MSIT 431: PROBABILITY AND STATISTICAL METHODS

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Ques 1. Exercise 3.15

Ans 1.

(a) Article in the student newspaper reporting interviews with three students who were unable to get tickets is a sample survey if it is meant to interview only students who were unable to get tickets. However, if it is meant to represent general opinion, it represents Anecdotal data which represents individual cases and are not necessarily representative of any larger group of cases.
(b) The data represents a sample survey of students who tried to get the ticket to the concert.
(c) The data represented here is a sample survey. The difference between the data represented in (b) and (c) is the fact that students are selected in (c) but in (b) students have volunteered to be a part of the survey.
(d) No. It is not an experiment. It does not have a treatment.
(e) There are different in which data can be represented. In an experiment, a certain condition is imposed on individuals and their responses are recorded. Anecdotal data reports cases that do not necessarily represent a larger group of case like in (a). In contrast to this (b) is an example of sample survey collecting data from a sample of cases that represents a larger population of cases.

Ques 2. Exercise 3.105

Ans 2. In CAPI, interviewer reads the question and enters the response. On the other hand, CASI is computer aided self-interview where the individual himself record their responses on a machine. CASI method would always almost show a higher percent of subjects admitting use of illegal drugs because a person would be more comfortable about sharing personal details of drug use with a computer rather than with a

Ques 3. Exercise 4.5

Ans 3. Set of possibilities for rolling two dices is as follows: -

(1,1), (1,2), (1,3), (1,4), (1,5), (1,6)

(2,1), (2,2), (2,3), (2,4), (2,5), (2,6)

(3,1), (3,2), (3,3), (3,4), (3,5), (3,6)

(4,1), (4,2), (4,3), (4,4), (4,5), (4,6)

(5,1), (5,2), (5,3), (5,4), (5,5), (5,6)

(6,1), (6,2), (6,3), (6,4), (6,5), (6,6)

Favorable possibilities : (6,1), (5,2), (4,3), (3,4), (2,5), (1,6), (5,6), (6,5)

Probability that the shooter wins (25 times) immediately on the come out roll is 8/36=0.22^25

Ques 4. Exercise 4.34

Ans 4.

(a) Each of the 4 positions of the PIN number can take a number between 0-9 (10 values).

Hence, possible PINS could be 10x10x10x10=10000

(b) For Probability that a PIN assigned at random has at least one 0, we will compute probability for no zeros and subtract 1 from that.

For no zeros, probability = (9*9*9*9)/10000=0.6561

Probability that a PIN assigned at random has at least one 0= 1-.6561=0.3439

Ques 5. Suppose 3 different letters are to be mailed to 3 distinctly addressed envelopes. An absent-minded assistant randomly puts the 3 letters into the 3 envelopes, one letter in each envelope. What is the probability that NONE of the letters arrive at the intended address? [Hint: Use the classical view of probability. Describe an entire set of equally likely outcomes and count the number of outcomes contained in the event under question.]

Ans 5. Let there be three different letters 1,2 and 3 and three envelopes 1,2,3.

Envelopes	**1**	**2**	**3**
	1	2	3
	1	3	2
Letters	3	2	1
	3	1	2
	2	1	3
	2	3	1

Probability that none of the letters arrive at the intended address 2/6=.33

Ques 6. Powerball

Consider the Illinois Powerball problem discussed in class. Find the probability that a valid lottery ticket matches 3 out of 5 white balls and match the Powerball. (In case you're curious, the payout for winning this prize is $100.) [Hint: It boils down to counting the number of equally likely winning tickets. You need to use combinatorics because there are too many to enumerate.]

Ans. For Valid Lottery ticket 3 out of 5 white balls and matching Powerball, $5C_3 \times 64C_2 = 20{,}160$

Total no. of possible outcomes: $69C_5 \times 26C_1 = 11238513 \times 26 = 292,201,338$

Probability: 20160/292201338=0.0000689935

Ques 7. Baseball series.

Suppose the two baseball teams, Chicago Cubs and Washington Nationals, are equally good in the sense that in any given game, each team wins with probability 1/2. Consider a new best-of-five series between them, namely, the team that wins three games wins the whole series. (No more game will be played azzfter one team already wins three.) What is the probability that the fifth game needs not be played to decide the winner? [Hint: Whether a fifth game is needed depends on the outcomes of the first four games. You can quickly solve the problem using combinatorics. Alternatively, you could enumerate all the equally likely outcomes of the first four games and then count—to make this easy, you could assume four games are always played, although the fourth is inconsequential if the first three already decide which team wins.]

Ans. Probability that fifth game need not be played = 1-Probability that fifth needs to be played.

Probability that fifth need to be played would be when there is a tie 2:2. Probability of each team winning is ½.

So, Probability that fifth need to be played=$4C_2 \times (1/2)^4 = 6/16 = 3/8$

Hence, Probability that fifth game need not be played=1-(3/8)=5/8=0.625