Coin Toss Simulator Challenges

**Algebra**

**Unit 3 Line Master 9a**

You will be altering code in the Coin Toss Simulator application   
from Master 8a–f.

Remember: you must be logged in to save your work in your   
Scratch account.

<https://scratch.mit.edu/projects/719300889/editor/>

Note:   
For Challenge 4, you will need access to a spreadsheet program.

Challenge 1: Obtaining Input from the User

Alter the code so the user can enter the number of trials   
they want when prompted.

Hint:  
Graphical user interface, application, Excel

Description automatically generated

Challenge 2: Simulating an Unfair Coin

In the simulator for Master 8a–f, you worked with two fair coins.   
This means that each coin is equally likley to land heads as tails.

How could you alter the code so that one of the coins is unfair?   
That is, one coin is slightly *weighted*, which means it is more likely to land one way than the other.

Coin Toss Simulator Challenges

(cont’d)

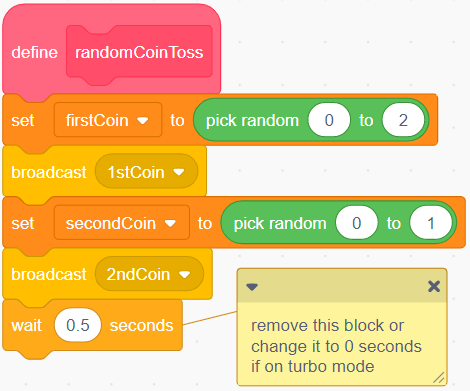
**Algebra**

**Unit 3 Line Master 9b**

* Alter the code so the firstCoin has a probability of landing

heads and probability of landing tails.  
Test the program with a large number of trials.   
How does the change affect the experimental probabilities?   
Use a tree diagram to explain.

Hint:

* Change the pick random range for the firstCoin variable   
  to include three possibilities (0 to 2).  
  
* Alter the code so the first coin has probability of landing

heads and probability of landing tails.  
Test the program with a large number of trials.   
How does the change affect the experimental probabilities?   
Is it what you expected? Explain.

Coin Toss Simulator Challenges

(cont’d)

**Algebra**

**Unit 3 Line Master 9c**

Challenge 3: Considering HT and TH as Separate Outcomes

Suppose you toss two different coins, such as a nickel and a dime.

In this case, HT and TH are not the same result.

Alter the code so HT and TH are separate outcomes.

What are the theoretical probabilities with HT and TH as   
separate outcomes?

Check to see if your experimental probabilities match what   
is expected.

Hint:   
You will need to make additional variables, keep track of the   
number of times they occur, and calculate their probabilities.

Graphical user interface, table

Description automatically generated with medium confidence

Challenge 4: Exporting and Graphing the Experimental Outcomes

If you have access to a spreadsheet program such as Google Sheets or Microsoft Excel, you can export data from the list that   
is created by the simulator in Master 8a–f and generate bar graphs   
to show the results.

1. Run the coin toss simulator from Master 8a–f with 1000 trials.

Coin Toss Simulator Challenges

(cont’d)

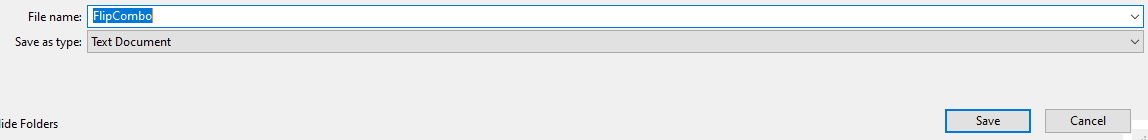
**Algebra**

**Unit 3 Line Master 9d**

2. Right click on the TossCombo List on the Stage   
 and select export.

**Graphical user interface, application

Description automatically generated**

3. Save the **TossCombo** text file in a folder to use later.  


4. Now you can import the data into the spreadsheet program you  
 use and use the spreadsheet’s charting functions to graph them.

5. If you completed Challenge 3, you can follow a similar process   
 to export and graph the results of a simulation involving   
 an unfair coin.   
 Predict what the graph will look like when your first coin has

probability of landing heads and probability of landing tails.