allRPN Calc

Acorn Aircraft **acornaircraft@me.com** http://web.mac.com/acornaircraft/AcornAircraftSite/Acorn_Aircraft.html

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Display

The top numeric line shows the contents of the y register. The lower numeric line shows the x register. The **Green** annunciators show the current calculator settings.

To change the settings:
•touch angle mode annunciator to change between **rad**, **deg**, **grad**
•touch display mode annunciator once followed by 0-9 to change the number of digits to right of decimal point
•touch display mode annunciator twice to alternate between **fix**, **fract**, **sci** or **eng**
•touch **Math**, **Trig**, **Stat**, **Conv**, **Prog, Fin** to change the upper 3 rows of keys on the keyboard

The top right line of the display always shows the last operation performed.

Automatic Memory Stack

The calculator features an automatic memory stack for performing all calculations. It consists of 4 memory registers that operate together.

t top of stack
z
y top line of calculator display
x bottom line of calculator display

The **x** register shows the result of the last operation.

Basic Operations

The calculator uses reverse polish notation for it's operating logic. You key in the numbers to be operated on followed by the operator.

To use any one-number function:
1) Key in the number
2) Touch the function key

For example to calculate log(9):

touch **9**
touch **log**

To use any two-number function:
1) Key in the first number
2) Touch ENTER
3) Key in the second number
4) Touch the function key

For example to calculate 4 + 2:
touch **4**
touch **ENTER**
touch **2**
touch **+**

Clearing
To clear the x register, touch the CLx key.

Number Entry
Key in numbers by touching the number keys in sequence. The decimal point must be keyed if it is part of the number. Correct touching errors with the back arrow key (CLx←).

example: to key 1.23, touch **1 . 2 3**

Negative Numbers
To key in a negative number, touch the keys for the number, then touch the **+/-** key.

example: to key -34.6, touch **3 4 . 6 +/-**

Large Numbers
Large numbers can be entered using **E** to key in an exponent. To key in a negative exponent, first touch **E** then the **+/-** key.

example: to key 2e-45, touch **2 E +/- 4 5**

Fractions
To key in a fraction, the parts of the fraction are separated by touching the decimal point.

example: to key 1 3/4, touch **1 . 3 . 4**

Number Display

The x and y register are displayed according to the current display mode selected. Display modes do not alter the underlying precision of the registers.

Fix Fix display shows a number with a fixed decimal position. You can specify from 0 to 9 digits to be displayed to the right of the decimal point. If you select 9, all available digits will be displayed. The last digit on the right is the rounded result of the underlying number. Numbers larger than what will fit in the Fix format are automatically displayed in Sci format.

Sci Scientific display shows a number with a leading significant digit followed by a decimal point and some number of additional digits raised to a power of 10.

Eng Engineering display is similar to Scientific, but the exponent is always divisible by 3 and the decimal point floats as needed.

Fract Fract display shows numbers as fractions. The display of fractions can be controlled using settings described below.

Errors

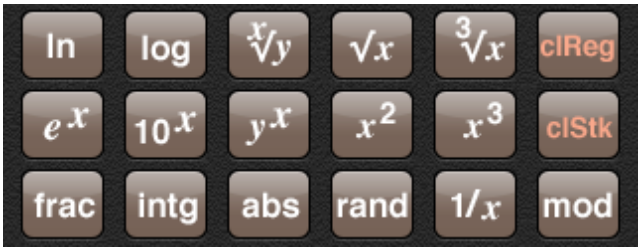
Various operations can result in an error. These are displayed as:

nan not a number *example: log(-1)*
inf infinity *example:1/0*
? number too large for word size

Main Keyboard Functions

ENTER stores new value in x register, raises stack
CLx← clears x register, edits during number entry
+/- changes sign of x
. decimal point, type a.b.c for the fraction a b/c
x<>y swaps x and y registers
R↓ roll down, moves y to x, z to y, t to z, x to t
LSTx returns value of x prior to last operation
STO store x in a register **0**-**9** or **.0**-**.9**
example: **STO4**, **STO.8**
+,-,x,÷ for register arithmetic
example: **STO+3**, **STO-.2**
RCL recall a register to x
example: **RCL4**, **RCL.5**

Math Functions



ln natural log for x > 0
log logarithm base 10 for x > 0
x√y x root of y (if y < 0 x must be an odd integer)
√x square root of x for x ≥ 0
3√x cube root of x
e^x natural antilog
10^x base 10 antilog
y^x y raised to x (if y < 0 x must be integer ≥ 0)
x² x squared
x³ x cubed
1/x reciprocal (x ≠ 0)
frac fractional part of x

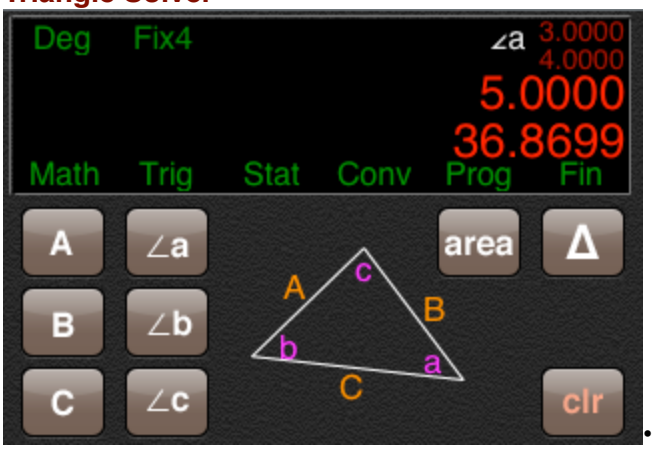
intg	integer part of x
abs	|x| absolute value
rand	random value 0 ≤ x < 1
STO rand	stores seed for random sequence
mod	remainder of y / x
clReg	clears storage registers 0-9, .0-.9
clStk	clears x,y,z,t

Trig Functions

sin	sin(x)
cos	cos(x)
tan	tan(x)
sin-1	arc sin(x) for |x| ≤ 1
cos-1	arc cos(x) for |x| ≤ 1
tan-1	arc tan(x)
Hyp	prefix for hyperbolic functions
→rad	convert x from degrees to radians
→deg	convert x from radians to degrees
→R	convert x,y from rectangular to polar
→P	convert x,y from polar to rectangular
→H	convert x to decimal hours
→Hms	convert x to H.mmss
→Hms+	y + x where x,y are in H.mmss
→Hms-	y - x where x,y are in H.mmss
π/2	constant Pi/2
π	constant Pi
Δabc	triangle solver *(see below)*

note: arguments and results of trig functions are in radians, degrees or grads depending on the setting of the angle annunciator in the display. Touch the annunciator to change the angle mode.

Triangle Solver



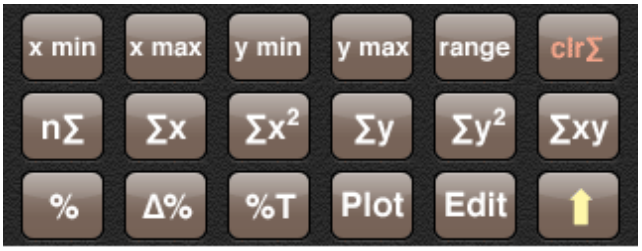
Start by pressing **clr**

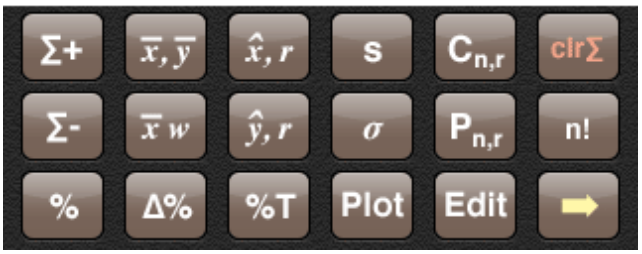
- Enter any 3 components of triangle by touching **A**,**B**,**C** or ∠**a**, ∠**b**, ∠**c**
- At least 1 entry must be a side A,B,C
- angles must conform to 0 < angle < 180°
- sum of angles entered must be less than 180°
- After 3 components are entered others are computed.
- Touch **A**,**B**,**C** or ∠**a**, ∠**b**, ∠**c** to recall values
- **area** returns triangle area
- **Δ** returns triangle perimeter length
- to enter a new triangle, press **clr** & repeat steps above

note1: *if there is more than 1 solution, an additional button appears in the middle of the triangle. Touch the button to select between the two solutions. Recalled values will be for solution 1 or solution 2 depending on the selection button setting.*

note2: inaccurate results can occur for small angles

Statistics Functions





clrΣ clears statistics registers n,∑x,∑x²,∑y,∑y²,∑xy
Σ+ accumulates x,y in registers, returns n
Σ- removes x,y from registers, returns n
x,y mean of x,y
x,w weighted mean
x̂,r linear estimate x for y, correlation coefficient
ŷ,r linear estimate y for x, correlation coefficient
s standard deviation x,y
σ population standard deviation x,y
nΣ recalls the number of samples
Σx recalls ∑x
Σx² recalls ∑x²
Σy recalls ∑y
Σy² recalls ∑y²
Σxy recalls ∑xy
RCLΣ+ 0,1,2,3,4,5 to recall n,∑x,∑x²,∑y,∑y²,∑xy
x min recalls minimum x value from list
x max recalls maximum x value from list
y min recalls minimum y value from list
y max recalls maximum y value from list
range ymax-ymin, xmax-xmin
Edit calls up the statistics edit display. A maximum of 200 samples can be edited. The edit display shows a 2 column list of x and y values. Touch the list to edit a number. Use the down and right arrow keys to move to the next value to edit. The delete row key deletes the high lighted row.
Plot opens the statistics plot window (see below)

% percent x of y
Δ% percent change y to x
%T x percent of y total

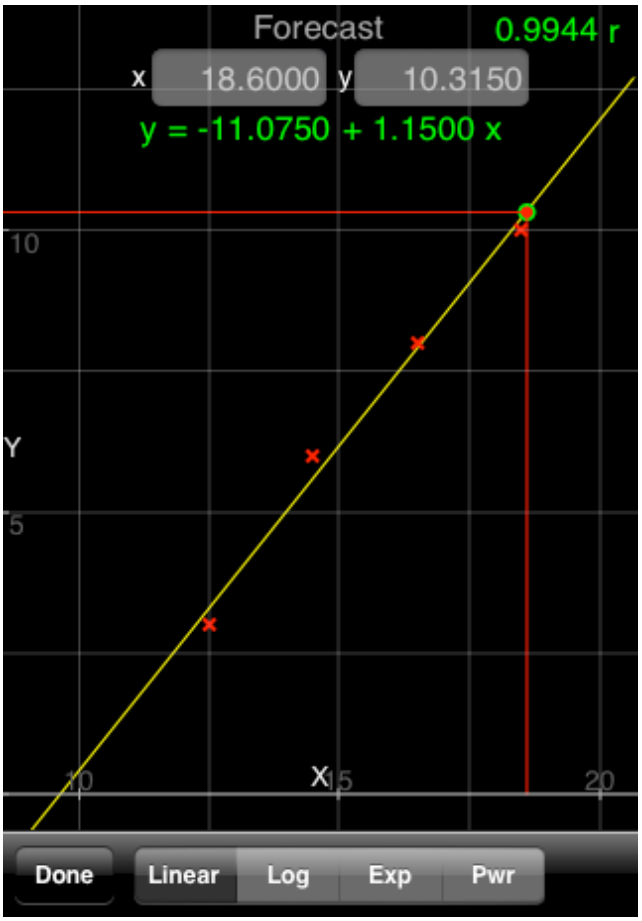
Cn,r combination y items taken x at a time

Pn,r permutation y items taken x at a time
n! factorial of x where x is an integer and
$0 \le x \le 170$
n! gamma function Γ(x+1) of non integer x

Statistics Editor

The statistics editor can store up to 200 samples. Samples can be reviewed and edited in the editor window which is accessed by touching the **Edit** key.

Statistics Plot



The statistics plot window displays the current samples as red x marks and the fit line/curve in yellow. The equation for the fit curve is displayed in green y = . The correlation coefficient is displayed in the upper right corner in green.

Choose the fit model by touching the control at the bottom of the screen.

Forecast Enter either an x or a y value by touching the field labeled x or y at the top of the screen. A keyboard will pop up for entering a value. Touch the "done" key to enter the value and compute the opposite value.

Programmer's Functions

hex changes display base to 16
dec changes display base to 10
oct changes display base to 8
bin changes display base to 2
xor y exclusive or x
and y and x
not negates x
or y or x
<< shift x left 1 binary place
>> shift x right 1 binary place
RL rotate x left 1 binary place
RR rotate x right 1 binary place

note: *binary representation may exceed width of display in which case an annunciator will appear next to number. Touch annunciator to move display left/right 16 places.*

note: *touch upper left annunciator to change word size between* **8**, **16**, **32**, **48** *bits*

Financial Functions

Annunciators:

•touch payment mode annunciator to set payment mode to **Begin** or **End** for compound interest calculations involving payments.

•touch odd period interest annunciator to set interest calculation method to **Simple** interest or **Comp** (compound) interest.

•touch date annunciator to set date format to **m.dy** or **d.my**

Amort Amortizes x number of periods using values stored in PMT, i, PV, and the display. Updates values in PV and n

INT calculates simple interest

NPV calculates the net present value of up to 80 uneven cash flows and initial investment using values stored with Cf0, Cfj and Nj

Rnd rounds mantissa of X-register to match the display

IRR calculates the internal rate of return (yield) for up to 80 uneven cash flows and initial investment using values stored in the cash flow registers.

Note: IRR can have multiple solutions if the cash flows change signs more than once. In those cases an alert dialog is displayed showing all the found values, but only the first value is returned. If this situation occurs you

should consider using MIRR as an alternative way of analyzing the cash flows.

MIRR calculates the modified internal rate of return (yield) for up to 80 uneven cash flows and initial investment using values stored in the cash flow registers.
MIRR = 100((PosNFV / -NegNPV)^1/n-1)
where:
PosNFV = future value of positive cash flows using the interest rate stored in i
NegNPV = net present value of negative cash flows using the "safe" investment rate mi.

clrFin clears n, i, pv, pmt, fv and the 80 cash flow registers

n stores or computes number of periods in financial problem

i stores or computes interest rate per compounding period

mi stores the "safe" interest rate per compounding period for the MIRR calculation.

PV stores or computes the present value ie. the initial cash flow

PMT stores or computes payment amount

FV stores or computes future value of a financial problem

Note: The current values of n, i, mi, PV, PMT and FV are displayed immediately above the keys.

Date changes a date in the Y-register by the number of days in the X-register and displays day of week in upper left corner

ΔDYS computes the number of days between two dates in the Y and X-registers

12x multiplies X-register by 12 and stores result in n register

12÷ divides X-register by 12 and stores result in i register

CF opens the cash flow editor. (see below)

Price calculates bond price, given desired yield to maturity

YTM calculates yield to maturity, given bond price

SL calculates depreciation using straight-line method

SOYD calculates depreciation using sum-of-years-digits method

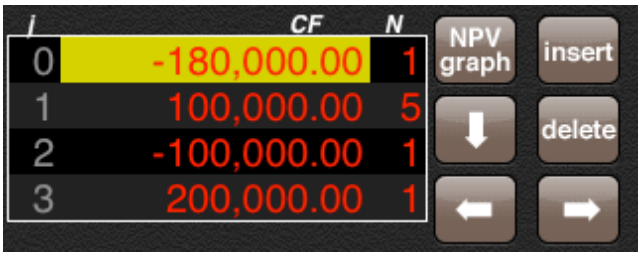
DB calculates depreciation using declining-balance method

Amort Table display an amortization table. Touch the email button to email the amortization table. Touch the Yearly button to show yearly

sums, the Monthly button to display monthly totals.

note: *the financial functions are modeled after the HP12c functions. For a full description of the operation of these functions refer to:*
http://h10032.www1.hp.com/ctg/Manual/c00363319.pdf

Cash Flow Editor



The cash flow editor displays the contents of the 80 cash flow registers in a scrolling list. The columns of the list display the cash flow period **j**, the value of the cash flow **CF** and the number of consecutive times the cash flow occurs, **N**. **N** must be in the range of 1 to 99.

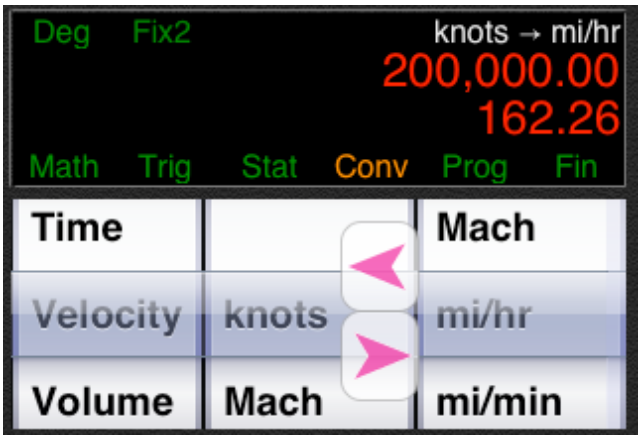
To edit a list entry, touch the list to hi-light the entry to be edited. Then type in a new value and press **ENTER**. Use the up, down, left and right arrow keys to move the selection.

To insert a new cash flow, select a cash flow j by touching the list and then touch the **insert** key. The cash flows from j to the end of the list are moved up one row and a new entry is initialized to 0.00 at j. The 79th entry of the list is deleted.

To remove a cash flow, select the cash flow by touching the list and then touch the **delete** key. The cash flows above the deleted one are moved down by 1 row. A new 0.00 entry is made in the 79th cash flow.

To exit the cash flow editor, touch any of the green annunciators **Math**, **Trig**, **Stat**, **Conv**, **Prog**, **Fin**. When you exit the cash flow editor, the value of the financial register N is modified be the row number of the last non-zero cash flow entry.

Conversions



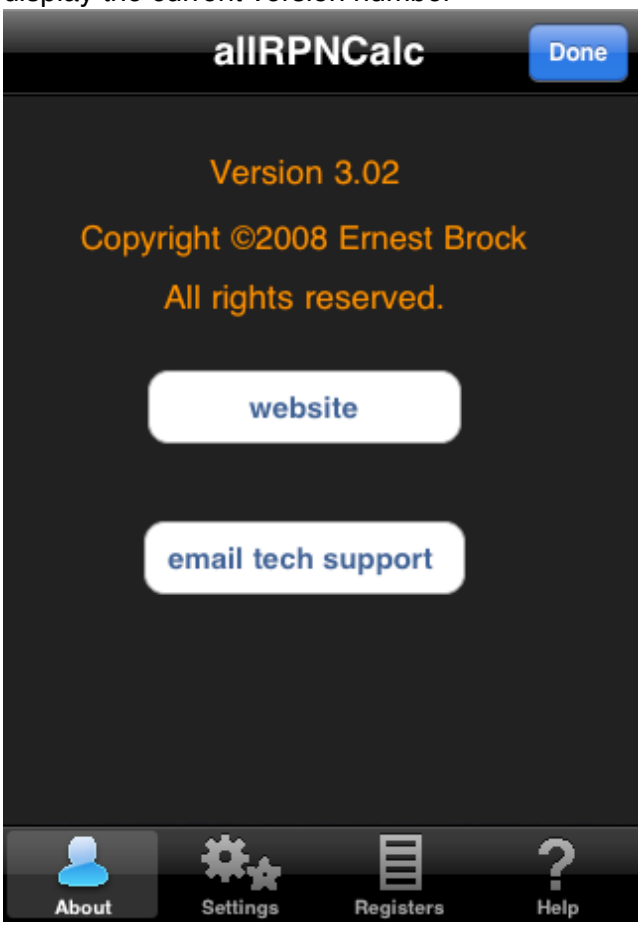
- rotate left wheel to select conversion type
- rotate right 2 wheels to select conversion targets
- touch left or right arrow to convert value in x

Information Screens

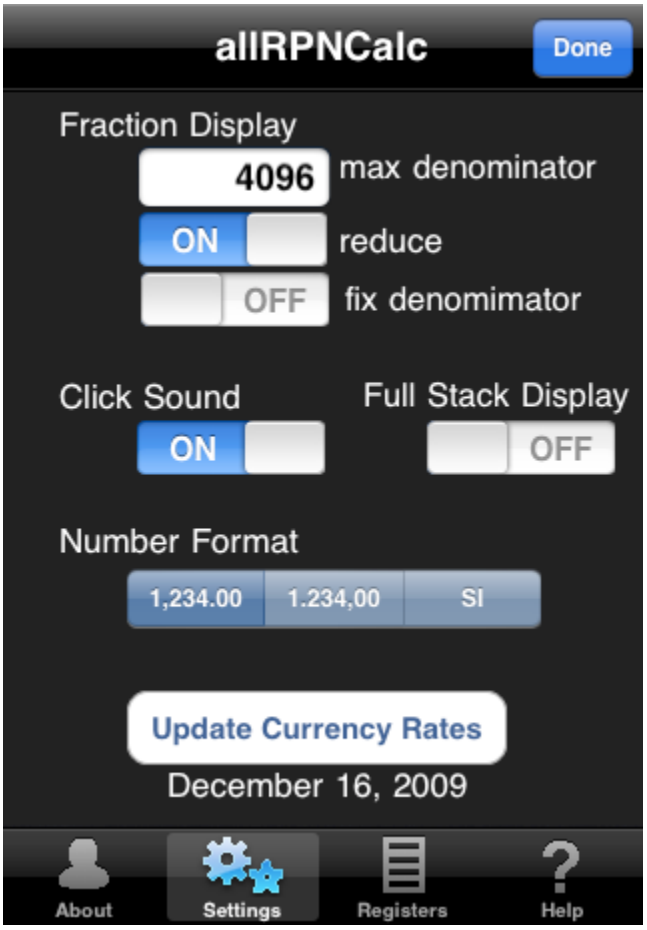
touch i in lower right corner to flip to information screens

About

display the current version number



Settings



•**max denominator**- maximum denominator for fractions
1 < md < 10000

•**fix denominator**- form fractions using only multiples of
1/(max denominator)

•**reduce**- reduce fractions to lowest common terms

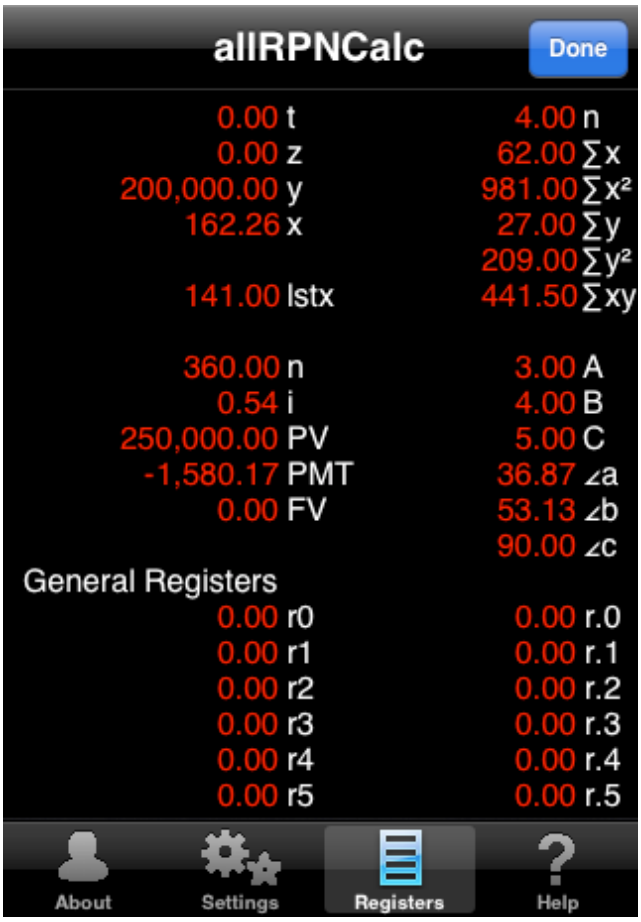
•**click sound**- turn on/off keyboard click sound

•**number format**- select between comma or period for separator between each 3 digits of mantissa and decimal radix character. SI places a space between each 3 digits of mantissa and fraction.

•**Update Currency Rates**- touch this button to update the currency rates. You must have a web connection to load the rates. The date of the last update is displayed under the button.

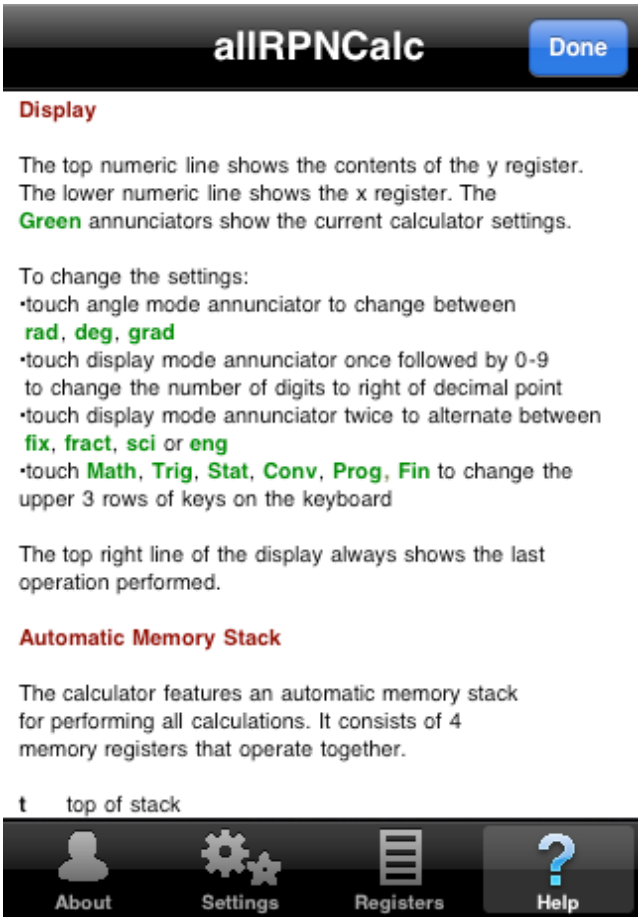
Rates are from the International Monetary Fund web page:
http://www.imf.org/external/np/fin/data/rms_rep.aspx

Registers



•displays calculator registers using current display format

Help



Touch the Help tab to display the user manual.