Instruction Queue

- The 68HCS12 executes one instruction at a time and many instructions take several clock cycles to complete.

- When the CPU is performing the operation, it does not need to access memory.

- The 68HCS12 prefetches instructions when the CPU is not accessing memory to speed up the instruction execution process.

- There are two 16-bit queue stages and one 16-bit buffer. Unless buffering is required, program information is first queued in stage 1, and then advanced to stage 2 for execution.
Instruction Execution Cycle

Read cycle: the process of accessing a memory location.

Write cycle: the process of storing a value in a memory location.

Execution cycle: the process of executing an instruction.

When executing an instruction, the 68HCS12 performs:

- One or more read cycles to fetch instruction opcode bytes and addressing information.

- One or more read cycles to fetch the memory operand(s) (optional).

- The operation specified by the opcode.

- One or more write cycles to write back the result to either a register or a memory location (optional).
Chapter Summary

- Computer:
  - hardware (CPU, Memory, I/O)
  - software
- Microprocessor vs. microcontroller
- Memory Addressing Modes
- Instructions
What you should have learned...

- Define/explain: computer, processor, microprocessor, microcontroller, embedded systems, hardware, software, assembler, compiler, RAM (DRAM, SRAM), ROM (PROM, EPROM, EEPROM, Flash memory), byte, word, nibble, bus, KB, MB, mnemonic, opcode, operand.

- Explain different memory addressing modes

- Write a sequence of arithmetic and data transfer instructions to perform simple operations.
Next...

- 68HCS12 Assembly Programming
- Reading: Chapter 2.1-2.4