

# Tutorial 1

## Question 1 (1\*5 = 5)

- a) How much data can a single memory address hold?
- b) How many bits are needed to address one location of memory?
- c) How much data can a CPU register hold?
- d) How many memory addresses does an instruction take up in memory?
- e) How many memory addresses does a word take up in memory?

## Question 2 (2\*4 =8)

What is special about these memory addresses

- a) 0x0800 0004
- b) 0x2000 1FFF
- c) 0x4800 0400
- d) 0x4002 1000

## Question 3 (4)

- a) If we want to place the number 24668 at the effective address 0x2000 003D, which address takes on which byte? (2)
- b) If our program consists of 29 instructions, and the first instruction was placed at memory address 0x0800 004B, what would the first free address after the block of instructions be? (2)

## Question 4 (2\*2 = 4)

For each of the following machine code instructions, what action will the CPU take?  
You must give the assembly instruction as well as explain what the instruction does.

- a) 0100 0000 0000 1010 (hint A6.7.7)
- b) 0010 0111 1010 0110 (hint A6.7.39)

## Question 5 (7)

- a) What is the job performed by the assembler? (1)
- b) What is the job performed by the linker? (1)
- c) What does the o option supplied to the assembler do? (1)
- d) When the microcontroller boots up, what key step does it have to take before it can start executing your instructions? (2)
- e) In general, how much is the program counter incremented by on each clock cycle? Why this amount? (2)

## Bonus (2)

What is the special purpose of the first word of flash?