4.5: Discrete Distribution (Playing Card Experiment)

Name: _____

Section: _____

Student ID#:_____

Work in groups on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help.

Student Learning Outcomes

- The student will compare empirical data and a theoretical distribution to determine if an everyday experiment fits a discrete distribution.
- The student will demonstrate an understanding of long-term probabilities.

Supplies

- One full deck of playing cards

Procedure

The experimental procedure is to pick one card from a deck of shuffled cards.

1. The theoretical probability of picking a diamond from a deck is _____.
2. Shuffle a deck of cards.
3. Pick one card from it.
4. Record whether it was a diamond or not a diamond.
5. Put the card back and reshuffle.
6. Do this a total of ten times.
7. Record the number of diamonds picked.
8. Let X = number of diamonds. Theoretically, $X \sim B$(_____,_____)

Organize the Data

1. Record the number of diamonds picked for your class in Table. Then calculate the relative frequency.

x	Frequency	Relative Frequency
0	_____	_____
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____

2. Calculate the following:
    1. $\bar{x}$ = _____
    2. s = _____
3. Construct a histogram of the empirical data.

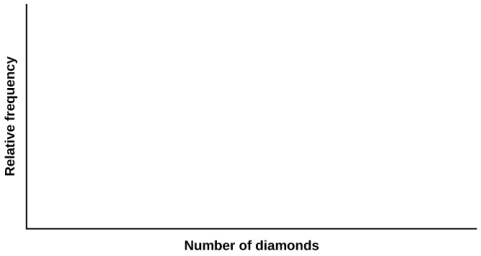

Figure 4.8.1

Theoretical Distribution

1. Build the theoretical PDF chart based on the distribution in the Procedure section.

x	$P(x)$
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

2. Calculate the following:
    1. μ = _____
    2. σ = _____
3. Construct a histogram of the theoretical distribution.

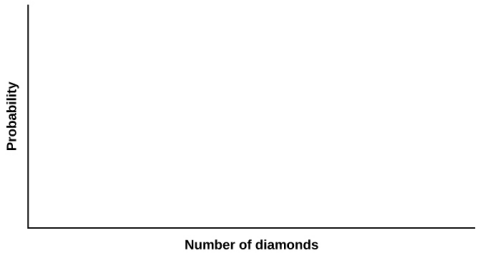

Figure 4.8.2

Using the Data

> **Note 4.8.1**
>
> *RF* = relative frequency

Use the table from the Theoretical Distribution section to calculate the following answers. Round your answers to four decimal places.

- $P(x = 3)$ = _____

- $P(1 < x < 4)$ = _____
- $P(x \geq 8)$ = _____

Use the data from the Organize the Data section to calculate the following answers. Round your answers to four decimal places.

- $RF(x = 3)$ = _____
- $RF(1 < x < 4)$ = _____
- $RF(x \geq 8)$ = _____

Discussion Questions

For questions 1 and 2, think about the shapes of the two graphs, the probabilities, the relative frequencies, the means, and the standard deviations.

1. Knowing that data vary, describe three similarities between the graphs and distributions of the theoretical and empirical distributions. Use complete sentences.
2. Describe the three most significant differences between the graphs or distributions of the theoretical and empirical distributions.
3. Using your answers from questions 1 and 2, does it appear that the data fit the theoretical distribution? In complete sentences, explain why or why not.
4. Suppose that the experiment had been repeated 500 times. Would you expect Table orTable to change, and how would it change? Why? Why wouldn't the other table change?
