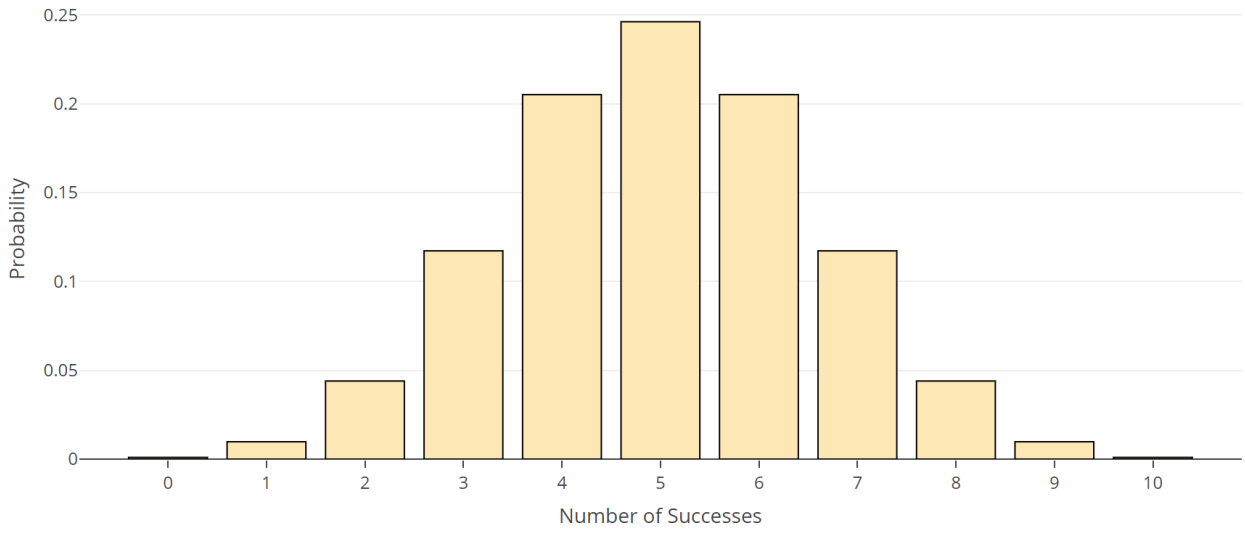
Practice Assignment: Probability Distributions

Questions 1–5: We know that the probability of heads is 0.5 for a fair coin, but can this probability be manipulated? Researchers at the University of British Columbia conducted a study to find out. They gave participants instructions about how to manipulate a coin toss and a few minutes to practice the technique. Then participants were tested to see whether they were able to increase their probability of flipping heads.

Let X = the number of times that a fair coin lands on heads out of 10 flips. The graph below represents the probability distribution for X. This model was constructed theoretically using probability rules. Note: Landing on heads is considered a "success" in this chance experiment.



1) Is the variable X discrete or continuous?

Answer: Discrete

2) Suppose your statistics class decides to estimate the probability distribution empirically by using a simulation. Everyone in the class flips a coin 10 times and records the number of heads. These values are then used to construct a class plot. Which of the following best describes how the class plot would compare to the previous graph?

   a) As long as the students in the class did not receive instructions on how to manipulate coin flipping probabilities, then the class plot would look exactly like the previous graph.

b) The class plot would likely have the same general shape as the previous graph (roughly symmetric, centered around 5), but the probabilities for each value would not be exactly the same.

c) The class plot would look nothing like the previous graph because the class plot was constructed empirically using a simulation and the previous graph was constructed theoretically using probability rules.

Answer: b

3) The following table is another representation of the probability distribution for X. Determine whether this statement is true or false: The sum of all the probabilities given in the table is 1.

X = Number of heads	Probability
0	0.0010
1	0.0098
2	0.0439
3	0.1172
4	0.2051
5	0.2461
6	0.2051
7	0.1172
8	0.0439
9	0.0098
10	0.0010

Answer: True

4) What is the probability of getting heads 6 or more times out of 10 flips if the coin-flipping process was really fair?

Answer: 0.3770

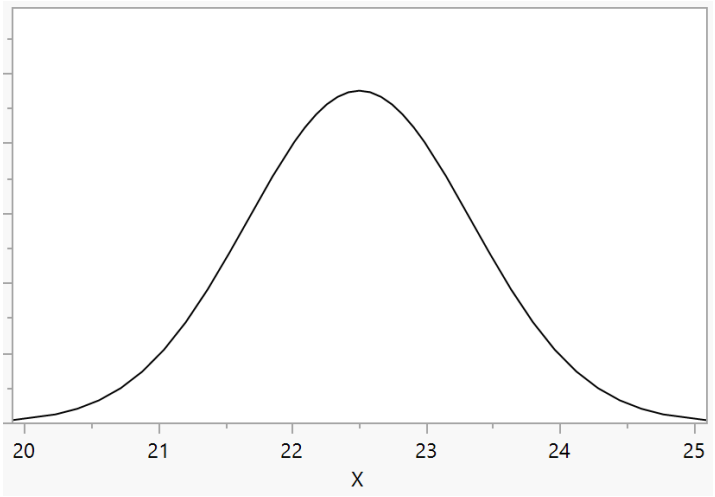
5) If a participant in the coin-flipping study got 6 heads out of 10 flips, would you be convinced that they had learned how to manipulate the probability of heads?

Answers will vary.

Sample answer: No, because getting 6 or more heads out of 10 flips is common, even if the coin is fair.

Questions 6 and 7: A hat sold at a retail store is marked "one size fits all." In reality, the hat is only comfortable for people whose head circumferences are between 22 and 23.5 inches.

Let X = the head circumference (in inches) of a randomly selected person. The following graph represents the probability distribution for X.



6) Is the variable X discrete or continuous?

Answer: Continuous

7) Mark the graph to show the probability that the hat will fit comfortably for a randomly selected person.

Answer: Shade the area between 22 and 23.5.