Summations

Example Programming Problems

$$x_1+x_2+x_3+...+x_n=\sum_{i=1}^{n} x_i$$

Equation 1

$$\sum_{i=1}^{n} i^3$$

Equation 2

$$\sum_{i=1}^{n} a^i$$

Equation 3

$$e^x=\sum_{i=0}^{\infty} \frac{x^i}{i!}$$

Equation 4

The fractional relative error is

$$\epsilon_r=\left|\frac{f_i-f_{i-1}}{f_i}\right|$$

Equation 5

Note in Eq. 5, *f* is the value being calculated with a computational technique. Also, this error cannot be calculated for the first iteration of the technique.

Student Programming Problems

$$\ln(1+x)=\sum_{i=1}^{\infty}(-1)^{i+1}\frac{x^i}{i}$$ NOTE: $|x|<1$

Equation 6

Sample Mean and Standard Deviation

$$\bar{x}=\frac{\sum_{i=1}^{n}x_i}{n}$$ This is the sample mean

Equation 7

$$s=\sqrt{\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n-1}}$$ *n* is number of observations and *s* is the sample standard deviation.

Equation 8

Median
For an odd number of values in a data set, the median is the number in the middle if the values are arranged in order. For an even number of values, the median is the average of the two values in the middle of the data set.

Mode
The mode is the value that appears the most times (most frequently) in a data set. If there is a tie for the most frequent value then there are multiple modes.

Products

Sometimes one needs to compute a product

$$f(x)=\sum_{i=1}^{n}y_i\prod_{\substack{j=1\\j\neq i}}^{n}\frac{(x-x_j)}{(x_i-x_j)}=\sum_{i=1}^{n}y_iL_i(x)$$

Equation 9

Write your own code to compute eq. 9.

Use the following data:

x	y
0	0.1
0.1	0.08023
0.2	0.02016

0.3	-0.08351
0.4	-0.23408
0.5	-0.43125
0.6	-0.66752
0.7	-0.92459
0.8	-1.16976
0.9	-1.35233
1	-1.4

Try different x values in your code between 0 and 1.