This week….

- Grading caught up:
  - HW 1
  - Quiz 1-3
  - HW 2: discuss today
- Midterm on Thursday
- Project 1 due next Tuesday (minus break)

Midterm Preparation

- Exam discussion on D2L
  - Post sample questions (and answers)
- Look to homework assignments, and in-class and online quizzes
- Exams from previous years
  - Warning: coverage is quite different

Midterm Exam

- No books
- No electronic devices
- You may bring 1 page of **your own** notes
  - Double-sided
- Assigned seating

Number Representations

- Conversion between binary and:
  - Decimal
  - Hexadecimal
- Unsigned versus signed (2's complement) representations
- Bit-wise operations: &, |, ~, ^

Arithmetic

- Adding/subtracting binary numbers
- Taking the 2’s complement of a number
- Shifting left/right (multiplication/division by 2)

Microprocessor Components

- Memory
- Registers:
  - General purpose
  - Special purpose, e.g.:
    - Program counter
    - PORTx, PINx, DDRx
- Arithmetic logical unit
- Data bus

Memory

- Addresses versus values
- Reading from versus writing to
- ROM versus RAM
- ROM versus EPROM (or Flash)

Atmel Digital Input/Output

How to use:

- DDRx
- PORTx
- PINx

You will be asked (in the context of a circuit):

- What a program does
- How to fix a program with bugs

Moving Between Analog and Digital

Digital to Analog:

- Resistive network
- Pulse width modulation + RC circuit

Analog to Digital:

- (analog comparator device)
- Successive approximation