

Machine cycle: Teacher summary

Machine cycle addition process

There are three major sections to the CPU that work together. These are the various registers (address register, program counter, instruction register, data registers and accumulator), the ALU and the control unit.

All these sections work to a drumbeat of billions of times per second. This is described by the clock speed of the computer, now typically around 3 Gigahertz or 3 billion cycles per second.

One cycle proceeds as follows.

1. Fetch or read instruction and address

The **program counter** points to the address in memory of the current program instruction: an operation and an operand.

All the information contained at this address is written to the **instruction register**.

2. Decode instruction and send data to address register

The operand is sent to the **address register** and the operator is decoded by the **instruction register interpreter**.

3 and 4. Execute the instruction

This will often be a single step, as in the case of a simple LOAD or STORE instruction. However, in our case of an ADD it will involve two steps.

In the first of these the number held at the location indicated by the address register from Stage 2 is added in the **ALU** to the number stored (at some earlier cycle) in the **accumulator**.

In the second stage the sum is sent back to the accumulator and wipes out the previous value stored there while the CPU increments the program counter.

$C=A+B$

will appear in assembly language as two instructions:

LOAD A

ADD B

The teacher explains the function of each component of the CPU and briefly outlines the four stages explained above in the background notes.

Students complete the worksheets.

Students are selected to play roles and are given cards with names to be attached on a wall above them or used as labels.

Each player highlights the parts they will read aloud.

The program to be executed is written up on the board or shown using the OHT provided.

Students expand and revise the definitions they have written on their worksheets on the basis of the play.