AMC Exercises 001

2020-05-27, V001, rb

T1: What are the 8-bits (1 byte) binary numbers (base 2) for 86 and -86 (base 10), respectively?
Read the Arduino sketch `0106_Int_Types_stdio_V001.ino` and run it to determine the binary numbers.

T2: Calculate the binary numbers for -86 based on Use Two's Complement. Hint: To get the inverse element of 0010 (2) subtract 1 first, i.e 0010 – 1 = 0001 and then apply bitwise negation (not operation): bitwise not(0001) = 1110. This is -2. Test: 2 + (-2) = 0 <-> 0010 + 1110 = (1)0000 = 0 (in 4 bits).

T3: Add the binary numbers and 'store' the result in 1 byte. What is the result?

T4: Write 86 and -86 (base 10) as hexadecimal numbers.

T5: Write 255, 128, 127, 64, 63, 32, 31, 16, 15 (base 10) as hexadecimal numbers.

T6: What is the resolution (bits) of the Arduino UNO ADC (ATmege328 microcontroller)?

T7: What is the resolution (bits) of the PWM output, i.e. how many different duty cycles can be generated?

T8: Write a program, that reads a single character from the serial port and takes different actions dependent on the character, e.g. if the character is 'H' print "Hello World!", if the character is 'R' print "Read the fine manual", if the character is 'L' and the LED if off switch it on, if the character is 'L' and the LED is on switch it off. You find some useful code to start with in the Git repository.

T9: A voltage divider is given with R1 = 2kOhms connected to GND and R2 connected to +5V. How large does R2 have to be such that the voltage drop across R1 is 4V? What is the total resistance R1 + R2? How large is the current?

T10: Read the comments in Arduino sketch `0104_ADC_Function_and_Integers_V001.ino` and follow the guidelines. What do you observe and why?

T11: Try to use the MPU6050 Accelerometer / Gyroscope with Arduino.