Chapter 2 - Mean & Standard Deviation

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Exercise 1

- Write three functions in Octave which calculate the **mean, average deviation and standard deviation** *respectively* in their closed forms from equation 2-2 and 2-1 for N samples.
- Write a function in Octave which calculates the **standard deviation suitable for running statistics**. This should have the number of samples, sum of samples, sum of the squares of the samples and a new list of samples as input.
- Calculate the mean, average deviation and standard deviation in both forms for the samples:

$$(x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9, x_{10}) = (2, 4, 4, 4, 5, 5, 7, 9)$$

  Hint: $\mu = 5$, $\sigma = 1.5$, $\sigma^2 \approx 4.5714$
- Calculate the signal-to-noise ratio, coefficient of variation and typical error for the above samples under the assumption that the mean is the desired signal. Describe what these numbers mean.
- Plot a sine wave of 1 Hz with unit amplitude for 10 seconds. In the same graph plot its average deviation, its standard deviation using your functions from above, its root-mean-square and derived from the root-means-square its peak-to-peak amplitude.
- Derive the formula for the standard deviation for running statistics.