Name _____

Investigation 12: Chances of Getting the Flu?
Worksheet 12.1 Flu Epidemic

Scenario

Did you get a flu vaccine last year? If you did, did you still get the flu?

Infectious diseases (or diseases that are often caused by a bacteria or virus) are extensively researched in the medical field. These diseases result in colds, seasonal flu, and in some cases major epidemics that affect large numbers of people or animals. In the fall of 1918 a flu pandemic erupted and became one of the greatest loss of lives the world had ever seen. By many accounts, the flu claimed between 2.5% and 5% of the global population. At that time, there was no flu vaccine, no antiviral drugs and no antibiotics to help lessen the number of patients who got the flu or aid in the recovery from the flu. As a result of this pandemic, countries began to put a greater emphasis on the study of patterns, causes and effects of diseases. Medical researchers are actively involved in understanding what causes the disease, how it is spread, how long it lasts, and other data that are related to the health of patients. Source: https://www.smithsonianmag.com/history/how-1918-flu-pandemic-revolutionized-public-health-180965025/

Flu Example
Consider the following simple example of an infectious disease, like a cold or flu and how it spreads throughout a small apartment building.

Suppose that a strain of the flu has a one-day infection period i.e., a person with the flu can only infect another person for one day and after that day, the person can't spread the flu and is immune – that is, once you get the flu you can't get this strain of flu again. This strain of flu is very potent – if a person comes in contact with someone with the flu that person will get the flu.

Six people live in a small apartment building. One person catches this strain of flu and randomly encounters one of the other tenants during the infection period and this second tenant gets this strain of flu. This second tenant infected with the flu visits a third tenant at random during the next day and this third tenant gets the flu. The process continues with a newly infected person randomly visiting someone who hasn't had the flu or visits an immune person and then the strain of flu dies out. If an infected person visits an immune person, then the spread of the flu will end as the flue in this example as only a one-say infection period.

Statistical/Probabilistic Question:

_____

Collect Appropriate Data

Conduct the simulation at least 5 times. For each trial, record the results of each roll of the die and the number of people infected in the table.

Trial number	Who was infected (# on each roll)	Number of people infected
1		
2		
3		
4		
5		

After completing the 5 trials, report the number of people infected for each trial to your teacher.

Analyze the Data

1. Fill in the table using the class simulation results.

Number of People Infected	Frequency
2	
3	
4	
5	
6	
Total	

2. Construct a dot plot of the class simulations results.

3. What is the most likely number of people living in the apartment building that will get the flu?

4. Add a column to the table. Label the column Relative Frequency. Complete the relative frequency column in the table.

Change the heading of the first column of the table to Let X = number of people infected. Change the heading of the Relative Frequency column to P(X) which represents the probability of x people being infected.

5. What is an estimate for the probability that all six people living in an apartment building will get the flu?

Interpret the Results in the Context of the Original Question

6. How did you model the spread of the flu in the apartment building? And how did you use this model to find an estimate for the probability that all six people living in the apartment building will get the flu?

Summary

7. What model could be used if there were 8 people in the apartment building?

8. How do you think the probability of all 8 people in an apartment building getting the flu compares with the probability of all 6 people getting the flu?

Investigation 12: Chances of Getting the Flu?
Worksheet 12.2 Simulation Steps

1. State the problem or statistical/probabilistic question.

2. Define the simple events which form the basis of the simulation.

3. State any underlying conditions that need to be made so that the answer to the probabilistic question can be determined.

4. Decide a model that will be used to match the probabilities. Describe how the random numbers will be assigned to match the probabilities described in the problem. Determine what constitutes a trial and what will be recorded.

5. Conduct the first trial.

6. Record the results of the trial.

7. Continue to run trials. Run a large number of trials. Remember to report the result of each trial.

8. Summarize the results of the trials and draw conclusions.

Name _____

Investigation 12: Chances of Getting the Flu?
Exit Ticket

Your math teacher owns 10 ties and randomly chooses a tie to wear to work each school day (not much fashion sense). You notice that he sometimes wears the same tie more than once during the week. You wonder if this is likely to happen often so you decide that you would like to find an estimate for the probability that he wears the same tie more than once in a five-day workweek. To find this estimate you design and conduct a simulation.

1. Describe the simple event.

2. Describe a model that would be appropriate to use for the simple event.

3. Describe a trial and describe what you would record for each trial.

4. Using the results below <u>what is an estimate for the probability</u> that he wears the same tie more than once in a five-day workweek?

   Below is a table showing results for this simulation.

Trial Number	Wears same tie more than once (Y/N)	Trial Number	Wears same tie more than once (Y/N)
1	Y	15	N
2	N	16	Y
3	N	17	Y
4	N	18	Y
5	N	19	Y
6	Y	20	Y
7	Y	21	Y
8	N	22	N
9	N	23	Y
10	Y	24	N
11	Y	25	Y
12	Y	26	N
13	Y	27	N
14	Y	28	Y