Stat 301 HW2

Summer 2018

Instructions: Follow submission directions in BbLearn

(1) A manufacturer has 5 computers that seem to be alike. Unknown to the quality department as of this point, it is found that 2 of the 5 are defective. An order calls for 2 of the terminals and is filled by randomly selection 2 of the 5 that are available.
   (a) List the sample space for this experiment.
   (b) Let A denote the event that the order is filled with 2 non-defective computers. List the sample points for event A.
   (c) Construct a Venn diagram for the experiment, illustrating event A.
   (d) What is the probability of event A?

(2) If you flip a fair coin 10 times, what is the probability of:
   (a) getting all heads
   (b) getting all tails
   (c) getting at least one tail?

(3) There are two events, A and B, such that $P(A) = 0.2$, $P(B) = 0.6$ and $P(A \cap B) = 0.1$. Find the following probabilities:
   (a) $P(A|B)$
   (b) $P(B|A)$
   (c) $P(A')$
   (d) $P(A|A \cap B)$
   (e) $P(A \cup B)$
   (f) $P(A' \cup B')$
   (g) Are events A and B independent? Show work

(4) An individual who has automobile insurance from a certain company is randomly selected. Let Y be the number of moving violations for which the individual was cited during the last 3 years.
   (a) Calculate EY
   (b) Calculate VY
   (c) Calculate SDY

y	0	1	2	3
$P(y)$	0.6	0.25	0.1	0.05

(5) In a study of a lake's fish population, scientists capture fish from the lake, then tag and release them. Suppose that over a period of five days, 200 fish of a certain type are tagged and released. As part of the same study, 20 such fish are captured three days later. Let X denote the number of tagged fish among the 20 captured. Suppose it is known that the lake has 1000 fish of this particular type.
   (a) What is this distribution? What are its parameter(s)?
   (b) What is the probability that at most four tagged fish will be found in the sample?
   (c) On average, how many tagged fish would you expect to find? Also calculate VX and SDX

(6) Hurricanes arrive to a certain region with a mean of 2.45 per year. Find the following:
   (a) What is this distribution? What are its parameter(s)?
   (b) What is the probability that there will be no hurricanes next year?
   (c) What is the probability that there will be more than 2 hurricanes next year?
   (d) What is the probability that during the next *two* years, there will be between one and three hurricanes?
   (e) Calculate EX, VX, and SDX

(7) Records at a certain doctor's office show that 22% of all patients admitted to a medical clinic fail to pay their bills, and eventually the doctor's office forgives the bill. Suppose that $n = 12$ patients represent a

random sample from the large pool of patients that are served by this doctor. Find the following:

   (a) What is this distribution? What are its parameter(s)?

   (b) What is the probability that all the bills will be forgiven?

   (c) What is the probability that one will be forgiven?

   (d) What is the probability that at least two will be forgiven?

   (e) Suppose now that there will be 500 patients in the sample. Find the expected number of bills that would need to be forgiven. Also calculate VX and SDX.

(8) It has been estimated that only about 30% of California residents have adequate earthquake supplies. Suppose we are interested in the number of California residents we must survey until we find a resident who does not have adequate earthquake supplies.

   (a) What is this distribution? What are its parameter(s)?

   (b) What is the probability that we must survey just one or two residents until we find a California resident who does have adequate earthquake supplies?

   (c) What is the probability that we must survey at least three California residents until we find a California resident who does have adequate earthquake supplies?

   (d) On average, how many California residents do you expect to need to survey until you find a California resident who does have adequate earthquake supplies? Also calculate VX and SDX.