1. **Twelve financial experts are asked to predict the Russell 2000 Index price 30 days in advance. The values they provide are: 1969, 1868, 1855, 1956, 1867, 1933, 1863, 1887, 1936, 1901, 1818, and 1956. In 30 days, the true Russell 2000 price is found to be 1867.**

   a. What is the mean of the predictions?

   b. What is the standard deviation of the predictions?

   c. What is the precision of the experts' predictions?

   d. What is the accuracy of an experts' predictions?

2. **For the following descriptions, the signal of interest is the mean of the signal amplitude and the noise is the standard deviation of the amplitude. Compute the signal to noise ratio for the signal in decibels.**

   * Use our definition of SNR from the week 1 session 2 notes, page 33 of 39 using the signal and noise powers *

   a. $\mu_{signal} = 0.50V, \sigma_{noise} = 0.35V$

   b. $\mu_{signal} = 0.45V, \sigma_{noise} = 0.10V$

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   c. $\mu_{signal} = 0.10V, \sigma_{noise} = 0.25V$

   d. $\mu_{signal} = 18.00V, \sigma_{noise} = 1.80V$

3. **Answer the following questions about sinusoidal signals and noise:**

   a. A sinewave centered at 0V has a peak voltage of 1.80 Volts. What is the standard deviation of the signal?

   b. A sinewave centered at 0 V has an RMS voltage of 2V. What is the standard deviation of the signal?

   c. A sampled sinewave signal has a signal to noise ratio of 6dB. The sinewave itself is known to have a peak voltage of 2.00V. What is the standard deviation of the noise?

4. **Find the mean and SD of the signal that results from adding the random signals indicated by their statistics below.**

    a. $\mu_1 = 1V, \sigma_1 = 20mV$ and $\mu_2 = 1V, \sigma_2 = 20mV$

    b. $\mu_1 = 1V, \sigma_1 = 20mV$ and $\mu_2 = 1V, \sigma_2 = 2mV$

    c. $\mu_1 = 1V, \sigma_1 = 30mV$ and $\mu_2 = 1V, \sigma_2 = 2mV$

    d. $\mu_1 = 3V, \sigma_1 = 10mV$ and $\mu_2 = 5V, \sigma_2 = 15mV$

5. **Answer the following questions about typical error and averaging:**

    a. A signal is normally distributed and has a standard deviation of 1.25V and a mean of 4.50V. What is the typical error of the signal assuming you are looking at just one sample?

    b. If I take 15 samples of the same signal and average them, what is the typical error of the average?

    c. If I want to ensure that my average has a typical error of less than 0.20, how many samples do I need to average together for the signal described above in a?

6. **Answer the following questions about normally distributed noise signals:**

    a. A normally distributed noise signal has a peak to peak value of 3.20 Volts. What is its approximate standard deviation?

    b. A normally distributed noise signal has a peak to peak value of 3.60 volts. What is its variance?