

The following MIX subroutines, for addition and subtraction of numbers having the form (4), show how Algorithms A and N can be expressed as computer programs. The subroutines below are designed to take one input u from symbolic location ACC, and the other input v comes from register A upon entrance to the subroutine. The output w appears both in register A and location ACC. Thus, a fixed point coding sequence

LDA A; ADD B; SUB C; STA D (7)

would correspond to the floating point coding sequence

LDA A, STA ACC; LDA B, JMP FADD; LDA C, JMP FSUB; STA D. (8)

Program A (*Addition, subtraction, and normalization*). The following program is a subroutine for Algorithm A, and it is also designed so that the normalization portion can be used by other subroutines that appear later in this section. In this program and in many others throughout this chapter, OFLO stands for a subroutine that prints out a message to the effect that MIX's overflow toggle was unexpectedly found to be on. The byte size b is assumed to be a multiple of 4. The normalization routine NORM assumes that $rI2 = e$ and $rAX = f$, where $rA = 0$ implies $rX = 0$ and $rI2 < b$.

00	BYTE	EQU 1(4:4)	Byte size b
01	EXP	EQU 1:1	Definition of exponent field
02	FSUB	STA TEMP	Floating point subtraction subroutine:
03		LDAN TEMP	Change sign of operand.
04	FADD	STJ EXITF	Floating point addition subroutine:
05		JOV OFLO	Ensure that overflow is off.
06		STA TEMP	$TEMP \leftarrow v$.
07		LDX ACC	$rX \leftarrow u$.
08	CMPA	ACC(EXP)	<u>Steps A1, A2, A3 are combined here:</u>
09	JGE	1F	Jump if $e_v \geq e_u$.
10	STX	FU(0:4)	$FU \leftarrow \pm f f f f 0$.
11	LD2	ACC(EXP)	$rI2 \leftarrow e_w$.
12	STA	FV(0:4)	
13	LD1N	TEMP(EXP)	$rI1 \leftarrow -e_v$.
14	JMP	4F	
15	1H	STA FU(0:4)	$FU \leftarrow \pm f f f f 0$ (u, v interchanged).
16		LD2 TEMP(EXP)	$rI2 \leftarrow e_w$.
17		STX FV(0:4)	
18		LD1N ACC(EXP)	$rI1 \leftarrow -e_v$.
19	4H	INC1 0,2	$rI1 \leftarrow e_u - e_v$. (Step A4 unnecessary.)
20	5H	LDA FV	<u>A5. Scale right.</u>
21		ENTX 0	Clear rX .
22		SRAX 0,1	Shift right $e_u - e_v$ places.
23	6H	ADD FU	<u>A6. Add.</u>
24		JOV N4	<u>A7. Normalize.</u> Jump if fraction overflow.
25		JXZ NORM	Easy case?
26		LD1 FV(0:1)	Check for opposite signs.
27		JAP 1F	