Rolling a Two

by – Paul Alves

Activity overview

*This activity was created for the Grade 11 College course in the Ontario curriculum. Students are expected to determine, using class-generated data and **technology-based simulation models**, the tendency of experimental probability to approach theoretical probability as the number of trials in an experiment increases. This lesson is a part of a unit on probability.*

Concepts

Theoretical Probability; Experimental Probability

Teacher preparation

The Nspire CAS file (Theoretical vs Experimental) will need to be loaded onto student handhelds. Students will need to be familiar with the probabilities associated with rolling a single die. Note: The calculators may need to be seeded using the RandSeed command. The command can be typed in a blank Calculator page prior to opening the student file. It is also accessible through the catalog which also displays the syntax.
Some review or practice may be needed to show students how to go into the history of a Calculator page and retrieve a previous as they will be required to do this to run a program that simulates the rolling of a single die.

Classroom management tips

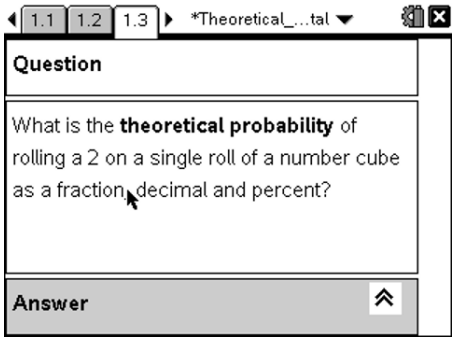
Students should be encouraged to work in pairs so as to compare the simulations to each other.

TI-Nspire Applications

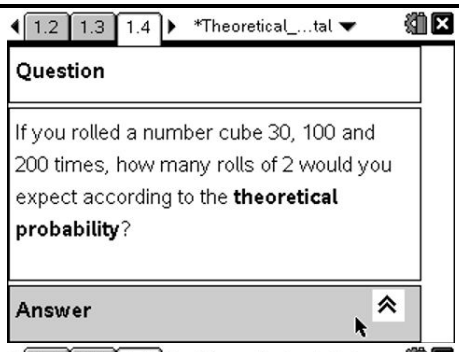
Notes (Q & A template); Lists and Spreadsheet; Data and Statistics; Calculator

Step-by-step directions

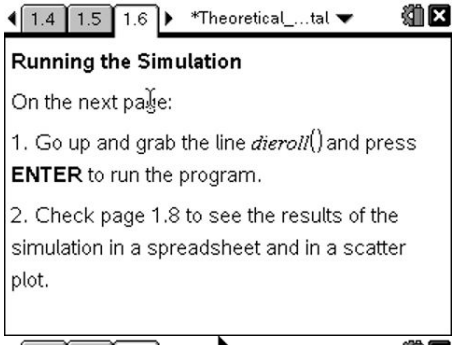
Note: This entire activity can be used as an assessment for probability.
On page 1.3 students are to determine the probability of rolling a 2 on a single die. Students can enter their answer in the Answer field of the template.



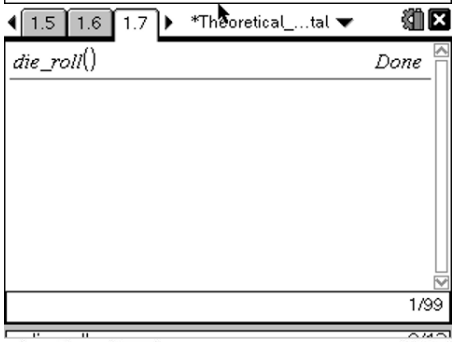
Students are to record their answer in the Answer field for the number of expected rolls of 2 for the number of rolls noted on page 1.4.



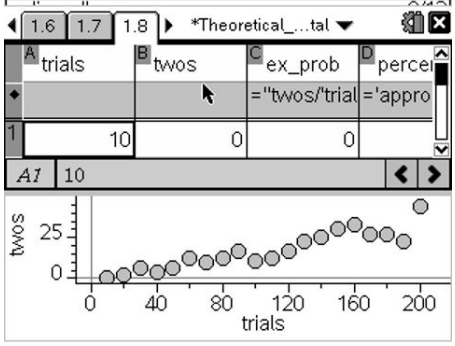
Instructions for running the simulation of rolling a single die for differing numbers of trials is outlined on page 1.6.



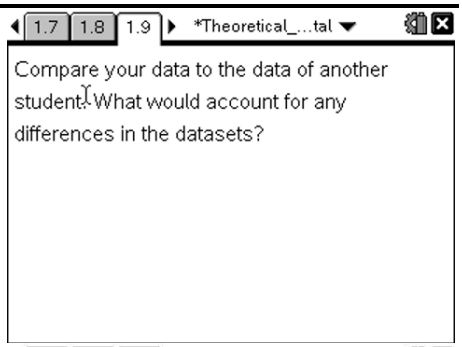
Page 1.7 is a calculator page that contains the execution command for the simulation. Students may want to move to page 1.8 to see the current data and then return to page 1.7 to run the simulation and verify that the data has changed.



Page 1.8 contains the spreadsheet showing the number of trials, the number times a roll of 2 was observed, the experimental probability expressed as a fraction and a percent. The scatter plot showing the numbers of trials and number of twos rolled is given below the spreadsheet.

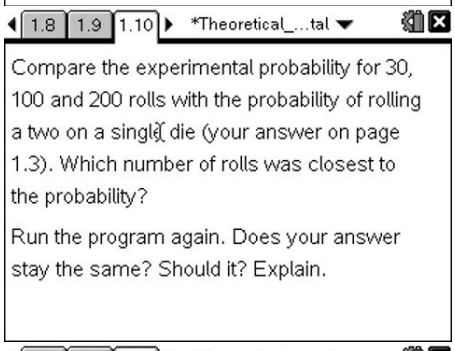


Students can compare the results from their simulation to a partner's results. If the calculators have not been seeded to different values, the results may be the same. A discussion as to why they are the same or different can be addressed at this time.



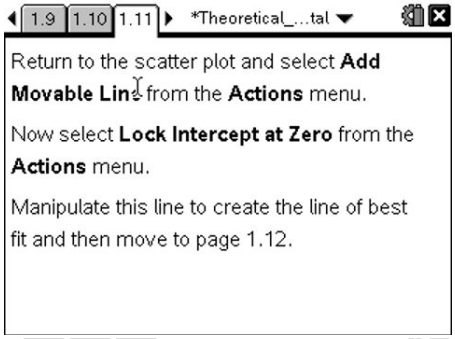
Students are to determine which number of rolls has the experimental probability closest to the theoretical probability. The teacher may want to ask students to post the number of trials (i.e. 30, 100 or 200) that is closest to the theoretical probability. As a class, observe which trial is most frequent amongst the student results.

Students can run the simulation again by returning to page 1.7 and observing if their answer remains the same.

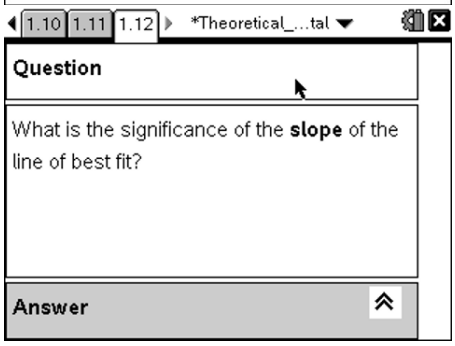


Students are to then return to their scatter plot and add a movable line with its intercept locked at zero. A discussion as to why the intercept should be zero can be addressed.

Students are to find the line of best by manipulating their movable line.



Students are to explain the connection between the slope of the line and the probability of rolling a 2 on a single die. They should focus on the decimal answer supplied for the theoretical probability and see that the slope and probability are roughly the same.



Assessment and evaluation

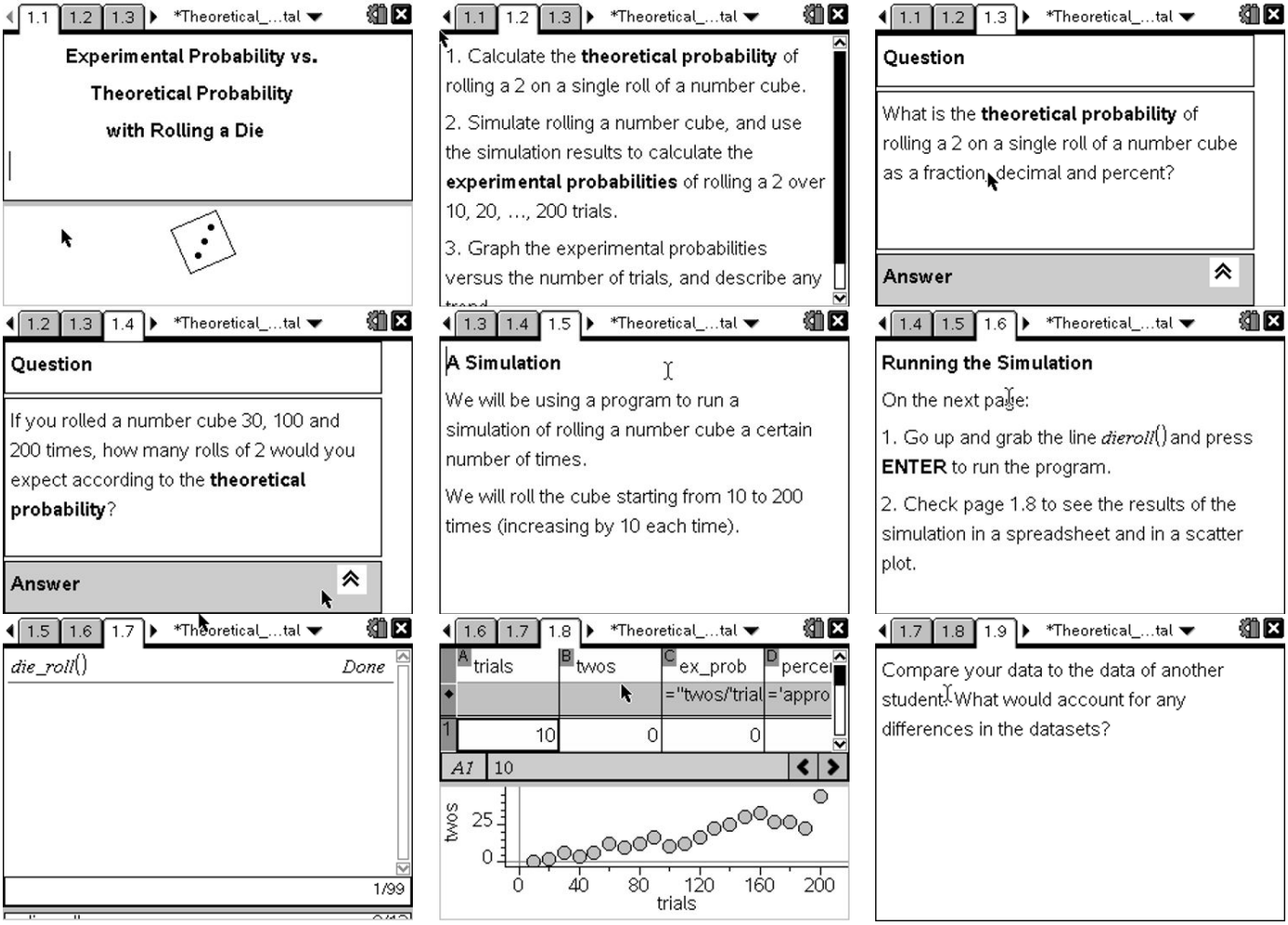
- *The entire activity can be used as an assessment piece.*

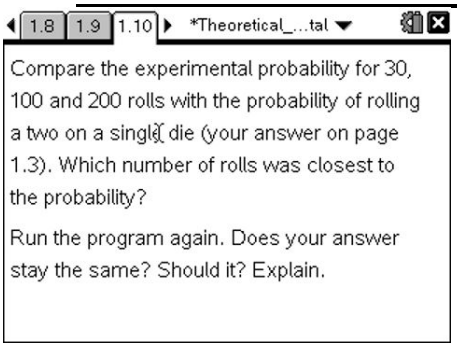
Activity extensions

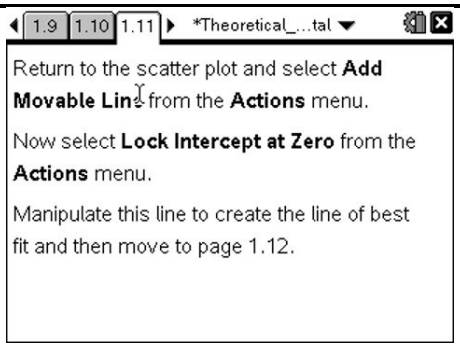
- *A discussion as to what would happen if we increased the number of trials can be addressed once the activity is completed.*
- *Independence can be explored by asking students if they had rolled a two on one roll, would the probability of rolling a 2 on the next roll be the same or different? Discuss what types of selection or events have probabilities that are dependent (eg. drawing a card at random and not replacing).*

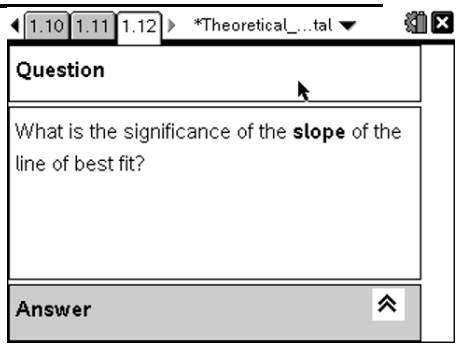
Student TI-Nspire Document

Theoretical vs Experimental




1.8 1.9 1.10 *Theoretical_...tal
Compare the experimental probability for 30, 100 and 200 rolls with the probability of rolling a two on a single die (your answer on page 1.3). Which number of rolls was closest to the probability?
Run the program again. Does your answer stay the same? Should it? Explain.


1.9 1.10 1.11 *Theoretical_...tal
Return to the scatter plot and select **Add Movable Line** from the **Actions** menu.
Now select **Lock Intercept at Zero** from the **Actions** menu.
Manipulate this line to create the line of best fit and then move to page 1.12.


1.10 1.11 1.12 *Theoretical_...tal
Question
What is the significance of the **slope** of the line of best fit?
Answer