Teacher Instructions

Dice Roll with the TI –Nspire TouchPad

Algebra II or Statistics

Created by: Ray Fox, Overton High School, Nashville, TN.
Dice Roll Activity

Students will explore the theoretical and empirical probability of simultaneously tossing multiple number cubes (dice).

- ✓ Theoretical is possible successes/total possibilities
- ✓ Empirical is from experimentation.
  - o Actually using dice or coins to discover relationship(s).
  - o Using TI-Nspire to simulate larger number of samples.
  - o Discovering the Central Limit Theorem (CLT)

TN State Standard

CLE 3103.5.4 Develop an understanding of probability concepts in order to make informed decisions. *(Level 3 on Webb's Depth of Knowledge: Strategic Thinking)*

AP Statistics (YMS 2ed, Chapter 6)

Materials: A pair of dice for each group
Copies of Worksheet
TI-Nspire TouchPad

- ? What are the probabilities when tossing a number cube (die)?
  - o For Theoretical divide the number of successes by the total possibilities
  - o Express all results in decimal format for easier comparison.
  - o For Empirical:
    - Roll a die 18 times. Record Tally then change to a decimal.
    - Use TI-Nspire to simulate 180 rolls
    - Now simulate 1800 rolls

Dots showing	1	2	3	4	5	6
Theoretical Probability	0.1666	0.1666	0.1666	0.1666	0.1666	0.1666
Tally (out of 18)						
Change to a decimal						
TI-Nspire: 180 rolls						
TI-Nspire: 1800 rolls						

- ? What is the probability of getting any particular number on the Die? 1/6 or 0.1666
- ? Is the probability the same for each side of the die? ____Yes__
- ? How did the counts change as the number of rolls increased? They get closer to Theoretical.
- ? How does the graph support your answer? The bars get closer to the same height
- ? What would be the probability of getting a 3 or 4? 2/6 or 1/3
- ? What would be the probability of getting a 3 and 4? 0
- ? What would be the probability of getting a number greater than 2? 4/6 or 2/3
- ? What would be the probability of getting at least a 2? 7/8
- ? If the die had eight sides, what would be the probability of getting 1? 1/8 7? 1/8

Teacher Instructions

Dice Roll with the TI –Nspire TouchPad

Algebra II or Statistics

You can have the students create the Nspire document
or you can use the prepared "DiceRoll.tns" document.

To have the students create the document:

Turn the TI-Nspire on c

Enter 1 for 1: New Document

Choose "Yes" to save previous work, otherwise choose "No."

Choose: 4: Add Lists and Spreadsheet

Use TouchPad to move up two cells ["A" is highlighted in grey in the top left corner.]

In top of first column (A) type: Samples ·

Use TouchPad to move down two cells

In Cell A1 type: 180·

Use TouchPad to move top of Column B

In top of second column (B) type: Roll1 ·

In the Gray Box under Roll1 type: =randint(1,6,a1) ·

Syntax: randint(low, high, rolls)

Add a Data & Statistics page

/~

5: Add Data & Statistics

Organize the data points

menu

2: Plot Properties

4:Add X Variable

Choose "Roll1"

The "Dot Plot" gives a nice visual and automatically adjusts window to optimal setting.

Now change to a histogram to obtain the counts for each side.

menu

1: Plot Type

3:Histogram

Gently move your finger on the TOUCHPAD to move cursor to each bar.
Divide each count by "180" to change the probability to a decimal.

Change the 180 in cell a1 to 1800 and repeat.

HINT: / Press the left side of TouchPad to return to previous page.

(/ right goes to next page)

NOTE: Change the plot type to dot plot to automatically adjust window.
Change back to Histogram to obtain the counts.
Complete the chart.

Teacher Instructions

Dice Roll with the TI –Nspire TouchPad

Algebra II or Statistics

Part II: Rolling a Pair of Dice

- What are the probabilities when tossing a pair of dice?
  - For Theoretical divide the number of successes by the total possibilities
  - Express all results in decimal format for easier comparison.
  - For Empirical:
    - Roll dice 18 times. Record Tally then change to a decimal.
    - Use TI-Nspire to simulate 180 rolls
    - Now simulate 1800 rolls

Dots Showing	2	3	4	5	6	7	8	9	10	11	12
Number Possible Combinations: (1,1) = 1: (1,2) & (2,1) =2;	1	2	3	4	5	6	5	4	3	2	1
Theoretical Probability	1/36	2/36	3/36	4/36	5/36	6/36	5/36	4/36	3/36	2/36	1/36
Tally (out of 18)											
Change to a decimal											
TI-Nspire: 180 rolls											
TI-Nspire: 1800 rolls											

2. **Analysis**
   - What is the probability of getting 7? ____6/36___ 11? ___2/36_____
   - Is the probability the same for each combination? ___NO_____
     - Why (not) Some have more possible ways to be rolled than others.

   - How does the graph support your answer? Yes
   - What would be the probability of getting a 3 or 4? 7/36
   - What would be the probability of getting a 7 and then 11? 6/36*2/36 = 1/108
   - What would be the probability of getting a number greater than 8? (4+3+2+1)/36

   - What would be the probability of getting at least an 8? (5+4+3+2+1)/36
   - If the dice had eight sides each,
     - what would be the probability of getting 16? 1/64 14? (3+2+1)/64

   - Contrast the distributions of the one die versus the pair of dice?
     One die gives a uniform distribution, a pair is not.
   - Which sample size produces a distribution that is closest to the theoretical?
     The larger the sample size (number of rolls), the closer the distribution is to the theoretical.
   - What conclusion(s) can you draw from this activity?

Extending the DiceRoll.tns document.

Teacher Instructions

Dice Roll with the TI –Nspire TouchPad

Algebra II or Statistics

Return to Data & Statistics page

Change the 1800 back to 180
In top of third column (C) type: Roll2
In the Gray Box under Roll2 type: randint(1,6,a1)

In top of fourth column (D) type: Tot
In the Gray Box under Tot type: =Roll1+Roll2

Go to Data & Statistics page

menu
2: Plot Properties
6: Remove X Variable
menu
2: Plot Properties
4:Add X Variable
Choose "TOT"
Use directions above to create a dot plot, then a histogram

Extension:

Change Page Layout to display the individual roll results and the Total of the Dice on one screen.