**Today, we will**:

- Do a review example problem – digital data acquisition & aliasing
- Review the pdf module: **Fourier Transforms, DFTs, and FFTs** and do some examples

## Example: Digital data acquisition

**Given**: Andy collects data with a digital data acquisition system that is 14-bit and has a range of -5 to 5 V. He samples at a sampling frequency of 200 Hz.

**(*a*) To do**: Calculate the quantization error in millivolts.

**Solution**:

**(*b*) To do**: For each case, will Andy's signal be clipped? Is there any aliasing? If so, what frequencies will he see (perceive)?

(i) Signal has a frequency of 40 Hz with a range of –3 to 3 V.
(ii) Signal has a frequency of 120 Hz with DC offset = –4.5 V and amplitude = 1.0 V.
(iii) Signal is $f(t) = 3.5\sin(700\pi t) + 1.0$ V.

**Solution**:

## Example: DFTs and FFTs

**Given**: Voltage data are acquired with a digital data acquisition system. A DFT (or FFT) is performed, and a frequency spectrum plot is generated.

**To do**: Which of the following has the better frequency resolution?

**Case a**: Data are sampled at $f_s$ = 100 Hz, and 512 data points are taken.
**Case b**: Data are sampled at $f_s$ = 200 Hz, and 256 data points are taken.

**Solution**:

## Example: DFTs and FFTs

**Given**: A signal contains frequencies up to 500 Hz. Voltage data are acquired with a digital data acquisition system at $f_s$ = 1000 Hz to avoid aliasing. 2048 data points are taken, a DFT or FFT is performed, and a frequency spectrum plot is generated.

**To do**: Calculate the following:

- The total sampling time
- The folding frequency of the resulting frequency spectrum
- The frequency resolution of the resulting frequency spectrum

**Solution**: