Altering the Code to Perform   
 Many Tosses

**Algebra**

**Unit 3 Line Master 12a**

Coding enables us to simulate activities that would take a long time in real life. For example, if you wanted to toss a real coin 1000 times, it could take more than an hour and it would be challenging to keep track of the results!

Let’s alter the code that you created in Masters 10 and 11 to include repeats and to calculate experimental probability.   
You will also use Turbo Mode in Scratch to speed up the calculations.

Open your code from Master 11, or go to this link for the completed application:

<https://scratch.mit.edu/projects/806733522/editor/>

Part 1: Tossing the Coin Many Times

Graphical user interface

Description automatically generatedAdd a repeat block to simulate tossing a coin many times.   
You will be able to adjust the code to simulate 100 tosses,   
1000 tosses, or any number of tosses that you choose!

1. Under Control, select a repeat block.   
 Drag and drop it so it appears around   
 the code below the when green flag   
 clicked block, as shown here.

2. Click on the green flag and watch as   
 10 tosses are automated. This means that,   
 rather than having to click on the flag 10 times   
 to simulate 10 coin tosses, you click once and the repeat   
 does the rest! Click on the space bar to reset the variables.   
 Alter the number of repeats from 10 to 100.   
 How many heads are tossed? How many tails?

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**Algebra**

**Unit 3 Line Master 12b**

3. If you change the repeat value to a larger number such as 1000,   
 you’ll have to wait a while to see the results.   
 In Scratch, you can use Turbo Mode.   
 It will execute the code super fast when you click on the green flag.

Graphical user interface, application

Description automatically generated To turn on Turbo Mode, click Edit and then   
 select Turn on Turbo Mode. You can later turn   
 Turbo Mode off in the same way.  
 You will know that you are in Turbo Mode,   
 when it says Turbo Mode next to the green flag   
 above the stage.

Set the repeat to 1000.   
 Click the space bar to reset the variables, then click the green flag   
 and watch how quickly your results appear!  
 How many heads were tossed? How many tails?

4. Reset the variables and adjust the repeat value to 10 000.  
 Execute the program.

a) How many tosses were heads? How many were tails?

b) What was the experimental probability of tossing heads?

c) The theoretical probability of tossing heads is , or 0.5  
 How do you think the experimental probability of tossing heads   
 will compare to the theoretical probability as you do more   
 and more coin tosses?

d) Reset the variables and adjust the repeat value to 100 000   
 or an even larger number of your choice.   
 Was your prediction in part c correct?

Altering the Code to Perform   
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**Algebra**

**Unit 3 Line Master 12c**

Part 2: Calculting the Experimental Probability of Tossing Heads

Graphical user interface

Description automatically generated1. Add a block to calculate the experimental   
 probability of tossing heads. To begin,   
 you need to make a new variable.   
 Under Variables, select Make a Variable   
 and name it headsEP.

2. Under Variables, select the set block and   
 place it inside the bottom of the repeat block  
 but below the if-then-else block.   
 Ensure the headsEP variable is selected   
 from the pulldown menu.   
 For now, set your repeat back to 10.

Graphical user interface

Description automatically generated with low confidence3. a) From under Operators, select   
 the division operator () and   
 place it inside the set block.

b) To determine the experimental   
 probability of tossing heads, you need   
 to divide the totalHeads variable by   
 the totalTosses variable.  
 From under Variables, drag the   
 totalHeads variable into the first oval   
 of the division operator and the totalTosses   
 variable into the second oval.

Altering the Code to Perform   
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**Algebra**

**Unit 3 Line Master 12d**

4. Add a set block to the reset subprogram for headsEP and ensure   
 it is set to 0. Your program should look similar to this:

Graphical user interface

Description automatically generated with low confidence

5. a) Click the space bar to ensure the variables are reset.  
 Execute the code with the repeat set to 10.   
 You will see the experimental probability for heads displayed   
 on the stage along with the values of the other variables.   
 Is the experimental probability calculated correctly?   
 If not, check for errors in your code.   
 If it is, move on to part b.

b) Reset the variables again.

While in Turbo Mode, adjust the repeat to 1 000 000 and click

on the green flag. What is the experimental probability of

tossing heads for your 1 000 000 tosses?

Is this what you would expect?

Additional Challenge

Add a block to your code to calculate and display the experimental probability of tossing tails.