**MXEN2003 Logbook**

**Lab 1**

***Task***

Your task is to demonstrate the ability to modify and upload code to the microcontroller to control a series of eight LEDs across multiple digital output registers. You will begin by connecting 8 LEDs and resistors to PORTA (arduino pins 22-29) using a breadboard. Check [ArduinoMega schematic](https://www.arduino.cc/en/uploads/Main/arduino-mega2560-schematic.pdf) or the [PinMapping](https://docs.arduino.cc/resources/pinouts/A000067-full-pinout.pdf) for correct pin locations.

***Outcomes***

1. Calculate a series limiting resistor value to ensure current limit is not exceeded for an LED connected to PORTA.

*The supply voltage on the Arduino (VCC) is 5V, and the continuous forward current over the LED is equal to, or less than 20mA. Meaning that the current of the circuit cannot exceed 20mA. For these circuits we consider the worst case (extreme) example. In this scenario the worst case if the forward diode voltage breaks and has a forward voltage equal to zero.*

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Description automatically generated

*This means that the voltage across the resistor must be 5V. With a current of 20mA the resistor value must be a maximum of 250 ohms.*

1. Describe how the written pins are specified. What is the purpose of the | and the & symbols, what would happen if they were removed?

*The or symbol (|) is used when setting the pins to high in order to keep the status of all other pins the same. The program compares PORTA to the right-hand side (1<<PA3), when using = it will set every pin to zero except for pin 3. But when using or, it compares PORTA to the right-hand side and sets any HIGH pin to HIGH on the result.*

*The & symbol is used when turning a pin to low. When using ~(1<<PA3) it sets everything high but pin 3. When comparing the RHS to PORTA using &, the only pins that will remain on are the ones that were already on. Except for pin 3 which will be turned off.*

1. Demonstrate two LEDs blinking alternately
2. Demonstrate 8 LEDs blinking in sequence
   * Preferably use a for or while loop [reference](https://en.cppreference.com/w/c/language/for)
3. Demonstrate the blinking sequence on a separate POR