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# Simulating Multiple Rolls of a Die

Let's alter our code from **Master 7** to include a loop, or a repeat, which will simulate rolling a die hundreds, thousands, and even millions of times!

> A *loop* is a repetition of instructions used in code. In Scratch, a repeat is used to make code blocks loop through multiple times.

What do you think will happen to the relative frequency of rolling a 3 with so many rolls?

> Relative frequency provides a better estimate of the likelihood of an event with larger amounts of data.

1. We will start by adding a repeat block so that the die rolls 10 times at once.
   ➤ Click the link to access the completed code from **Master 7**:

   https://scratch.mit.edu/projects/878489604/editor

   ➤ From the **Control** tab, select the **Repeat 10** block and place it around all the code under the green flag block.
   ➤ Since we are rolling the die 10 times and are keeping track of the number of times a 3 is rolled in the **num3Rolled** variable, we can remove the **say 3!** block.
   ➤ Click on the green flag multiple times to see what happens! Don't forget that if you'd like to reset the variables to 0, you can click on the **space** bar.

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Here is a screenshot of the completed code.
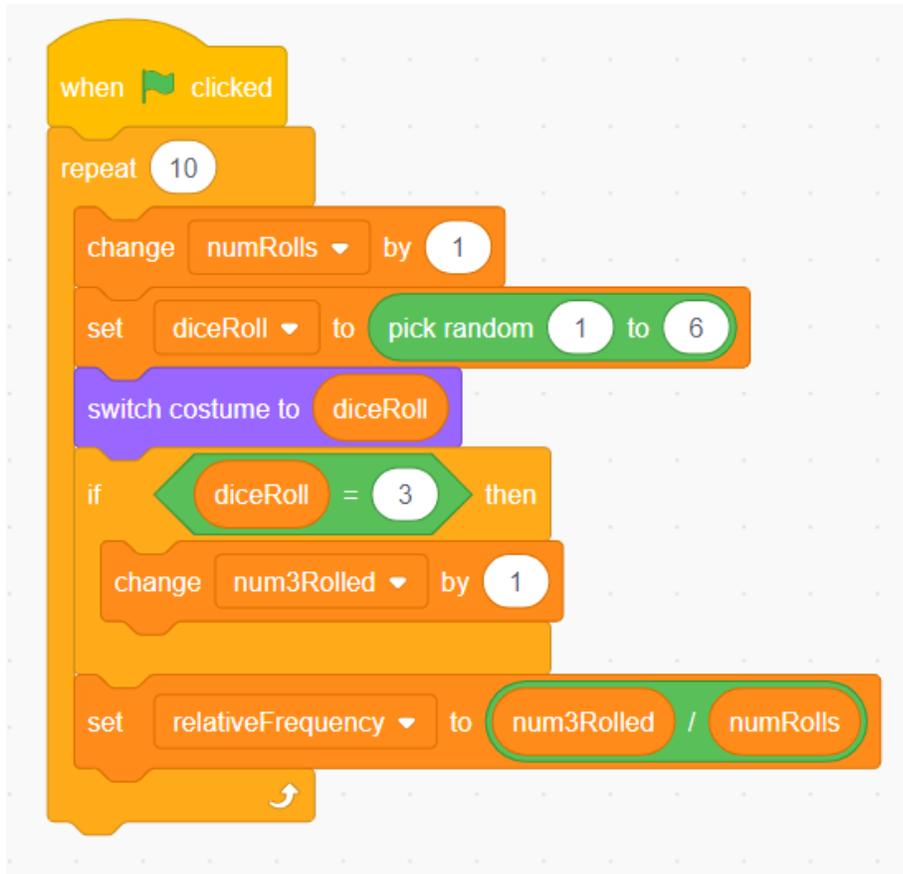


2. Let's loop the code even more times!
   ➢ Try changing the repeat number to 100 and then 1000.
   ➢ What do you notice about the relative frequency
     of rolling a 3?

   ➢ Does it get closer to the expected likelihood of $\frac{1}{6}$ or about 0.17?

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3. When you changed the repeat to 1000, you might have noticed that you had to wait a while for the 1000 rolls to happen.
   We can use **Turbo Mode** in Scratch to make this happen faster!

   ➢ To turn on *Turbo Mode*, select *Edit* and *Turn on Turbo Mode*.
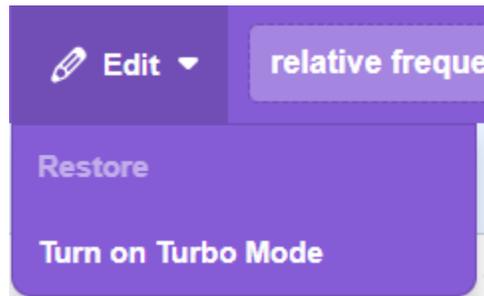


   ➢ Try clicking the green flag with 1000 in the repeat
      to see what happens.
   ➢ Change the repeat to 10 000 and even 1 000 000 or more!
   ➢ What do you notice about the relative frequency when you roll
      the die so many times?