

1. What **memory areas** do the following **Java Virtual Machine** registers point to?

- a) SP **the stack**
- b) LV **the local variable frame**
- c) CPP **the constant pool**

2. What **other data area** is the stack used for aside from holding operands for instructions?

Local variables

3. The **stack pointer** contains the decimal value “2045”. What will it contain after three numbers are pushed onto the stack?

2048

4. What **register** is changed as a result of the **GOTO** instruction?

The PC (Program Counter) register

5. What gets saved on the stack as the result of a **subroutine call instruction**?

The return address (address of the instruction after the call)

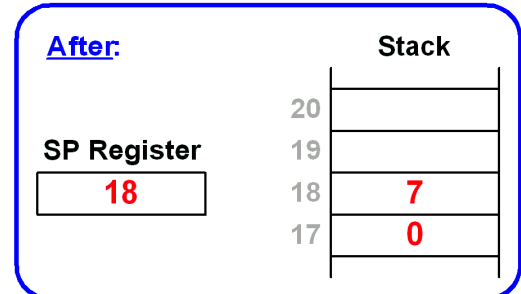
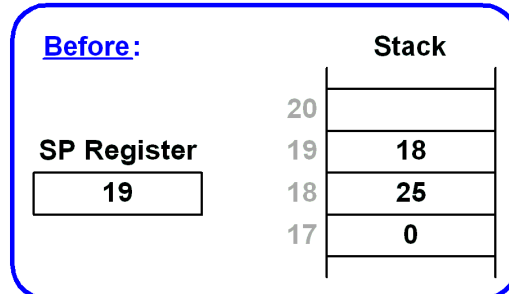
6. What’s the **difference** between a “**BIPUSH 12**” and a “**ILOAD 12**” instruction?

BIPUSH uses an “immediate value” – the “12” itself is actually loaded onto the stack.

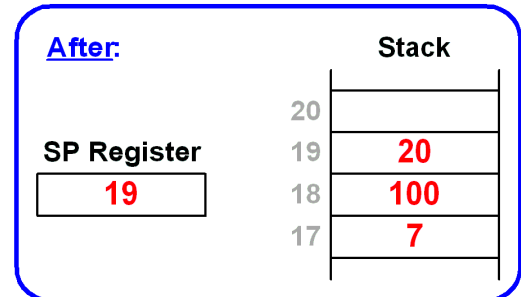
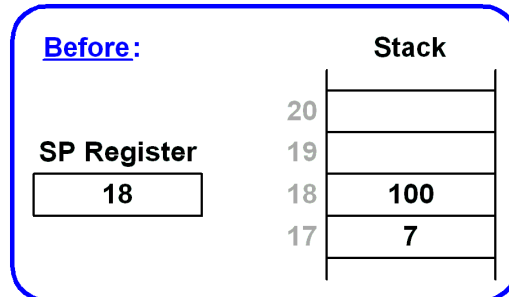
ILOAD uses a pointer – the “12” indicates “local variable number 12”, which will be loaded onto the stack

7. Show the new register and stack contents after the following instructions are executed:

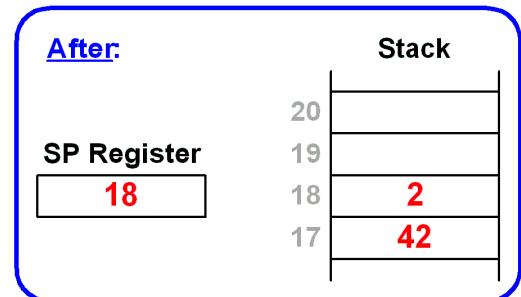
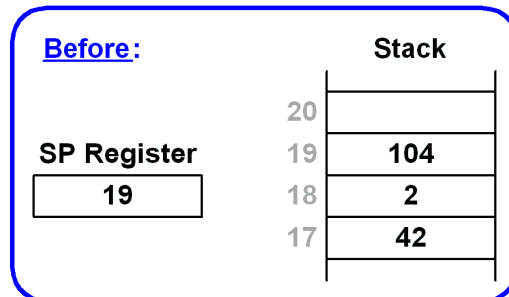
SUB



BIPUSH 20



ISTORE 18



(Note – in the last case, strictly speaking, address 19 on the stack still contains the value “104”, but since it is now at an address higher than indicated by the Stack Pointer, we consider it to be gone).

8. List the major components of the MIC-1's data path.

Registers, memory control unit, ALU/Shifter, B and C buses

9. **Give the names** of MIC-1 registers that are used for the following functions:
- a) Holds a **copy** of the **word most recently pushed onto the stack**. **TOS**
 - b) Holds the **memory address** of the **data area being read or written**. **MAR**
 - c) Holds the **memory address** of the **next instruction to be fetched**. **PC**
 - d) Holds the **memory address** of the **word most recently pushed onto the stack**. **SP**
 - e) Holds the **data read** from memory or about to be **written** to memory. **MDR**
10. **Can** the MIC-1 add the **LV** and **MDR** registers together in the same clock cycle?
Why or why not?
- No – they can't both be connected to the ALU inputs at the same time.**
11. **Why** does the MBR register have **two** different control signals to load it's data onto the B Bus?

To allow the 8-bit data in the register to be connected to the 32-bit bus as a signed or unsigned value.