

One assignment submitted per group. Show all of your work. Please staple in the upper left hand corner.

- Identify the most plausible distribution (Bernoulli, Binomial, Geometric, Poisson) to model the following random variables and identify the expected value, the variance, and the probability that the observed outcome is 1:
 - The number of multiple choice questions a bot randomly guessing will get correct (20 questions, 4 choices for each question).
 - How many printing jobs a printer receives in an hour (on average it receives 50 printing jobs in an 8 hour day).
 - The number of people you need to meet before meeting somebody with the same birthday as you. Assume birthdays are perfectly uniformly distributed among the 365 days of the year (don't include February 29).
 - Whether my dog Brutus will be excited to see me when I come home today (Use $X = 0$ for not excited, $X = 1$ for excited). Assume there is a probability of .9999 that he will be excited.
- Suppose I have a random variable X with probability mass function $f(x) = cx^2$ for $x = 1, 2, 3, 4, 5$ and $f(x) = 0$ for all other values.
 - What value does c need to be to make this a valid probability mass function?
 - Find the CDF corresponding to this probability mass function.
 - What is $P(X = 3)$?
 - What is $P(|X - 3| > 1)$?
 - What is $P(X = 2|X \leq 3)$?
 - What is $E[X]$?
 - What is $E[e^X]$?
 - What is $SD[X]$?
- The current Jackpot for the Powerball lottery is 70 million dollars (top line in the table). You can win the same amount of money in more than one way (depending on if you get a match on the special red ball). The table of the prizes and corresponding probabilities are as follows (make the assumption that nobody else would win the Jackpot so you wouldn't have to split the winnings):

Prize (\$)	Probability
70,000,000	1/175223510.00
1,000,000	1/5153632.65
10,000	1/648975.96
100	1/19087.53
100	1/12244.83
7	1/360.14
7	1/706.43
4	1/110.81
4	1/55.41
0	c

- What must c be to make this a valid probability distribution?
- What is the expected Prize amount of a Powerball ticket? (don't include ticket price)
- Note that a Powerball ticket has a cost of \$2. What is the expected payout of a Powerball ticket?
- What is the variance and standard deviation of the payout of a Powerball ticket?
- If Tim plays the Powerball two times in a row what is the probability that Tim doesn't lose money?
- What would the Jackpot need to be for the expected value of the payout of a ticket to rise to \$0?

4. A statistics instructor wrote an exam and on it they put a question that they believed each student would have a probability of .8 of getting correct. There were 55 exams that were graded and 38 students correctly answered the question.
- (a) What is the probability that if the true probability of a student getting the question correct was 80% that 38 students out of the 55 would answer correctly?
 - (b) What is the probability that 38 or less students would have answered the question correctly if the true probability of success was .8?
 - (c) Using the previous two answers do you think the professor's expectations were too high?
5. In a computer lab there are two different printers. From 1pm-2pm Printer1 receives on average 12 print jobs and Printer2 receives on average 5 print jobs. Assume the number of print jobs requested on Printer1 and on Printer2 are independent of each other.
- (a) Define random variables to denote the number of print jobs each printer gets and state their distributions.
 - (b) What is the expected number of print jobs for Printer1 from 1:00pm-1:25pm?
 - (c) What is the probability that Printer2 receives 10 or more print jobs between 1pm and 2pm?
 - (d) What is the distribution of the number of print jobs requested in that computer lab from 1pm-2pm?
 - (e) What is the probability that there are 0 print jobs requested in the computer lab between 1pm and 2pm?