PROBLEM-SOLVING EXERCISE #1
DESIGN AND UNCERTAINTY

PART A
Roll a single standard six-sided die 36 times and tabulate your results (i.e., number of 1's, number of 2's, ..., number of 6's). Calculate the mean, variance and standard deviation of your data.

PART B
Roll a pair of standard six-sided dice 36 times and tabulate your results (i.e., number of 2's, number of 3's, ..., number of 12's). Calculate the mean, variance and standard deviation of your data.

PART C
Suppose you have a pair of six-sided dice where each die contains the following sides:
(1, 1, 2, 3, 5, 5). In theory, if you rolled this pair of dice 36 times, how many times would you obtain a total of 2, 3, 4, 5, 6, 7, 8 and 10? Using graph paper, plot the distribution of expected values. Calculate the mean, variance, and standard deviation of this distribution.

PART D
The number of false fire alarms in a suburb of Detroit averages 6.2 per day. Assuming that a Poisson distribution is appropriate:
What is the probability that exactly 6 false alarms will occur on a given day?
What is the probability that less than 6 false alarms will occur on a given day?
What is the probability that more than 6 false alarms will occur on a given day?

(Hint: the probabilities of all possible cases must add to one).

PART E

College Pro Painting

You have decided that for your summer job you are going to manage a group of students who will paint houses to earn money for the summer. As Manager, your paycheck depends on your capability to efficiently schedule the team so that all the houses get painted on time with little, or ideally no, overage on scheduled man-hours.

Given that a house requires H man-hours to paint, your team has N houses to paint and S students on the team:

i. Write the expression that relates the number of students that you will need to schedule to finish painting the houses in 12 weeks assuming 40-hour work weeks.

ii. If it takes 120 man-hours to paint a house and your team has 24 houses to paint, how many students do you need to hire to paint the houses in 12 weeks assuming 40-hour workweeks?

iii. A friend of yours, Bionka, managed a College Pro Painting team last summer and tells you that since every student is not as efficient as you may expect combined with the fact that the neighborhood you're covering has both small and large houses, the number of man-hours to paint a house, H, is not exactly 120. Instead, she tells you that H is equally likely to take anywhere from 100 man-hours to 140 man-hours. Additionally, Bionka hints that not all of your workers show up as expected. In fact, during a given week a man-day (8 hours) of work is lost on the average of 1.1 times. Fill in the following probability tables:

H	100	110	120	130	140
P(H)					

Let R = Number of times 8 man-hours (a man-day) will be lost in a week

R	0	1	2	3	4	5
P(R)						

Recall that you have 12 weeks to paint these houses. Considering the two 'risks of uncertainty' characterized by the above tables that contain more realistic information regarding the number of man-hours that will *probably* be required to paint the 24 houses and the number of man-days of work that will *probably* be lost per week for each of the 12 weeks, how many students should you recruit to be most efficient? Briefly explain your answer.

PROBLEM-SOLVING DELIVERABLES

You should work in teams of either two or three. You may not work alone. Turn in your results for Parts A, B, C, D, and E and your team's signed cover page at the beginning of your team's lecture on Wednesday, September 28, 2022 for Professor Siadat's lecture or Thursday, September 29, 2022 for Professor Hanna's lecture. One set of results should be submitted per team.