Discussion Section #3
Due: To be submitted to CatCourses by 11:59pm.

Instructions:

This week, you will focus on reviewing material from Chapters 1 - 4 and fundamental properties from calculus.

You are allowed to work alone or in small groups. But if you work in a group, the work you turn in should be your own.

Discussion assignments will be graded for both completeness and correctness. Simply providing the correct answer, without justification, is not considered complete. For credit you **must** either show you steps (if it's a calculation problem) or explain/justify your reasoning (if it's a short answer problem).

Your Discussion Assignment must be submitted as a PDF to CatCourses by 11:59pm the day of your Discussion Section.

Problem Set:

1. An academic department with five faculty members—Anderson, Box, Cox, Cramer, and Fisher—must select two of its members to serve on a personnel review committee. Because the work will be time–consuming, no one is anxious to serve, so it is decided that the representatives will be selected by putting five slips of paper in a box, mixing them, and selecting two.

   (a) What is the probability that both Anderson and Box will be selected?

   (b) What is the probability that at least one of the two members whose name begins with C is selected?

   (c) If the five faculty members have taught for 3, 6, 7, 10, and 14 years, respectively, at the university, what is the probability that the two chosen representatives have a combined at least 15 years' teaching experience at the university?

2. You roll a pair of standard six–sided dice and record the largest of the two values showing. Let X be random variable associated with the outcome of this experiment. (Example: If you roll a 2 and a 6, you will record the outcome $X = 6$.)

   (Hint: To answer these questions, you might want to make a Table and review the slides from Lecture 6.)

   (a) What is the sample space of X?

   (b) What is the probability mass function (PMF) of X?

   (c) What is the cumulative distribution function (CDF) of X?

3. If you roll a pair of fair standard six–sided dice, what is the probability that

   (a) the sum is 7;

   (b) the larger number is at least 5:

(c) both numbers are at least 5?

4. In class I have said several times that "the PMF and the CDF give equivalent information". We have so far only used the PMF to construct the CDF. Now we are going to do the reverse: use the CDF to construct the PMF.

   Let $p(a)$ be the probability mass function (PMF) of a random variable A.

$$p(a) = \begin{cases} p_1, & a = a_1 \\ \dots & \\ p_k, & a = a_k \\ 0, & \text{otherwise.} \end{cases}$$

   (Notice that we have not specified the values of p_i's and a_i's.) The cumulative distribution function (CDF) associated with $p(a)$ is defined as follows:

$$F(a) = \sum_{a_i \leq a} p(a_i), \quad \text{if } p(a_i) \geq 0.$$

   (Or as I prefer to write it: $F(a) = P(A \leq a)$.) And given by this formula:

$$F(a) = \begin{cases} 0, & a < 0 \\ 1/2, & 0 \leq a < 1 \\ 3/4, & 1 \leq a < 2 \\ 1, & 2 \leq a. \end{cases}$$

   Use $F(a)$ to recover the states a_i and their associated probabilities p_i.

   (Hint: You should graph the function!)