



About the Lesson

In this activity, students will collect data on a 1 cent coin as it falls under its own volition after being placed on its edge 25 times. Students will then analyze the class' data using a scatter plot and determine the experimental probability of getting a head or a tail. As a result, students will:

- Perform operations on lists and calculate the probability that a coin will fall on a head or tail.



Vocabulary

- Probability
- Linear Regression
- Cumulative Sum
- Sequence

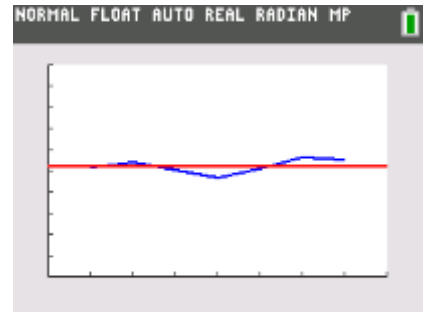
Teacher Preparation and Notes

- Students should know how to collect data, input that data into lists, create a scatter plot, calculate and graph a linear regression equation.
- Teachers may want to give more guidance when students are calculating the linear regression.

Activity Materials

- Compatible TI Technologies:
 - TI-84 Plus*
 - TI-84 Plus Silver Edition*
 -  TI-84 Plus C Silver Edition
 -  TI-84 Plus CE

* with the latest operating system (2.55MP) featuring MathPrint™ functionality.



Tech Tips:

- This activity includes screen captures taken from the TI-84 Plus CE. It is also appropriate for use with the rest of the TI-84 Plus family. Slight variations to these directions may be required if using other calculator models.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at <http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials>
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

Lesson Files:

- The_1_Cent_Event_Student.pdf
- The_1_Cent_Event_Student.doc



Introduction

In this activity, students will collect data on a 1 cent coin as it falls under its own volition after being placed on its edge 25 times. They will then analyze the class' data using a scatter plot and determine the experimental probability of getting a head or a tail.

Students will need to find a level table top with a "sweet spot" where they can easily place their coin on edge. Instruct students to place the coin on its edge and wait until it falls. They should not hit the table or blow on it; just wait until it falls. They will record the result, Heads or Tails, and will then repeat the event for a total of 25 times. Students should tally their results as shown:

HEADS	TAILS



Collecting the Data

Find a level table top with a "sweet spot" where you can easily place your coin on its edge. Place the coin on its edge and wait until it falls on its own. Don't hit the table or blow on it. Just wait until it falls. Tally your result, Heads or Tails, and repeat the event for a total of 25 times.

HEADS	TAILS

Entering the Data

1. Gather student data to compile a list for the "class data". Students will then enter the class data into their calculators.
2. Clear all the lists on your calculator by **2nd** **[mem]** select **4:ClrAllLists** and press **enter**.





17. To get the probability we need to divide the total heads by the total falls. In the sample we have $13/25 = 0.52$ or 52%. Create a new list named **PROB** to hold these values. While still in the header tell the computer to do this calculation; **LTHEAD/LTFALL**. Press $\boxed{2nd}$ \boxed{list} to get the names of the lists.

HEADS	TAILS	THEAD	TFALL	PROB
13	12	13	25	0.52
14	11	27	50	0.54
11	14	38	75	0.5067
9	16	47	100	0.47
17	8	64	125	0.512
21	4	85	150	0.5667
12	13	97	175	0.5543

PROB = " LTHEAD / LTFALL "

18. Notice the numbers are all between 0 and 1. When you flip a coin you expect 50% of the time you will get heads.

How many of your data points are more than 50%? What does that mean?

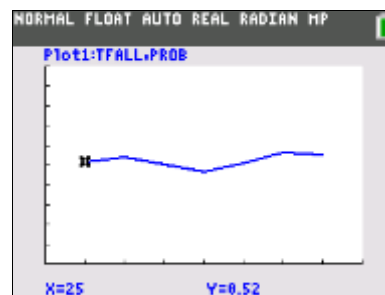
19. Set up a plot of **PROB** vs. **TFALL** and see how the probability is revealing itself with repeated trials. Don't forget to turn off your **Y=** equations and to reset the window. Press $\boxed{2nd}$ $\boxed{stat\ plot}$ $\boxed{1}$ to set up Plot1 as shown.



20. We will set up the window manually. Press \boxed{window} and enter the data as shown, with the exception of **Xmax**. This number will be determined by the total number of falls that your class had.

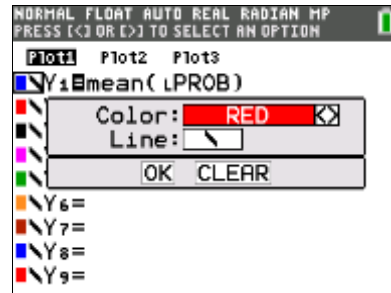


21. Now look at the plot by pressing \boxed{trace} .
What do you think the probability is tending toward?

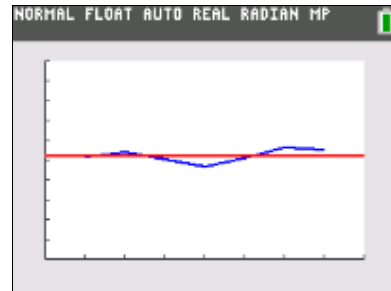




22. Look at the average of the probabilities to help. Press $\boxed{y=}$ and move to a free line. Key in the key word for average by pressing $\boxed{2nd} \boxed{[list]} \boxed{\leftarrow} \boxed{3}$. Now select the list you want the mean of by pressing $\boxed{2nd} \boxed{[list]}$ and find the **PROB** list. Change the color of the line by pressing $\boxed{\leftarrow}$ to highlight the line properties and press \boxed{enter} . Use the arrows to select the color you like then arrow down to **OK** and press \boxed{enter} .



23. Press \boxed{graph} and see the Truth.



24. Finally, examine your coin with a magnifying device. Do you notice anything that might cause your coin to fall over one way more often than the other? Ask your teacher (or use the web) to understand the concept of **center of mass**. Explain your findings.