

Math 201, Spring 2022

Problem Set # 11

Due April 20, 2022 at 11:59pm on gradescope

Question 1. Suppose that a professor chooses a random student in a class of 40 students (there are 23 girls and 17 boys in the class) to perform a calculation on the board. The professor repeats this procedure 3 times, choosing a new student each time (i.e. no student will go twice). Let X be the total number of boys chosen. Calculate the mean and variance of X . (You will want to use a calculator for this one.)

Hint 1: Use indicator random variables

$$X_i = \begin{cases} 1 & \text{if a boy is chosen for calculation } i \\ 0 & \text{else.} \end{cases}$$

Hint 2: Notice that the distribution of X_i does not depend on i .

Question 2. (a) A fair die is rolled until three different numbers are seen. Let X be the number of rolls this requires. Find $E[X]$ and $\text{Var}(X)$. [Hint: Use the technique of the coupon collector problem in the book.]

(b) A fair coin is flipped 12 times. Find the expected value for the number of times you see three consecutive tails.