Name: _____

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ISyE 2027a
Test 3

Calculators, notes, and books are not allowed. Please work in the bluebook and transfer your answers to the back of this sheet. Put your name on everything and hand in both the bluebook, test, and answer sheet.

1. (30 points) What would be the name of a reasonable distribution for modelling the following? (a) The combined weight of 100 oranges. (b) The number of oranges weighed until an orange exceeds 1 pound. (c) The number of oranges out of the next 100 that exceed 1 pound. (d) The amount of juice strained until a seed slips through the sieve. (e) The number of seeds that slip through the sieve during the next 10 gallons of juice strained.

2. (30 points) Suppose X is equally likely to be 0, 1, or 2. (a) What is the mean of X? (b) What is the variance of X? (c) What is $\Pr\{X = 2 \mid X = 2\}$?

3. (30 points) Let X be the number of aces and Y the number of kings in a 5 card hand dealt from a standard deck. Find the marginal probability mass function of X. Find the joint probability mass function of X and Y. (In answering the previous two questions, please use the notation $\binom{n}{k}$.) Are X and Y independent and why?

4. (30 points) Suppose X has probability density function $f(s) = 3 * (1 - x^2)/4$ for $-1 \leq s \leq 1$. (a) Find the mean of X. (b) Find the variance of X. (c) Find the cumulative distribution function of X.

5. Suppose the average amount of juice in a randomly selected orange is 1/2 cup with a standard deviation of 1/4 cup, and that we need 30 cups of juice. Accurately approximate the probability that 64 oranges will supply enough juice.

6. Suppose a street vendor sells fresh squeezed orange juice at a price of \$6 per pint though it only costs \$2 per pint. The vendor is unable to replenish the juice supply during the day. Leftover juice has a value of \$1 per pint. The daily demand for juice is assumed to be uniformly distributed from 10 to 20 pints. How many pints of juice should the vendor bring each morning in order to maximize the expected profit?

7. (30 points) Suppose a miniload has a storage rack that is 100 feet long and 20 feet high with the i/o point in one corner. The s/r machine travels 5 feet per second horizontally and 1 foot per second vertically. Currently, items are stored in the rack without respect to their activity. However, it has been determined that only 25% of the items cause 90% of the activity. Suppose these most active 25% of the items are moved to the 25% closest of storage locations. Let T be the time from the i/o point to the location of a random selected item. Find the cumulative distribution function of T.