N.Crato, S.Dhar, N.Moheb, B.Ray

I pledge my honor that I have abided by the Honor System. ———————————
Show your work for full credit.

1. In a college graduating class of 100 students, 54 studied mathematics, 69 studied history, and 35 studied both mathematics and history. If one of these students is selected at random, find the probability that:

    (a) (7 pts) the student took mathematics or history.

    (b) (7 pts) the student took neither mathematics nor history.

    (c) (7 pts) the student took history but not mathematics.

2. (12 pts) Ten race cars, numbered from 1 to 10, are running around a circular track. An observer sees three cars go by. If the cars appear in random order, what the probability that the largest number seen is six?

3. The data give the observed times (in milliseconds) for packets of uniform size to travel through a local area network during a one minute period.

   33, 24, 45, 36, 88, 32, 47, 65, 97

   Denote the sample average time by $\bar{x}$ and the sample standard deviation by s.

    (a) (5 pts) Find the sample median, $\tilde{m}$, of the data.

    (b) (5 pts) Compute the sample average, $\bar{x}$, of the data.

    (c) (6 pts) Is the distribution of the data symmetric? Explain why or why not.

(d) (6 pts) Suppose the network experiences a slowdown, so that the original transfer times are increased by a factor of three. Additionally, a waiting time of one millisecond is added to each of the increased transfer times. Give the sample average and sample standard deviation of the new transfer times as a function of the sample average and sample standard deviation of the original transfer times. (Note: it not necessary to compute $\bar{x}$ or s for the original data.)

4. A town has 3 fire engines operating independently. The probability that a specific engine is available when needed is 0.96.

    (a) (8 pts) What is the probability that none are available when needed?

    (b) (7 pts) What is the probability that at least one fire engine is available when needed?

5. (15 pts) Computer chips coming off an assembly line are marked as defective (D) or non-defective (N). The chips are tested and their condition listed. This is continued until 2 consecutive defectives are produced or until 4 chips have been tested, whichever occurs first. List all possible outcomes in the sample space for this experiment.

6. A message is coded into binary symbols 0 and 1 and sent over a communication channel. The probability that a 0 is sent is 0.4 and the probability that a 1 is sent is 0.6. The channel, however, has a random error that changes a 1 to a 0 with probability 0.2 and changes a 0 to a 1 with probability 0.1.

    (a) (10 pts) What is the total probability that a 0 is received?

    (b) (5 pts) Given that a 1 is received, what is the probability a 0 was sent?