in the Julian calendar.

Universal Time (UT)

Essentially what used to be called Greenwich Mean Time. Based on the rotation of the Earth and therefore non-uniform, making it unsuitable for accurate astronomical calculations. See also Dynamical Time above.

Links to Historic Documents and Articles

The following links may be of interest to those interested in the history of calendars and dates. The various texts are in English unless indicated otherwise.

1582 Calendar Reform (in Latin)

http://personal.ecu.edu/mccartyr/inter-grav-text.html

1582 Calendar Reform

http://personal.ecu.edu/MCCARTYR/intGrvEng.html

Gregorian Calendar (in German)

http://de.wikipedia.org/wiki/Gregorianischer_Kalender

Gregorian Calendar Introduction

http://www.ortelius.de/kalender/greg_en.php

British 1750 Calendar Act

http://www.statutelaw.gov.uk/content.aspx?ActiveTextDocId=1516754

http://en.wikipedia.org/wiki/Calendar_(New_Style)_Act_1750

http://findarticles.com/p/articles/mi_m2279/is_n149/ai_17782422

"New" Julian Calendar

http://www.ortelius.de/kalender/grref_en.php

Old Style and New Style Dates

http://www.cree.ie/genuki/dates.htm

Danish 1699 Act (in Danish)

http://www.kb.dk/tekster/almanak/2.html

French Revolutionary Calendar Legislation (in French)

http://www.webexhibits.org/calendars/calendar-french-law.html

Acknowledgements

Calendar Magic has benefited greatly from the involvement of Dave Gordon and Kaj Nielsen as beta testers "par excellence". Their attention to detail in scrutinising and testing enhancements has improved the quality of new releases enormously. Kaj has also suggested many of the new features implemented in recent versions.

Credit is also due to New Zealander Tony Cooper who fine tuned and optimised much of the code used by the Big Numbers Calculator.

The Factor Calculator in Calendar Magic uses impressively fast code from Shamus Software (http://www.shamus.ie) for finding the prime factors of integers. My thanks to Mike Scott for granting permission to use this code and for providing a special version.

The Big Numbers Calculator uses Steve Pagliarulo's super-fast QuickPi program for calculating pi, e and phi. My thanks to Steve for making this possible.

Also thanks to Info_ZIP (http://www.info-zip.org/) for their portable and compact unzip.exe program, used for unzipping downloaded ECB currency exchange rate data.

The generation of weekly Torah readings is based on the Parasha Calendar algorithm and tables described on Alan Corré's web site at http://www.uwm.edu/~corre/ while using the transliterated Torah reading names found at http://www.jewfaq.org/readings.htm.

Many other users have also contributed to the success of Calendar Magic through comments and suggestions for improvements and enhancements, including Benny Tiefenbrunner and Robert van Gent. Robert also provided the astronomical data for the implementation of the Islamic Umm al-Qura calendar.

Various reference sources have been consulted during the development of Calendar Magic. Two, in particular, have been of enormous help. These are:

1. The awesome text-book "Calendrical Calculations", written by Reingold & Dershowitz and published by Cambridge University Press (ISBN 978-0-521-70238-6 paperback).

2. Russ Rowlett's Dictionary of Units of Measurement at

    http://www.unc.edu/~rowlett/units/index.html

    The coverage of both current and historical units of measurement provided by this dictionary is extraordinarily comprehensive.

Other sources of information include:

1. Claus Tøndering's "Frequently Asked Questions about Calendars":

    http://www.tondering.dk/claus/calendar.html

2. Robert van Gent's coverage of Islamic calendars:

    http://www.phys.uu.nl/~vgent/islam/islam_tabcal.htm

    http://www.phys.uu.nl/~vgent/islam/ummalqura.htm

    http://www.phys.uu.nl/~vgent/islam/islam_lunvis.htm

3. Robert Wilson's paper on regular star polygons:

    http://www.sonoma.edu/users/w/wilsonst/Papers/Stars/default.html

4. Eric Weisstein's World of Mathematics:

   http://mathworld.wolfram.com/

5. Sikh World UK:

   http://www.sikhworld.co.uk/page19.html

6. Delta-T:

   http://sunearth.gsfc.nasa.gov/eclipse/SEcat5/deltatpoly.html

   http://sunearth.gsfc.nasa.gov/eclipse/SEhelp/deltaT.html

   http://sunearth.gsfc.nasa.gov/eclipse/phase/phasecat.html

7. Biorhythms:

   http://www.beamtech.de/biorhythm/

8. Buddhist festivals:

   http://www.geocities.com/sidneysee/festivals1.htm

Jordan Russell's (http://www.jrsoftware.org/) excellent software installer, Inno Setup, is a pleasure to use, as is pdfFactory Pro from FinePrint (http://www.fineprint.com/). More recently, VBGold's (http://www.vbgold.com/) Smart Print control has been used to provide enhanced printing capabilities.

Credit should also be given to Curtis Clark for his Moon Phases TTF font.

Version History

The history of enhancements, changes and bug fixes to Calendar Magic is stored in a separate PDF file history.pdf.