Probability Topics: Probability Lab (edited: Teegarden)*

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Based on *Probability Topics: Probability Lab*† by

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Abstract

This module presents students with a lab exercise allowing them to apply their understanding of Probability. Using a Minitab simulation, students will compare theoretical probabilities with experimental probabilities as it relates to dice. They will also investigate the effect of sample size.

Probability Lab

1 I. Student Learning Outcomes:

- The student will calculate theoretical and empirical probabilities.
  - The student will appraise the differences between the two types of probabilities.
  - The student will demonstrate an understanding of long-term probabilities.

2 II. Theoretical probability for the sum of two dice

Begin by looking at Theoretical probabilities for the sum of two dice. Let the value in the first row be the result for Die 1 and the value in the first column be the value for Die 2. Input the sum of the corresponding row and column in each box.

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+	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

Table 1

2.1 Using the following table, record the theoretical probabilities.

Sum	2	3	4	5	6	7	8	9	10	11	12
Count											
Probability											

Table 2

Using the table above, determine the following theoretical probabilities
1. P(sum less than 5) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
2. P(sum at least 9) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
3. P(sum at most 6) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
4. P(sum more than 7) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
5. P(sum between 3 and 8) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
6. P(sum less than 11) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3 III. Experimental (empirical) probability for the sum of two dice

Rolling the dice Using Minitab, simulate rolling two dice 360 times and finding the sum. Use Calc → Random Data → Integer, 360 rows and save in die 1, die 2.

Then use the Calc → Row Statistics. Select Sum, the two die columns and save in Sum Use Stat → Tables → Tally to summarize the data.

3.1 Record the experimental probabilities:

Sum	2	3	4	5	6	7	8	9	10	11	12
Count											
Probability											

Table 3

Using the table above, determine the following experimental probabilities
1. P(sum less than 5) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
2. P(sum at least 9) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
3. P(sum at most 6) = _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4. P(sum more than 7) = _____
5. P(sum between 3 and 8) = _____
6. P(sum less than 11) = _____

4 IV. Essay Questions (On a separate sheet of paper, answer these questions in complete sentences.)

1. How do the empirical probabilities compare to the theoretical probabilities? (You may wish to convert the probabilities to percentages for ease of comparison.)

2. If you increased the number of times you rolled the dice to 720, would the empirical probability values change? Why?

Rerun the simulation and record your results.

Sum	2	3	4	5	6	7	8	9	10	11	12
Count											
Probability											

Table 4

3. Did the increase in the number of trials cause the empirical probabilities and theoretical probabilities to be closer together or farther apart? Why? (You may wish to convert the probabilities to percentages for ease of comparison.)

ATTACH THE SESSION WINDOW WITH YOUR RESULTS AND THE ESSAY ANSWERS TO THIS COVER SHEET.