

Name: _____

Group _____

- 1) An individual who has automobile insurance from a certain company is randomly selected. Let X be the number of moving violations for which the individual was cited during the last 3 years. The mass of X is

x	0	1	2	3
$p_X(x)$	0.60	0.25	0.10	0.05

- a) Find the expected value for the number of moving violations.
- b) Find $\mathbb{E}(2X)$ (use Corollary 11.2) and $\mathbb{E}(X + X)$ (use Theorem 11.7).
- c) Are the two expected values in part b) the same or different? Explain using mathematical equations.

- 2) An individual who has automobile insurance from a certain company is randomly selected. Let Z be the number of moving violations for which the individual was cited during the last 3 years. The mass of Z is

z	0	1	2	3
$p_Z(z)$	0.45	0.30	0.20	0.05

$$\mathbb{E}(Z) = 0.85$$

- b) If the cost of insurance depends on the following function of accidents, $g(z) = 400 + (100z - 15)$, what is the expected value of the cost of the insurance?
- i) Method 1: Calculate the new mass and then calculate the expected value.
- ii) Method 2: Use Corollary 11.2
- iii) Are these two methods the same? Which method is easier?

- 3) An individual who has automobile insurance from a certain company is randomly selected. Let W and Y be the distributions of the number of moving violations for which individuals were cited during the last 3 years. The masses of Y and W are

y	0	1	2	3
$p_Y(y)$	0.30	0.35	0.15	0.10

w	0	1	2	3
$p_W(w)$	0.15	0.45	0.25	0.15

$$\mathbb{E}(W) = 1.4$$

- b) Find $\mathbb{E}(Y)$

- b) What is the expected value for the difference of the number of moving violations for 4 people with distribution Y and 3 people with distribution W ?

- c) Would [b\)](#) change if you wanted to know the sum of the two functions of the distributions instead of the difference? Why?

- 4) A school class of 120 students are driven in 3 buses to a basketball game. There are 36 students in one of the buses, 40 students in another, and 44 on the third bus. When the buses arrive, one of the 120 students is randomly chosen. Let X denote the number of students on the bus of that randomly chosen student. If you were not in class, please ask on Piazza for clarifications

- a) Find $\mathbb{E}(X)$.

- b) What is the average number of students on each of the buses?

- c) Why are a) and b) different?

- d) If on a second game, the expected value of the number of students on the bus of the one that is randomly selected is 41.8. What is the expected increase of the difference of the students of the second game versus the first game?

5) Four students order noodles at a certain local restaurant. Their orders are placed independently. Each student is known to prefer Japanese pan noodles 40% of the time. How many of them do we expect to order Japanese pan noodles?

a) Do this problem using the mass.

b) Do this problem using indicator variables.

c) If I did not specify the method, which method would you choose to use? Why?

6) There is a bowl containing 30 cashews, 20 pecans, 25 almonds, and 25 walnuts. I am going to randomly pick and eat 3 nuts. What is the expected number of cashews that I will eat?

7) This problem involves the scenario in problem 5 on Worksheet W6M. Consider some 4-sided dice. Roll two of these dice. Let X denote the minimum of the two values that appear, and let Y denote the maximum of the two values that appear.

a) Find the expected value of X .

b) Find the expected value of Y .

8) Two fair 4-sided dice are rolled.

a) Let X be the sum of the dice. What is the expected value of X ?

b) Let Y be the difference of the dice. What is the expected value of Y ?

9) Alice, Bob, and Charlotte are looking for butterflies. They look in three separate parts of a field, so that their probabilities of success do not affect each other.

Alice finds 1 butterfly with probability 17%, and otherwise does not find one.

Bob finds 1 butterfly with probability 25%, and otherwise does not find one.

Charlotte finds 1 butterfly with probability 45%, and otherwise does not find one.

Let X be the number of butterflies that they find together. What is the expected value of X ? Hint: use indicator random variables.