Statistics Exercises

Measures, Probability, Permutations and Combinations

1. Consider the following dataset: 2, 0, 5, 0, 4, 8, 2, 1, 1, 7.
   (a) Calculate the mean, median and mode of this set.
   (b) Is the dataset symmatrical? If not, is this set skewed to the left or to the right?
   (c) Calculate the range of the dataset.
2. Consider the following dataset: 3, 5, 6, 1, 6, 5, 8, 4, 7.
   (a) Calculate the mean, median and mode of this set.
   (b) Calculate the variance and the standard deviation.
   (c) Verify that at least 75% of the measurements differ from the mean less than twice the standard deviation (Tchebichevs Rule).
   (d) Calculate the range of the dataset.
   (e) Calculate the standard score of the 100th percentile.
3. Consider the following eight letters: a, c, f, g, i, t, x, w.
   (a) How many permutations are there of the eight letters?
   (b) Of the permutations in part (a) how many start with the letter t?
   (c) Of the permutations in part (a) how many start with the letter g and end with the letter c?
4. A computer science professor has seven different programming books on a bookshelf, three of them dealing with C++ and the other four with Prolog. In how many ways can the books be arranged on the shelf if
   (a) there are no restrictions,
   (b) if the languages must alternate,
   (c) if all the C++ books must be next to each other, and
   (d) if all the C++ books must be next to each other and all the Prolog books must be next to each other?
5. How many words of 3 letters can be created from the set {m, r, a, f, t}, including meaningless words?
6. In a certain population, 30% of the persons smoke and 8% have a certain type of heart disease. Moreover, 12% of the persons who smoke have the disease. Use Bayes' theorem to compute:
   (a) the percentage of the population that smoke and have the disease
   (b) the percentage of the population with the disease that also smoke
7. Two coins are flipped simultaneously. One has a probability of heads equal to 0.6 and the other has a probability of heads equal to 0.7. What is the probability that the coin flip will be both heads or both tails?

8. For a very large group of students, the probability of receiving the mark 10 in the course 'Mathematical Techniques in Computer Science' was 30 percent ($P(MTCS)$ is 0.3), and the probability of a 10 in the course 'Elementary Maths for Game and Media Technology' was 20 percent ($P(EMGMT)$ is 0.2). Also 15 percent of the students had 10 in both classes ($P(MTCS$ and $EMGMT)$ is 0.15). All students followed both courses.

   (a) Build a table with columns $P(MTCS)$ and $P(\neg MTCS)$ and rows $P(EMGMT)$ and $P(\neg EMGMT)$, and fill the table elements with $P(MTCS \wedge EMGMT)$, $P(MTCS \wedge \neg EMGMT)$ etc.

   (b) What is the probability that a randomly selected student got exactly one 10?

   (c) What is the probability that a student got no 10?

   (d) If someone got a 10 in EMGMT, what is the probability that she or he got a 10 in MTCS?

   (e) Does the data precisely agree with the assumption that the event of getting a 10 in MTCS is independent of getting a 10 in EMGMT?