

# Sample Questions for the Final Exam

## STOR 435

**Problem:** Let  $X$  and  $Y$  be independent random variables with probability mass functions

$$\begin{array}{c|cc} x & 0 & 1 \\ \hline p_X & .5 & .5 \end{array}$$

$$\begin{array}{c|cc} y & 0 & 2 \\ \hline p_Y & .5 & .5 \end{array}$$

a. Find  $EX$

Answer:\_\_\_\_\_.

b. Find  $EXY^2$

Answer:\_\_\_\_\_.

c. Find the probability mass function and CDF of  $Z = \min(X, Y)$ .

**Problem:** The heights of male students applying for a basketball team are independent and normally distributed with mean 72in and standard deviation 6in.

a. Find the height  $h$  such that 70% of the applicants are at least  $h$  inches tall.

Answer:\_\_\_\_\_.

Suppose that a student is placed on the team if and only if he is greater than or equal to 76in tall.

b. Find the probability that a student is placed on the team.

Answer:\_\_\_\_\_.

c. What is the expected number of applications the coach will need to review until he puts together a team of 12 players?

Answer:\_\_\_\_\_.

**Problem:** To operate properly a certain machine requires a ballast whose weight can range from 8.00 to 12.00 lbs. Ballasts produced by a supplier have random weights with mean 10 lbs and variance 2 lbs<sup>2</sup>.

a. Find an upper bound on the probability that a ballast produced by the supplier will not be suitable for the machine.

Answer:\_\_\_\_\_.

b. Estimate the probability that a shipment of 50 ballasts will weigh more than 515 lbs.

Answer:\_\_\_\_\_.

c. Concisely state any assumptions you made in answering part (b) above.

**Problem:**

A. Carefully state the Cauchy-Schwarz inequality.

B. Let  $X$  be a random variable such that  $Ee^X$  and  $e^{EX}$  are finite. What can you say about the relation between these two quantities?

C. Let  $X_1, X_2, \dots$  be i.i.d.  $\text{Exp}(2)$  random variables. Find the limiting values of the following quantities as  $n$  increases.

a.  $\frac{1}{n} \sum_{i=1}^n X_i$

b.  $\frac{1}{n} \sum_{i=1}^n X_i^2$