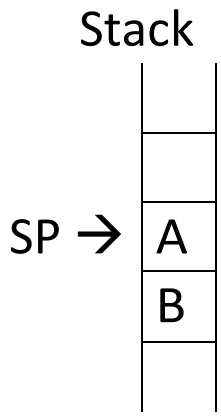
Problem 4

Given a processor with 0 addresses, and the following instructions:

PUSH V
POP V
ADD: POP A, POP B, PUSH (A+B)
SUB: POP A, POP B, PUSH (A-B)
MUL: POP A, POP B, PUSH (A*B)
DIV: POP A, POP B, PUSH (A/B)



Make a program to evaluate the expression of Problem 3: X= (A+B-C)/(B*D)

Find the right order to push the values of arguments into the stack and to use the operations to obtain the results. Finding the right order of the instructions is a bit of a puzzle.

Problem 7

Given a processor specified as follows.

- 16 bits instructions
- 64 different instructions
- Register file with 32 registers
- All instructions have one explicit operand
- Three different types of instructions
    1. Operand addresses directly register
    2. Operand addresses direct relative with explicit register
    3. Operand addresses direct to memory

a) Design the instruction format for the three types of instructions; determine for each field its representation and size in bits.

Type 1	
Type 2	
Type 3	

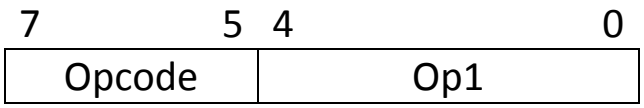
b) What is the maximum displacement/offset in the Type 2 instruction?

c) If memory addressing is on byte level, how many KB can an instruction of type 3 address?

Problem 8

Given a processor with the instruction **ADD op1** to be interpreted as **AC ← AC+[op1]**, where the content of a register AC is increased by a value following from operand op1.

The instruction format is



where Opcode of ADD is 110

Let the content of register PC be a_{hex} and of AC be 1_{hex} and memory content as given.

Determine the value that is added to the content of AC and its new content after performing the instruction in PC for each of the addressing modes.

Memory

Pos	Content
8_{hex}	$0c_{hex}$
9_{hex}	ce_{hex}
a_{hex}	$c8_{hex}$
b_{hex}	cf_{hex}
c_{hex}	05_{hex}

Addressing mode op1	value added to AC	new value of AC
Direct to memory		
Indirect via memory		
Relative to AC		