8-Bit Arithmetic Operations using 8085

Aim:

To perform 8-bit arithmetic operations such as addition, subtraction, multiplication, and division using the 8085 microprocessor.

Apparatus Required:

- Laptop with internet connection

Algorithm:

For Addition (With Carry Consideration):

- Load the first number into register A.
- Load the second number into register B.
- Add the contents of registers A and B.
- If carry is generated, store carry in a separate location.
- Store the sum in another location.

For Subtraction (Considering Greater Number):

- Load the first number into register A.
- Load the second number into register B.
- Compare A and B.
- If A < B, swap the values of A and B to ensure positive result.
- Subtract the content of B from A.
- Store the result in a specified location.

For Multiplication:

- Load the first number into register A.
- Load the second number into register B.
- Multiply A and B using repeated addition.
- Store the result in suitable locations (including extra space if needed for higher bits).

For Division:

- Load the dividend into register A.
- Load the divisor into register B.
- Perform division using repeated subtraction.

- Store the quotient in one location and remainder in another.

Program:

Addition of Two 8-bit Numbers:

```
IN 01H       ; Read input from port 0x01 into A
 MOV B,A      ; Save it in B
      IN 02H       ; Read input from port 0x02 into A
      ADD B        ; A = A + B
      OUT 03H      ; Send sum to port 0x03
      HLT          ; Stop execution
```

Subtraction (First number - Second number)

```
IN 01H       ; Read first number (A) from port 0x01 into A
      MOV B,A      ; Save it in B
      IN 02H       ; Read second number (B) from port 0x02 into
A
      MOV C,A      ; Save B in C
      MOV A,B      ; Restore first number into A
      SUB C        ; A = A - B
      OUT 03H      ; Output result to port 0x03
      HLT          ; End program
```

Multiplication using repeated addition:

```
IN 01H       ; Read first number (Multiplicand) into A
MOV C, A     ; Store in C

IN 02H       ; Read second number (Multiplier) into A
MOV B, A     ; Store in B

MVI A, 00H   ; Clear A to hold result

LOOP:
ADD C        ; A = A + C
DCR B        ; B = B - 1
JNZ LOOP     ; Repeat until B = 0

OUT 06H      ; Output the result to port 06H
```

```
HLT          ; End of program
```

Division (Using Repeated Subtraction):

```
IN 01H       ; Read dividend into A
MOV C, A     ; Store dividend in C (for remainder tracking)
MVI A, 00H   ; Clear A for quotient
MOV D, A     ; Use D to store quotient

IN 02H       ; Read divisor into A
MOV B, A     ; Store divisor in B

DIV_LOOP:
MOV A, C     ; Load current remainder into A
CMP B        ; Compare remainder with divisor
JC END_DIV   ; If A < B, jump to END_DIV
SUB B        ; A = A - B
MOV C, A     ; Update remainder in C
INR D        ; Increment quotient
JMP DIV_LOOP ; Repeat loop

END_DIV:
MOV A, D     ; Move quotient to A
OUT 03H      ; Output quotient to port 03H

MOV A, C     ; Move remainder to A
OUT 04H      ; Output remainder to port 04H

HLT          ; End program
```

Output:

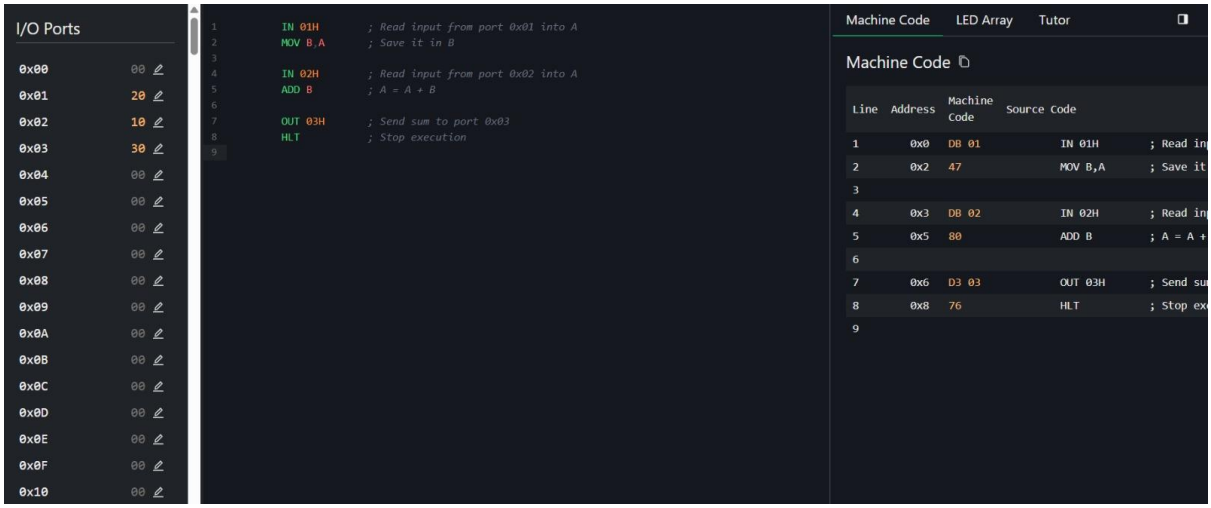
Addition of Two 8-bit Numbers:

Input Ports:

- **01H** → First number
- **02H** → Second number

Output Ports:

- **03H** → Sum
- **04H** → Carry (if generated)



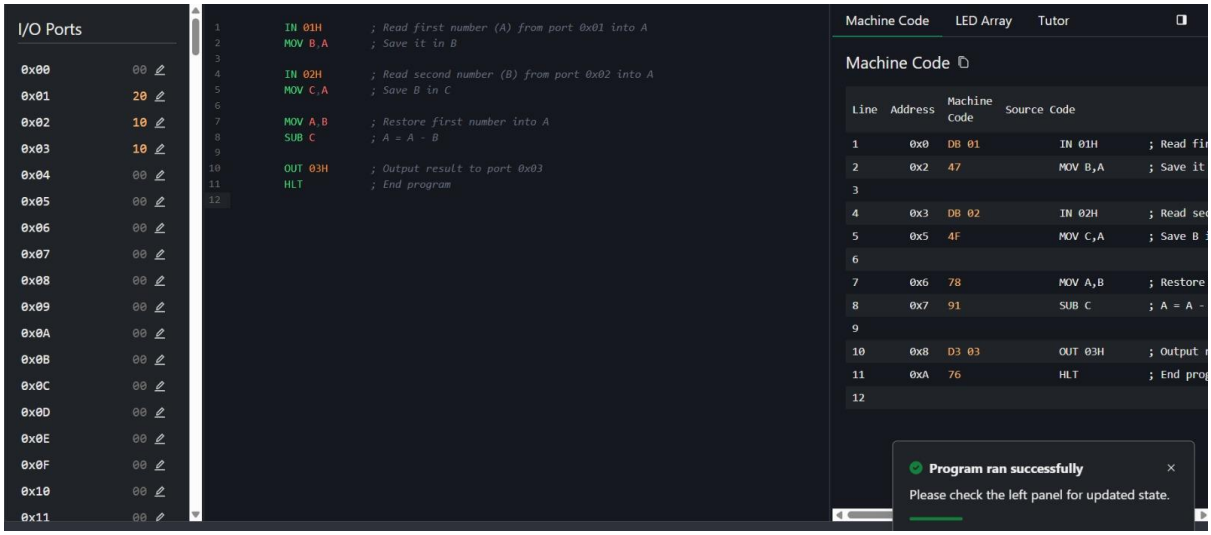
Subtraction (First number - Second number)

Input Ports:

- **01H** → First number
- **02H** → Second number

Output Ports:

- **03H** → Result (Difference)



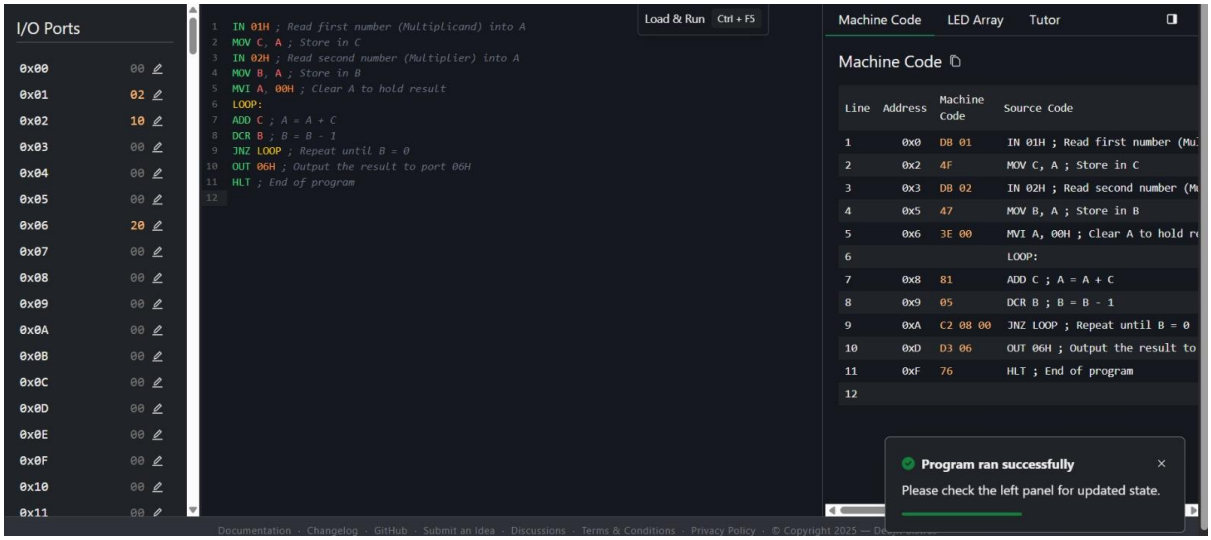
Multiplication using repeated addition:

Input Ports:

- **01H** → Multiplicand
- **02H** → Multiplier

Output Ports:

- **06H** → Product



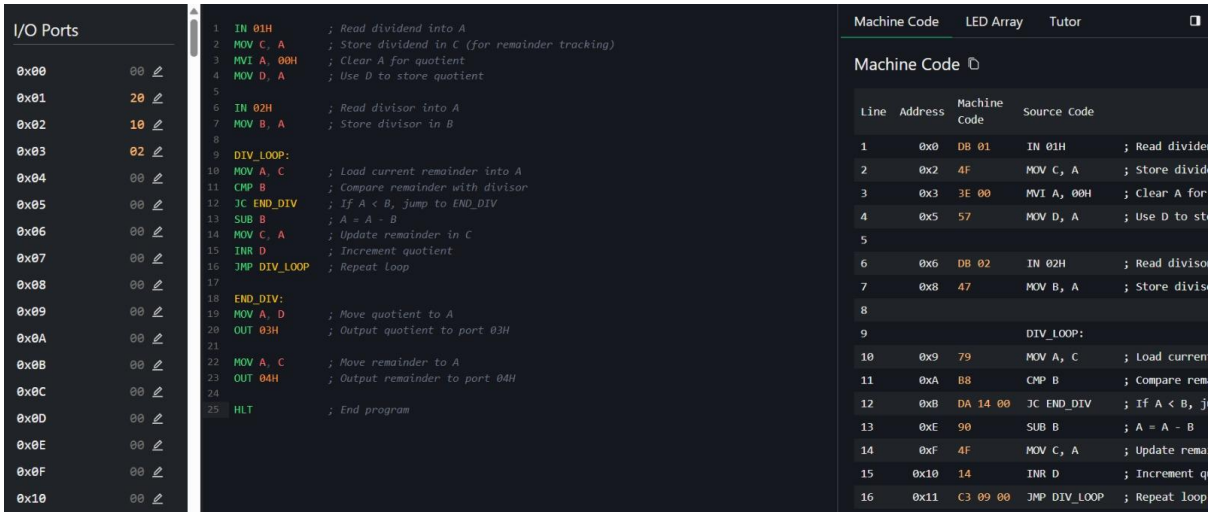
Division (Using Repeated Subtraction):

Input Ports:

- **01H** → Dividend
- **02H** → Divisor

Output Ports:

- **03H** → Quotient
- **04H** → Remainder



Result:

The 8-bit arithmetic operations using the 8085 microprocessor have been successfully executed and verified using memory access for input and output.