

# A14

## Extra credit module 14

### Discrete Distributions Redux

#### Stat 251

**Instructions:**

Only upload in BbLearn. Follow directions on Assignments link on class website for BbLearn submissions; deviation from instructions will result in no earned points.

This assignment is worth up to 3.5 points **if and only if you complete ALL problems**. Once you complete all problems and upload your document to BbLearn, the quiz for this module will be available to you in BbLearn.

- (1) Suppose that the probability that an adult in America will watch the Super Bowl is 40%. Each person is considered independent. We are interested in the number of adults in America we must survey until we find one who will watch the Super Bowl.
  - (a) In words, define the random variable  $X$
  - (b) List the values that  $X$  may take on
  - (c) Give the distribution of  $X$  in shorthand notation
  - (d) How many adults in America do you expect to survey until you find one who will watch the Super Bowl?
  - (e) Find the probability that you must ask seven people
  - (f) Find the probability that you must ask three *or* four people
  
- (2) 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) In words, define the random variable  $X$
  - (b) List the values that  $X$  may take on
  - (c) Give the distribution of  $X$  in shorthand notation
  - (d) What is the probability that we must survey just one *or* two residents until we find a California resident who does not have adequate earthquake supplies?
  - (e) What is the probability that we must survey *at least* three California residents until we find a California resident who does not have adequate earthquake supplies?
  - (f) How many California residents do you expect to need to survey until you find a California resident who does not have adequate earthquake supplies?
  - (g) How many California residents do you expect to need to survey until you find a California resident who does have adequate earthquake supplies?

- (3) A group of Martial Arts students is planning on participating in an upcoming demonstration. Six are students of Tae Kwon Do; seven are students of Shotokan Karate. Suppose that eight students are randomly picked to be in the first demonstration. We are interested in the number of Shotokan Karate students in that first demonstration.
- In words, define the random variable  $X$
  - List the values that  $X$  may take on
  - Give the distribution of  $X$  in shorthand notation
  - How many Shotokan Karate students do we expect to be in that first demonstration?
- (4) Suppose that a technology task force is being formed to study technology awareness among instructors. Assume that ten people will be randomly chosen to be on the committee from a group of 28 volunteers, 20 who are technically proficient and eight who are not. We are interested in the number on the committee who are *not* technically proficient.
- In words, define the random variable  $X$
  - List the values that  $X$  may take on
  - Give the distribution of  $X$  in shorthand notation
  - How many instructors do you expect on the committee who are not technically proficient?
  - Calculate the variance and standard deviation
  - Find the probability that at least five on the committee are not technically proficient
  - Find the probability that at most three on the committee are not technically proficient
- (5) The probability that a randomly selected box of a certain type of cereal has a particular prize is 0.2. Suppose you purchase box after box until you have obtained two of those prizes (you REALLY want them!).
- What is the name of this distribution? What is/are its parameter(s)?
  - What is the probability that you purchase exactly four boxes (meaning that 2 of the 4 contain your prize)?
  - What is the probability that you purchase at most four boxes?
  - How many boxes do you expect to purchase? What is the variance and standard deviation?
- (6) An oil company conducts a geological study that indicates that an exploratory oil well should have a 20% chance of striking oil.
- What is the name of this distribution? What is/are its parameter(s)?
  - What is the probability that the first strike comes on the third well drilled?
  - What is the probability that the third strike comes on the seventh well drilled?
  - How many wells would we expect that must be drilled if the oil company wants to set up three producing wells? What is the variance and standard deviation?
- (7) A specific location has a 10% chance of rain on any given day during a given week.
- What is the name of this distribution? What is/are its parameter(s)?
  - What is the probability that it will take a week for it to rain on two separate days?
  - What is the probability that it will take two weeks for it to rain on two separate days?
  - How many days would we expect to pass before it rains on two days? What is the variance and standard deviation?