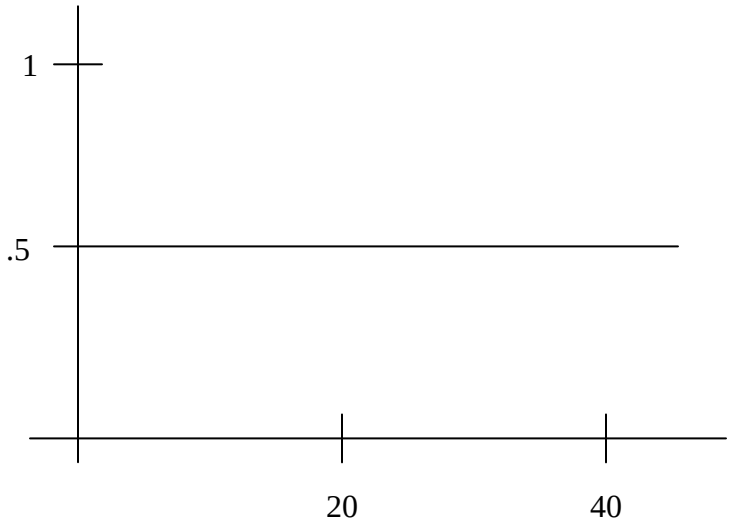
Probability applet activity NAME:

Go to the site www.whfreeman.com/scc and click on the colorful book labeled “Concepts and Controversies, 5E”. Click on “Statistical Applets” in the main frame under “Student Categories”. Then select “Probability” from the menu of the various applets. (Actually, you need to click on the picture to its left.) This is a simulation of tossing a coin and recording the number of heads.

The default probability of heads is .5. The default number of tosses is 15. If you click the “Toss” button, it simulates the tossing of 15 coins and records the actual coins above the graph. Try this now. The graph shows the **proportion** of coins that turn up “heads” after each toss. Notice the proportion of heads after the first toss is either 1 or 0, depending on if it was heads or tails. The fraction in the upper left corner tells you how many coins you have tossed as well as the number and proportion of heads.

1. What is the difference between theoretical probability and experimental probability? Relate this concept to the experiment of tossing a coin.

2. Click on the “Reset” button to clear the graph. Bullet the box marked “Show true probability”; this is located to the right of the “Toss” and “Reset” buttons. (This simply puts a horizontal line at the value of the theoretical probability.) Set the number of tosses to 40. Leave the “Probability of heads” at .5. Click the “Toss” button. Copy the graph as best you can. The theoretical probability is marked.

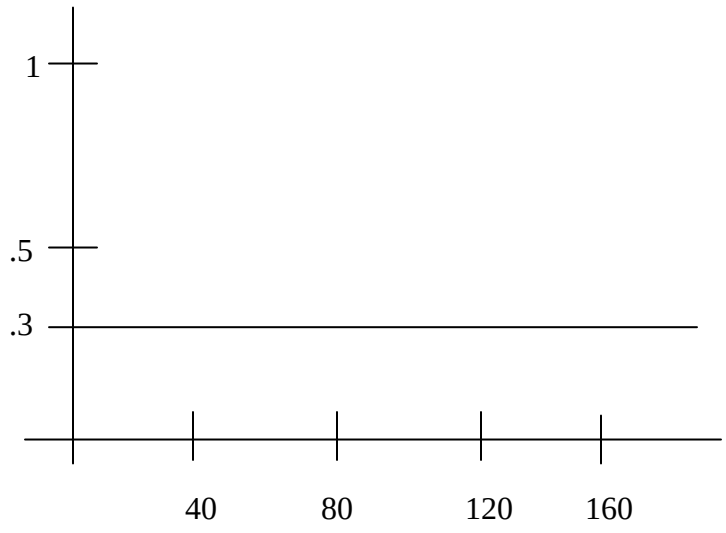


3. Record the information for your first 40 tosses in the table below. Get these numbers from the upper left corner of the applet, for example "# Heads = 25/45 = .56". Without resetting the graph, click the "Toss" button again and again, filling in the table as you go. (Wait for it to finish tossing those in cue before clicking the Toss button again.) Notice the simulation continues. Fill in the table with the data it gives you.

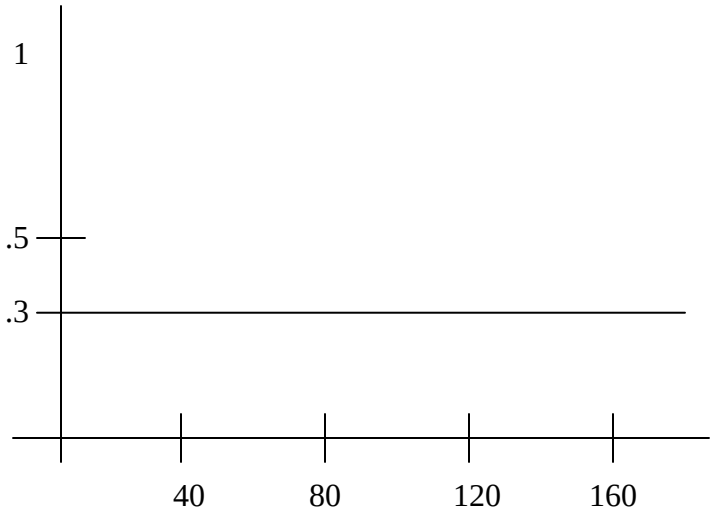
Number of tosses	**40**	**80**	**120**	**160**	**200**	**240**	**280**
Probability of heads in fraction form							
Probability of heads in decimal form							

You should see that the probability of heads is leveling off as more and more coins are tossed. If this is not obvious, keep tossing until it looks to be leveling off. What value does the proportion of heads seem to be approaching? Why do you think it approaches this value?

4. It seems that the experimental probability of getting heads approaches the theoretical probability as we do more and more trials. This is often called the Law of Large Numbers. What do you think would happen if we set the "Probability of heads" to be .3? Draw a hypothetical graph of the result of 160 tosses. The theoretical probability is marked for you.



5. Now, change the “Probability of heads” to .3. Click on the “Reset” button to erase your graph and redraw the horizontal line at y = .3. Then have it simulate 160 or so tosses. Did you guess correctly in the last question? Copy the graph as best you can.



What were the differences between your graph in question 4 and the actual graph that the computer generated for question 5? Were they superficial or meaningful differences? Explain.