1. The data below represents suspended solids concentrations in river water (taken from “Water Quality in Agricultural Watershed: Impact of Riparian Vegetation during Base Flow, Water Resources Bull., pp. 233-239, 1981). Values are in parts per million (ppm). Consider the following 50 observations:

   55.8  60.9  37.0  91.3  65.8  42.3  33.8  60.6  76.0  69.0
   45.9  39.1  35.5  56.0  44.6  71.7  61.2  61.5  47.2  74.5
   83.2  40.0  31.7  36.7  62.3  47.3  94.6  56.3  30.0  68.2
   75.3  71.4  65.2  52.6  58.2  48.0  61.8  78.8  39.8  65.0
   60.7  77.1  59.1  49.5  69.3  69.8  64.9  27.1  87.1  66.3

   a) Construct a relative frequency diagram (see Section 2.4, pp. 37-42) using the intervals 0 - <10, 10 - <20, 20 - <30, 30 - <40, …, 90 - <100.
   b) What portion of the concentrations are less than 50 ppm? At least 60 ppm?
   c) Explain why you cannot base a frequency diagram on the intervals 0 - 10, 10 - 20, 20 - 30, 30 - 40, …, 90 - 100.
   d) Compute the sample mean, median, variance, standard deviation, coefficient of variation, and sample range.
   e) Determine the following percentiles: 10, 25, 75, and 90.
   f) Construct a box-and-whisker plot describing the data set. (See Section 2.5.4, pp. 45-47)
   g) Briefly discuss what the box-and-whisker plot shows about your data.

2. Do problem #2-29 on p. 58 of Ayyub & McCuen.

3. Suppose that vehicles taking a particular freeway exit can turn right (R), left (L), or go straight (S). Consider observing the direction for each of three successive vehicles.

   a) List all outcomes in the event A that all three vehicles go in the same direction.
   b) List all outcomes in the event B that all three vehicles take different directions.
   c) List all outcomes in the event C that exactly two of the three vehicles turn right.
   d) List all outcomes in the event D that exactly two vehicles go in the same direction.
   e) List outcomes in D’, C ∪ D, and C ∩ D.
4. Consider a randomly selected student. Let A denote the event that the student has a Visa credit card and B denote the event that the student has a MasterCard. Suppose \( P(A) = 0.5, \) \( P(B) = 0.4, \) and \( P(A \cap B) = 0.25. \)

a) Compute the probability that the selected student has at least one of the two types of cards (i.e., the probability of the event \( A \cup B \)).

b) What is the probability that the student has neither type of card?

c) Calculate the probability that the student has a Visa card but not a MasterCard.

5. A consulting firm presently has bids out on three projects. Let \( A_i \) denote the event that they are awarded project \( i \) for \( i = 1, 2, 3. \) Suppose that \( P(A_1) = 0.22, \) \( P(A_2) = 0.25, \) \( P(A_3) = 0.28, \) \( P(A_1 \cap A_2) = 0.11, \) \( P(A_1 \cap A_3) = 0.05, \) \( P(A_2 \cap A_3) = 0.07, \) and \( P(A_1 \cap A_2 \cap A_3) = 0.01. \) Compute the probability of the following events:

a) \( A_1 \cup A_2 \)

b) \( A_1' \cap A_2' \) [Hint: \((A_1 \cup A_2)' = A_1' \cap A_2' \)]

c) \( A_1 \cup A_2 \cup A_3 \)

d) \( A_1' \cap A_2' \cap A_3' \)

**Useful Excel Functions**

=\text{AVERAGE}(\text{number 1, number 2, … }) \) returns the sample mean (average)

=\text{MEDIAN}(\text{number 1, number 2, … }) \) returns the sample median (50\textsuperscript{th} percentile)

=\text{STDEV}(\text{number 1, number 2, … n}) \) returns the sample standard deviation

=\text{VAR}(\text{number 1, number 2, … n}) \) returns the sample standard variance