7.SP Election Poll, Variation 3

Task

Members of the seventh grade math group have nominated a member of their group for class president. Every student in seventh grade will cast a vote. There are only 2 candidates in the race, so a candidate must receive at least 50% of the vote to be elected. It is expected to be a tight race, so the math group wants to conduct a survey to gain information on their candidate's prospects. They do not have the time to interview all seventh graders in the school (even if they could contact them) so they decide to interview a sample of 40 students from that grade. They obtain the seventh grade list of names from their school principal's office and select the sample from this list. They plan to ask each sampled student whether they plan to vote for their candidate or the other candidate.

a. How should the students select the sample of 40 from the list if they want to have the best chance of obtaining a representative sample? Use the random number table provided below, a random number generator, or a software program to help select the sample of 40 students.
b. All of the 40 students selected from the list of seventh graders in the school responded to the survey. The results showed that 18 of the 40 students surveyed said they would vote for the math group's candidate. The math group is puzzling over whether this provides enough information for them to feel confident about their candidate winning with 50% of the vote. To get a sense of how much this sample result of 18 out of 40 could vary in random samples of size \( n = 40 \), the math group decides to repeatedly simulate the sample selection process and compute the proportion of sampled students that would vote for their candidate for each repeated sample.

Because they are interested in whether their candidate can win with 50% of the vote, they decide to simulate assuming that the seventh grade class is divided 50-50 between the two candidates (50% voting for the math group candidate and the other 50% voting for the other candidate).

i. Carry out this simulation by taking samples of 40 students and recording the proportion of students in the sample that would vote for the math group’s candidate. Repeat the sampling process 100 times. To carry out the process, use a random number generator or a software program.

ii. Draw a dot plot to represent the outcome of the 100 simulations.
iii. How many times does the selected sample reflect that 18 or fewer students out of the 40 sampled would vote for the math group's candidate?

iv. If 50% of the class was going to vote for the math group's candidate, then is the sample outcome of 18 out of 40 voting for the math group's candidate a reasonably likely occurrence? In other words, is the 50% population percentage plausible given the observed sample proportion of 45%?

v. Using your answers to (i) and (ii), should the math group students conducting the poll be discouraged, or is it reasonable to think their candidate might win? Why or why not?

c. Now, the math group is puzzling over whether their 18 out of 40 provides enough information for them to think that the percentage who favor their candidate might be 60%. They decide to repeat the simulation only this time, they decide to simulate assuming that the seventh grade class is divided 60-40 between the two candidates (60% voting for the math group candidate and the other 40% voting for the other candidate).

i. Carry out this simulation by taking samples of 40 students and recording the proportion of students in the sample that would vote for the math group's candidate. Repeat the sampling process 100 times. To carry out the process, use a random number generator or a software program.

ii. Draw a dot plot to represents the outcome of the 100 simulations.

iii. How many times does the selected sample reflect that 18 or fewer students out of the 40 sampled would vote for the math group's candidate?

iv. If 60% of the class was going to vote for the math group's candidate, then is the sample outcome of 18 out of 40 voting for the math group's candidate a reasonably likely occurrence? In other words, is the 60% population percentage plausible given the observed sample proportion of 45%?

v. Using your answers to (i) and (ii), should the math group students conducting the poll be discouraged, or is it reasonable to think their candidate might win 60% of the vote? Why or why not?