Econ 325 Section 001
Assignment 1

The due date is Tuesday, September 17, before the class starts.

1. Following is a random sample of three (x, y) pairs of data points:

$$(x_1, y_1) = (11, 52), \quad (x_2, y_2) = (13, 72), \quad (x_3, y_3) = (15, 62)$$

i.e.,

	$i = 1$	$i = 2$	$i = 3$
x_i	11	13	15
y_i	52	72	62

   (a) Compute the sample variance of x, i.e., $s_x^2 = (1/(n-1)) \sum_{i=1}^{n} (x_i - \bar{x})^2$.

   (b) Compute the sample covariance between x and y, i.e., $s_{xy} = (1/(n-1)) \sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})$.

   (c) Compute the sample correlation coefficient between x and y.

2. In one year, the average stock price of Apple Inc. was \$650 with the standard deviation equal to \$100. Using the empirical rule, it can be estimated that approximately 95 % of the stock price of Apple Inc. will be in what interval?

3. Exercise on weighted mean. The final grade point in Econ 325 is computed as a weighted average of assignment (x_1), midterm (x_2), and final exam (x_3). The weights are $w_1 = 0.1$, $w_2 = 0.3$, and $w_3 = 0.6$ for assignment, midterm, and final exam, respectively. Using the summation sign, we may express the final grade point in terms of x_i and w_i for $i = 1, 2, 3$ as $\bar{x} = \sum_{i=1}^{n} w_i x_i = w_1 x_1 + w_2 x_2 + w_3 x_3$ for $n = 3$. Table 2 reports the scores of assignment, midterm, and final exam for two students (A and B). What would be the final grade point for A and B?

Table 2: Grade Points

	Assignment (x_1)	Midterm (x_2)	Final Exam (x_3)
Student A	90	90	46
Student B	80	64	90

4. Please read "Notes on Summation Operator" posted on the course website. Compute the sum $\sum_{i=1}^{n} x_i$, the average $\bar{x} = (1/n) \sum_{i=1}^{n} x_i$, and the sample variance $(1/(n-1)) \sum_{i=1}^{n} (x_i - \bar{x})^2$ when $n = 5$ and $x_i = i$, i.e., $x_1 = 1$, $x_2 = 2$, ..., $x_5 = 5$ as follows.

   (a) Compute $\sum_{i=1}^{n} x_i$

   (b) Compute $\bar{x} = (1/n) \sum_{i=1}^{n} x_i$

   (c) Compute $s^2 = (1/(n-1)) \sum_{i=1}^{n} (x_i - \bar{x})^2$

(d) Show that $\sum_{i=1}^{n}(x_i - \bar{x}) = 0$ for this example.

(e) Show that $\sum_{i=1}^{n}(x_i - \bar{x}) = 0$ holds for any sequence of numbers $\{x_i\}_{i=1}^{n}$ given that $\bar{x} = (1/n)\sum_{i=1}^{n} x_i$.

5. Given two sequences of numbers $\{x_i\}_{i=1}^{n}$ and $\{y_i\}_{i=1}^{n}$ and constant a and b, show that the following are true:

   (a) $\sum_{i=1}^{n} ax_i = a\sum_{i=1}^{n} x_i$.

   (b) $\sum_{i=1}^{n}(x_i + y_i) = \sum_{i=1}^{n} x_i + \sum_{i=1}^{n} y_i$.

   (c) $\sum_{i=1}^{n}(ax_i + by_i) = a\sum_{i=1}^{n} x_i + b\sum_{i=1}^{n} y_i$.

   (d) $\sum_{i=1}^{n}\sum_{j=1}^{n} abx_iy_j = ab\sum_{i=1}^{n} x_i\left(\sum_{j=1}^{n} y_j\right)$

   (e) $\sum_{i=1}^{n}\sum_{j=1}^{n} abx_iy_j = ab\sum_{j=1}^{n} y_j\,(\sum_{i=1}^{n} x_i)$