2. Statement: Exchange the contents of memory locations 2000H and 4000H

Program 1:

```
      LDA 2000H       : Get the contents of memory location 2000H into
accumulator
      MOV B, A        : Save the contents into B register
      LDA 4000H       : Get the contents of memory location 4000Hinto
accumulator
      STA 2000H       : Store the contents of accumulator at address 2000H
      MOV A, B        : Get the saved contents back into A register
      STA 4000H       : Store the contents of accumulator at address 4000H
```

Program 2:

```
      LXI H 2000H             : Initialize HL register pair as a pointer to
memory location 2000H.
      LXI D 4000H             : Initialize DE register pair as a pointer to
memory location 4000H.
      MOV B, M                : Get the contents of memory location 2000H into B
register.
      LDAX D                  : Get the contents of memory location 4000H into A
register.
      MOV M, A                : Store the contents of A register into memory
location 2000H.
      MOV A, B                : Copy the contents of B register into accumulator.
      STAX D                  : Store the contents of A register into memory location
4000H.
      HLT                     : Terminate program execution.
```

4.Statement: Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.

Program - 4: Subtract two 8-bit numbers

Sample problem:

```
(4000H)       = 51H
(4001H)       = 19H
Result        = 51H - 19H = 38H
```

Source program:

```
      LXI H, 4000H            : HL points 4000H
      MOV A, M                : Get first operand
      INX H                   : HL points 4001H
      SUB       M             : Subtract second operand
      INX H                   : HL points 4002H
      MOV M, A                : Store result at 4002H.
      HLT                     : Terminate program execution
```

6.Statement: Add the contents of memory locations 40001H and 4001H and place the result in the memory locations 4002Hand 4003H.

Sample problem:

```
      (4000H) = 7FH
      (400lH)  = 89H
Result    = 7FH + 89H = lO8H
      (4002H) = 08H
      (4003H) = 0lH
```

Source program:

```
      LXI H, 4000H            :HL Points 4000H
      MOV A, M                :Get first operand
      INX H                   :HL Points 4001H
      ADD M                   :Add second operand
      INX H                   :HL Points 4002H
      MOV M, A                :Store the lower byte of result at 4002H
      MVIA, 00                :Initialize higher byte result with 00H
```

```
      ADC A                   :Add carry in the high byte result
      INX H                   :HL Points 4003H
      MOV M, A                :Store the higher byte of result at 4003H
      HLT                     :Terminate program execution
```

Program - 5.a: Add two 16-bit numbers - Source Program 1

Sample problem:

```
(4000H) = 15H
(4001H) = 1CH
(4002H) = B7H
(4003H) = 5AH
Result = 1C15 + 5AB7H = 76CCH
(4004H) = CCH
(4005H) = 76H
```

Source Program 1:

```
LHLD 4000H            : Get first I6-bit number in HL
XCHG                  : Save first I6-bit number in DE
LHLD 4002H            : Get second I6-bit number in HL
MOV A, E              : Get lower byte of the first number
ADD L                 : Add lower byte of the second number
MOV L, A              : Store result in L register
MOV A, D              : Get higher byte of the first number
ADC H                 : Add higher byte of the second number with CARRY
MOV H, A              : Store result in H register
SHLD 4004H            : Store I6-bit result in memory locations 4004H and
4005H.
HLT                   : Terminate program execution
```

8.Statement: Find the l's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.

Sample problem:

```
      (4400H) = 55H
```

```
          Result = (4300B) = AAB
Source program:

LDA 4400B             : Get the number
CMA                   : Complement number
STA 4300H             : Store the result
HLT                   : Terminate program execution
```

4.Statement: Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.

Program - 4: Subtract two 8-bit numbers

Sample problem:

```
(4000H)       = 51H
(4001H)       = 19H
Result        = 51H - 19H = 38H
```

Source program:

```
      LXI H, 4000H            : HL points 4000H
      MOV A, M                : Get first operand
      INX H                   : HL points 4001H
      SUB       M             : Subtract second operand
      INX H                   : HL points 4002H
      MOV M, A                : Store result at 4002H.
      HLT                     : Terminate program execution
```

16.Statement: Calculate the sum of series of numbers. The length of the series is in memory location 4200H and the series begins from memory location 4201H.
a. Consider the sum to be 8 bit number. So, ignore carries. Store the sum at memory location 4300H.
b. Consider the sum to be 16 bit number. Store the sum at memory locations 4300H and 4301H

a. Sample problem

4200H = 04H
4201H = 10H
4202H = 45H
4203H = 33H
4204H = 22H
Result = 10 +41 + 30 + 12 = H
4300H = H

Source program:

```
LDA 4200H
MOV C, A          : Initialize counter
SUB A             : sum = 0
LXI H, 420IH      : Initialize pointer
BACK:   ADD M     : SUM = SUM + data
INX H             : increment pointer
DCR C             : Decrement counter
JNZ BACK          : if counter 0 repeat
STA 4300H         : Store sum
HLT               : Terminate program execution
```

b. Sample problem

4200H = 04H
420IH = 9AH
4202H = 52H
4203H = 89H
4204H = 3EH
Result = 9AH + 52H + 89H + 3EH = H
4300H = B3H Lower byte
4301H = 0IH Higher byte

Source program:

```
LDA 4200H
MOV C, A          : Initialize counter
LXI H, 4201H      : Initialize pointer
SUB A             :Sum low = 0
MOV B, A          : Sum high = 0
BACK: ADD M       : Sum = sum + data
JNC SKIP
INR B             : Add carry to MSB of SUM
SKIP: INX H       : Increment pointer
DCR C             : Decrement counter
JNZ BACK          : Check if counter 0 repeat
STA 4300H         : Store lower byte
MOV A, B
STA 4301H         : Store higher byte
HLT               :Terminate program execution
```