UPN-Calc – An arbitrary precision RPN calculator for J2ME/MIDP1

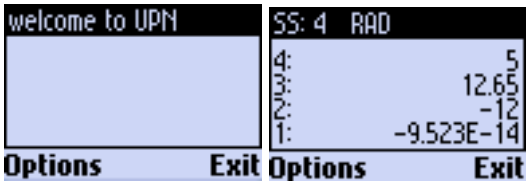
Overview

UPN[1] is a stack based scientific calculator for the Mobile Java Platform. It features:

- Arbitrary precision unnormalized[2] BCD[3] (see [Cow03]) arithmetic.
- Arithmetic standard functions (approximated to arbitrary precision): *sin*, *cos*, *tan*, *arcsin*, *arccos*, *arctan*, x^{-1}, $\sqrt{x}$, e^x, *ln*, y^x.
- Angle measure in *DEG*, *RAD* or *GRAD*.
- Stack contents and configuration information persistent between sessions.

Usage

Main Display



Central part of the display is the stack. Above the stack the status line shows the current size of the stack (which may be greater than the number of displayed elements) and the angle measure or a message.

Below the stack the menu for the current context is displayed. Actual look of this menu depends on the device used.

Entering Numbers

To enter a value just start typing using the numeric keys.

A number may contain a sign, a decimal point or an exponent. To enter these characters press the #-key. Depending on the context the appropriate character is inserted.

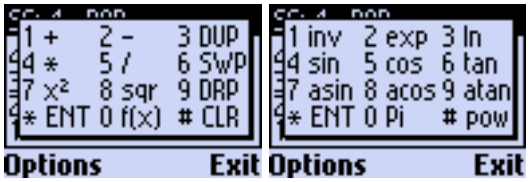
To complete press * twice (*ENT*) or perform any other arithmetic function or operation.

[1] from the German abbreviation for "umgekehrte polnische Notation"

[2] Unnormalized: trailing zeros are preserved (and not suppressed, as in normalized arithmetic), e.g. $2.47 + 6.33 = 8.80$.

[3] BCD: binary coded decimal. Values exactly representable in decimal notation are exact values for the calculator, too.

Operations and Functions



Press * to open the first operation menu. Press the appropriate key to perform the following operations:

1	remove two elements from stack and replace with sum
2	remove two elements from stack and replace with difference
3	duplicate first element
4	remove two elements from stack and replace with product
5	remove two elements from stack and replace with quotient
6	swap first and second element
7	remove first element from stack and replace with x^2
8	remove first element from stack and replace with $\sqrt{x}$
9	remove first element from stack
*	complete entering a number/do nothing
0	show menu of further functions
#	remove all elements from stack

The second menu shows further arithmetic functions:

1	remove first element from stack and replace with x^{-1}
2	remove first element from stack and replace with e^x
3	remove first element from stack and replace with $\ln x$
4	remove first element from stack and replace with $\sin x$
5	remove first element from stack and replace with $\cos x$
6	remove first element from stack and replace with $\tan x$
7	remove first element from stack and replace with $\arcsin x$
8	remove first element from stack and replace with $\arccos x$
9	remove first element from stack and replace with $\arctan x$
*	complete entering a number/do nothing
0	enter π[4]
#	remove two elements from stack and replace with y^x

[4]This operation is not truly arbitrary precision—maximum accuracy for π is currently 50 decimal digits.

Options

Using the options menu you can configure the program in the following aspects:

- Angle Measure
  - *DEG*: Trigonometric functions use degrees (360 for full angle).
  - *RAD*: Trigonometric functions use radians (2π for full angle).
  - *GRAD*: Trigonometric functions use grads (400 for full angle).
- Precision
  - Stack: Number of decimal digits used in stack display. This accuracy should be lower than the internal accurarcy.
  - Internal: Number of decimal digits used for the numeric approximations of arithmetic functions. Depending on the required accuracy, especially for the trigonometric functions, this setting should be $3 \ldots 5$ digits greater than the stack accuracy.
- Font Size: Choose an appropriate font size for display of stack and menu pages. Optimal setting depends on the device used.

Closing the Program

If the program is left using the *exit* operation, options and stack content is saved and will be restored during the next program invocation.

Leaving the program with the abort key of the device (*hangup* on some devices) saving of options and stack may be suppressed.

References

[Cow03] Mike Cowlishaw. General decimal arithmetic specification. Technical report, IBM UK Laboratories, 2003. http://www2.hursley.ibm.com/decimal/.