



# Tech Info Library

## Applesoft: Internals--Floating Point Math Package (1 of 3)

Revised: 11/7/84  
Security: Everyone

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Applesoft's floating point package provides a 9 digit scientific package for evaluating numeric equations. It supports trigonometric functions with arguments in radians, exponents and logarithms to base e.

### ABBREVIATIONS

msb: most significant bit or byte  
lsb: least significant bit or byte  
eol: end of line token (\$00)

A: the 6502 accumulator  
X: the 6502 X register  
Y: the 6502 Y register  
Z: the zero flag of the 6502 status register  
C: the carry flag of the 6502 status register

A,X is a 16 bit number where A has the msb and X the lsb.

(Y,A) is the number or string whose address is in Y and A, with the msb in Y and the lsb in A.

FAC: the floating point accumulator  
ARG: the ARGument register

### REAL NUMBER FORMAT

The real number format used throughout Applesoft is: the exponent is a single byte signed number (EXP) in excess of \$80 form (the signed value has \$80 added to it); the mantissa is 4 bytes (HO,MOH,MO,LO); the binary point is to the right of the most significant bit. Since in binary floating point notation the msb is always 1, the number's sign replaces the msb when the number is stored in memory in packed form. The sign, though, is kept in a separate byte (SGN) when only bit 7 is significant. If the exponent is zero, the number is zero, although the mantissa isn't necessarily zero.

Examples:

EXP	HO	MOH	MO	LO	SGN
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#### Packed format

-10	84	A0	00	00	00
10	84	20	00	00	00

#### FAC format

-10	84	A0	00	00	00	FF
10	84	A0	00	00	00	00

Arithmetic routine calling conventions for single argument functions (e.g., SGN, ABS or INT):

On entry the argument is in the FAC.  
On exit the result is in the FAC.

Arithmetic routine calling conventions for two argument functions (e.g., FADD and FSUB):

On entry the first argument is in the ARG.  
On entry the second argument is in the FAC.  
On exit the result is in the FAC.

#### FLOATING POINT REGISTERS

NOTE: The TEMP locations may be used for other things when not used by the floating point math package.

	FAC	ARG	TEMP1	TEMP2	TEMP3	RND
EXP	9D	A5	93	98	8A	C9
HO	9E	A6	94	99	8B	CA
MOH	9F	A7	95	9A	8C	CB
MO	A0	A8	96	9B	8D	CC
LO	A1	A9	97	9C	8E	CD
SGN	A2	AA	(packed format)			

#### FLOATING POINT CONSTANTS

The following addresses point to useful numbers; they're packed and suitable for use by most of the arithmetic routines including CONUPK and MOVMF.

RND	00C9
-32768	E0FE
1	E913
SQR (1/2)	E92D
SQR (2)	E932
-1/2	E937
LN (2)	E93C
10	EA50
1000000000	ED14
1/2	EE64
LOG (2) base e	EEDB

$\pi/2$	F063
$\pi^2$	F06B
$1/4$	F070

Apple Tech Notes

Tech Info Library Article Number:74