

ARITHMETIC OPERATIONS PROGRAMMING

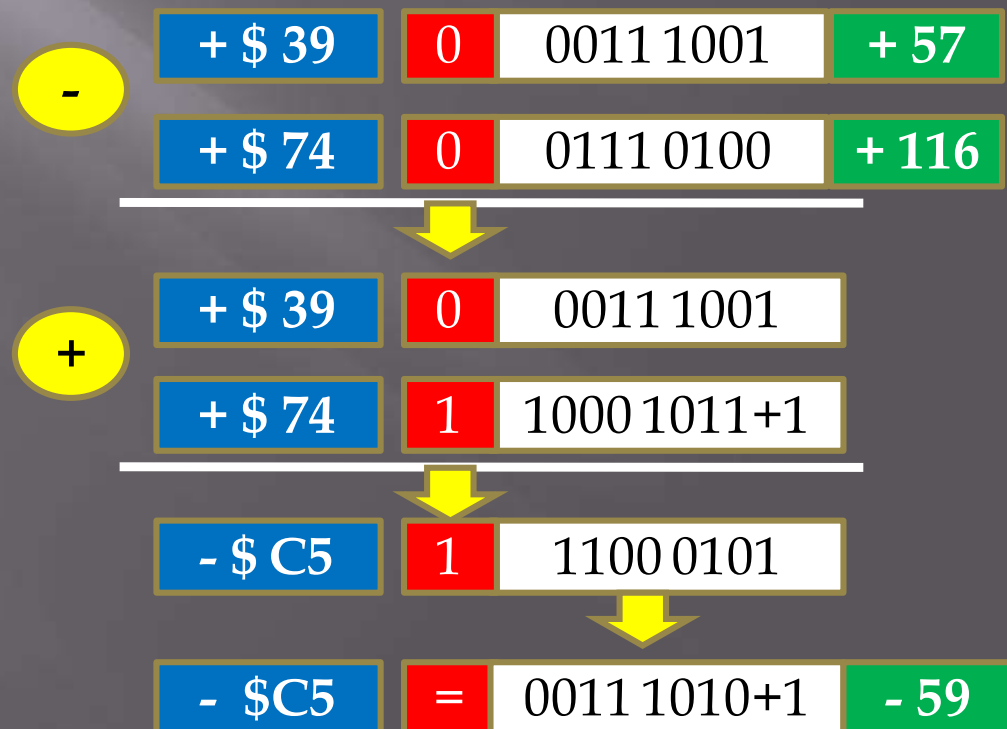
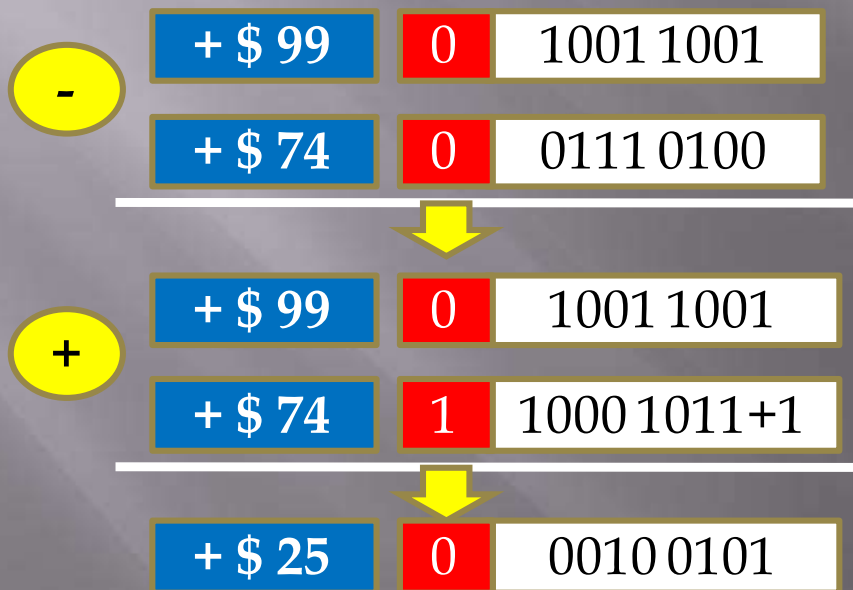
Representation of digits in micro-processing systems
8-bit two's complement

Binary sign	Binary value	Decimal sign	Decimal value
0	1111 1111 (max)	+	255
0	0000 0001 (min)	+	1
0	0000 0000		0
1	1111 1111 (min)	-	1
1	0000 0000 (max)	-	256

Addition and Subtraction

Concept of Carry / Borrow bit:

9-th bit in 8-bit "Add" or "Subtract" operations or
17-th bit in 16-bit "Add" or "Subtract" operations is considered as a
special C-bit (C-flag) in Condition Code Register (CCR)



PROGRAMMING THE SUBTRACTION OPERATION

Org \$1500	; Starting address of the program
LDAA # \$ 39	; Load BCD digit \$39 (0011 1001)
SBCA # \$ 74	; Subtract BCD \$ 74 (0111 0100)
STAA \$1001	; Store the result in address \$1001
END	

Please read pp. 50 to 60: “Multi-precision operations, BCD operations and Multiplication & Division operations. *Read example programs.*”

Condition Code Register (CCR)

- Condition code Register (CCR) is special purpose register which *contains set of flags* indicating conditions of the operation recently executed

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		H		N	Z	V	C

Bit 0: C-bit => Carry Flag

Bit 1: V-bit => Overflow Flag. Whenever result of a two's complement operation is out of range V=1

Bit 2: Z-bit => Zero Flag. Whenever result is 0 than Z=1, otherwise Z=0

Bit 3: N-bit => Whenever the most significant bit of the result of operation is = 1, than N=1, Otherwise, N=0

Bit 5: H-bit => Half-carry flag is carry flag for lower 4-bits to the upper 4 bits.

Program Loops

- ▣ Loop is program element for repetitive operation with determined segment of algorithm.
- ▣ **Definition 1:** Finite loop a sequence of instructions that will be executed for finite number of times
- ▣ **Definition2:** Endless loop a sequence of instructions that will be executed forever if started (until power off)

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