COMP 550
Algorithms and Analysis
Spring 2020
Pop Quiz 5
Don't forget to write your name on the quiz sheet.

1. Suppose X is an indicator variable for the occurrence of an event e and Y is an indicator variable for the event that e does not occur. Express Y in terms of X. Suppose $Y = aX + b$. Fill in the blanks with the values of a and b.

a) Value of a: -1

b) Value of b: 1

2. Suppose X is a random variable and the probability that $X = 0$ is .2, the probability that $X = 0.5$ is .5, and the probability that $X = 1$ is .3. What is $E[X]$, the expected value of X? .55

3. If X and Y are random variables, is it always true that $E[X + Y] = E[X] + E[Y]$? true

4. If X and Y are random variables, is it always true that $E[X * Y] = E[X] * E[Y]$? false

5. If X is a random variable and c is a real number, is it always true that $E[cX] = cE[X]$? true

6. If X and Y are independent random variables, is it always true that $E[X * Y] = E[X] * E[Y]$? true

7. Suppose X is an indicator variable for an event e and the probability that e will happen is 0.6. What is $E[X]$? .6

8. Suppose X_i for $1 \leq i \leq 10$ are indicator variables for the i^{th} toss of a coin yielding "heads." Let Y be a random variable for the number of times heads will occur on the even tosses, that is, tosses number 2,4,6,8,10. Express Y in terms of the indicator variables X_i. Choose the best answer.

a) $Y = X_1 + X_2 + \ldots + X_{10}$

b) $Y = X_1 + X_3 + X_5 + X_7 + X_9$

c) $Y = X_2 + X_4 + X_6 + X_8 + X_{10}$

d) $Y = X_2 - X_1 + X_3 - X_2 + \ldots + X_{10} - X_9$