NAME _____

STAT 291 - Statistics for the Mathematical Sciences I

Example Probability Problems

For each of the following examples, begin by clearly defining the events of interest, and then constructing a Venn Diagram for the scenario. Then answer the questions that are asked in class.

1. A certain small town has two main attractions, a caverns and a small zoo. The local chamber of commerce has found that on any given day 80% of tourists visit the caverns, while 55% of tourists visit the zoo. They also found that 42% visit both attractions.

2. Suppose that at a large university it is known that two thirds of all athletes are male. It is also known that 20% of all athletes would test positive for steroids, or some other substance that has been banned by the NCAA. 30% of all athletes are known to be women who would not test positive for any banned substance.

3. Professor Jackson is in charge of a certain community college's program to prepare people for a high school equivalency exam. Records show that the two most common subjects that students need help in are mathematics and English. 80% of students need tutoring in math, while 70% need help with English. Suppose that only 20% need help in English but not math.

4. It is estimated that 15% of the adult population has hypertension, but that 75% of all adults feel that personally they do not have this problem. It is also estimated that 6% of the population has hypertension but does not think that the disease is present.

Questions

1. Tourist Example
   (a) What is the probability that a randomly selected tourist would not visit either attractions?
   (b) What is the probability that a random tourist would visit the caverns, but not the zoo?
   (c) What is the probability that a random tourist would visit the caverns, given that they visited the zoo?
   (d) Are visiting the caverns and visiting the zoo mutually exclusive?
   (e) Are visiting the caverns and visiting the zoo independent?

2. The Athlete Example
   (a) What is the probability that a randomly selected athlete is male and would not test positive?
   (b) What is the probability that a random athlete is female or would test positive?
   (c) If we select a female athlete, what is the probability that she would test positive?
   (d) What is the probability that a male athlete would test positive?
   (e) Are gender and testing positive or negative independent of each other?

3. The GED Example
   (a) What is the probability that a student does not need help in either subject?
   (b) What is the probability that a student does not need help in English?
   (c) Given that a student does not need help in English, what is the probability of needing help in math?
   (d) Are needing help in English and math independent?

4. The Hypertension Example
   (a) Suppose someone does not think they have hypertension, what is the probability that they do?
   (b) Suppose someone thinks they do have hypertension, what is the probability that they do?
   (c) Are the events independent?
   (d) What is the probability that someone thinks they have hypertension or actually does have hypertension?
   (e) What is the probability that someone does not think they have hypertension, given that they do?