

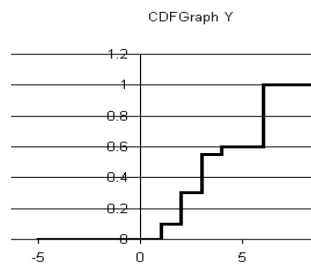
Math 382 Practice Exam 1

1. Consider a well-shuffled deck of cards consisting of 52 distinct cards, 4 of which are aces. Draw one card from the deck and put it aside. Then draw another card. Denote $A_1 =$ "First card is an ace", $A_2 =$ "Second card is an ace"
 - (a) Find $P(A_1)$
 - (b) Find $P(A_2 | A_1)$
 - (c) Find $P(A_1 | A_2)$
 - (d) Are events A_1, A_2 independent? Explain.
 - (e) What is the probability that you draw your first ace on your third try?

2. A computer manufacturer uses chips from three sources, equal amount from each source. Chips from sources A, B and C are defective with probabilities 0.001, 0.005 and 0.01, respectively.
 - (a) What proportion of all chips used by manufacturer will be defective?
 - (b) If a chip is found to be defective, find the probability that the source was C.

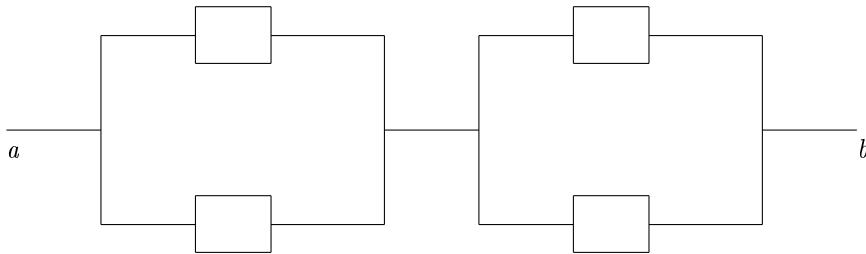
3. Multiple choice: circle the appropriate answer and explain.
 - (a) If the events A and B are mutually exclusive then A, B are independent. Is this true?
 Always Never Sometimes
 - (b) If the sample space consists of n outcomes, then each outcome has the probability $1/n$.
 Always Never Sometimes
 - (c) The following is the graph of CDF of a random variable Y. Then $P(Y = 3)$ equals:

0.5 0 0.25 0.55



- (d) A box contains 6 red balls and 13 white balls. Four balls are drawn at random. The probability that we will get exactly 2 red balls and 2 white ones is
 0.000258 0.0387 0.302 4/19

4. The average number of accidents at a busy intersection is 41.6 per year.
- Find the expected number of accidents in a week.
 - Find the probability that there will be no accidents in a week
 - Find the probability that there will be 2 or more accidents in a month
5. An insurance company is selling a “one-sum” policy on your car. You pay a premium of \$500 in the beginning of the year. In the event your car gets seriously damaged, you will obtain a payment of \$9000. The probability that a car will get seriously damaged during a year is estimated as 4%.
- Find the distribution of the random variable X = amount of money you receive from the company in a year [make a table containing x and $f(x)$].
 - Find the expected profit of the insurance company from the policy.
 - If the insurance company sells 500 such policies, what is its expected profit?
 - Find the variance of the profit.
6. Shaquille O’Neal makes 50% of his free throws. He attempts 10 in a game.
- Find the probability he will make 8 or more.
 - Find the standard deviation of the number of free throws he makes.
 - What assumption should one make to be able to evaluate a), b) ?
 - Find the probability that he needs 5 free throws to make his 2nd.
7. (a) Assuming that components act independently, find the probability that the following system works: (each component has reliability of 0.7)



- Suppose the system has n components, all connected in parallel. How large should n be to make the reliability of the entire system higher than 99.9%? (each component still has the reliability of 0.7) Show your reasoning.

Exam policy: one page (8.5x11 inches) with formulas, calculator