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

Add 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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**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.

 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?

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Part 2: Calculting the Experimental Probability of Tossing Heads

1. 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.

3. 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.

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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:

 

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.