7.SP.6 Heads or Tails

Each of the 20 students in Mr. Anderson's class flipped a coin ten times and recorded how many times it came out heads.

a. How many heads do you think you will see out of ten tosses?

b. Would it surprise you to see 4 heads out of ten tosses? Explain why or why not.

c. Here are the results for the twenty students in Mr. Anderson's class. Use this data to estimate the probability of observing 4, 5 or 6 heads in ten tosses of the coin. (It might help to organize the data in a table or in a dot plot first.)

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of heads	3	5	4	6	4	8	5	4	9	5	3	4	7	5	8	6	3	6	5	7

Commentary

This task asks students to think about how the distribution of observed outcomes from a chance experiment might differ from the theoretical distribution and to use observed data to estimate a probability (7.SP.6).

This task could be used as an assessment item or as the basis for a classroom discussion. If you use it for classroom discussion, be sure that students understand that they will not always see exactly see 5 heads in ten tosses, even if the coin is fair.

After students have had a chance to estimate the probability in part (c), you could follow up by asking them if they think that this number is exactly equal to the theoretical probability of getting 4, 5 or 6 heads when a coin is tossed. Then you can point out that this estimated probability is based on only 20 observations, and ask students what they think would happen if they were to have 50 observations or 100 observations. (The theoretical probability for 4, 5 or 6 heads in ten tosses is 0.656.)

If time permits, you could also have each student in your class toss a coin 10 times and record the number of heads. You could then use your class data in place of the data provided in the problem.

Solution: 1

a. Most students will reply that they exepct to see 5 heads, but encourage answers like "around 5 heads".

b. It would not be surprising to see only 4 heads in ten tosses. Although this outcome might occur less often than getting 5 heads, students should understand that there will be variability in the outocmes when a coin is tossed ten times, and that you don't always get 5 heads.

c. It helps to organize the data before estimating the requested probability. A dot plot of the data is shown here:
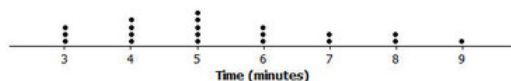
Because 12 of the observed outcomes were 4, 5 or 6, the estimated probability is 12/20 = 0.60.