

## Lab 1

### Instructions

Complete each task and demonstrate the working program to your tutor. Tasks should be demonstrated using AVR Studio's simulator. This lab must be marked by the end of the lab in week 4.

### Part A – 16-bit Add (2 Marks)

Load the 16-bit numbers 40960 and 2730 into register pairs r17:r16 and r19:r18. Add them together and store the result in register pair r21:r20.

When that's working try adding the numbers 640 and 511. Does your program deal with overflow correctly?

### Part B – Array Addition (2 Marks)

Load the two arrays (1, 2, 3, 4, 5) and (5, 4, 3, 2, 1) into 10 registers, and then add them together, storing the result as a third array in data memory. Each integer should take up one byte.

Data memory should be allocated using the assembler directives instead of hard-coding the address.

You do not need to use loops or load data from program memory for this task.

### Part C – Upper Case (3 Marks)

Write a program to copy a string from program memory into RAM. The loaded string should then be converted into upper case. You may do this one character at a time.

You may assume the string is less than 20 characters long. The string may contain letters, numbers, spaces, and punctuation.

### Part D – Array Sort (3 Marks)

Write a program to load the array (7, 4, 5, 1, 6, 3, 2) from program memory into RAM and then sort it (using bubble sort) in ascending order.