6. (5 points) As covered in class, the execution speed of a program on a processor can be given as:

$$Execution\ Time = N \times CPI \times 1/f$$

Where N is the number of instructions, CPI is clocks per instruction and f is the clock frequency. $Execution\ Time$ will improve by either reducing N and CPI, or increasing f (or a combination thereof). List at least **five** improvements that can be made in order to improve the $Execution\ Time$.

Solution: Any five of the following could be accepted:

- **Reduce number of instructions**
  - adopt CISC, that uses instructions that can do more
  - improve the compiler so that it produces more optimized code
- **Reduce clocks per instruction**
  - adopt RISC, simpler instructions can be executed faster
  - add parallel execution units, do more per clock cycle
- **Increase clock frequency**
  - migrate to a more modern manufacturing technology
  - adopt pipelining
  - redesign and improve timing critical components in the circuit (adders, alu etc)
  - *Could also be accepted*: overclock the system (use higher voltage, clock frequency)