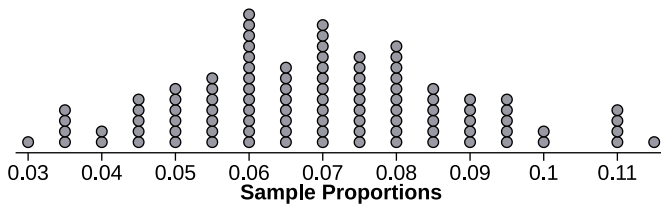


1. According to the Education Data Initiative, 7% of college students receive scholarships. Suppose this claim is true. A researcher selected a random sample of 200 college students and recorded the proportion of students ($\hat{p}$) in the sample who received scholarships. Here is a simulated sampling distribution of $\hat{p}$.



- a. What does the dot at 0.03 represent?
- b. What is the shape of the sampling distribution of $\hat{p}$? Justify.
- c. What is the mean of the sampling distribution of $\hat{p}$? Interpret.
- d. What is the standard deviation of the sampling distribution of $\hat{p}$? Interpret.
- e. What condition must be met to use the formula for standard deviation? Check the condition.

2. For each of the following scenarios, determine if the sampling distribution of $\hat{p}$ is approximately normal. Be sure to justify.
- a. i. $n = 10, p = 0.4$
ii. $n = 30, p = 0.4$
iii. $n = 100, p = 0.4$
- b. What values of n make the sampling distribution of $\hat{p}$ more normal?
- c. i. $n = 50, p = 0.06$
ii. $n = 50, p = 0.48$
iii. $n = 50, p = 0.96$
- d. What values of p make the sampling distribution of $\hat{p}$ more normal?

3. A local newspaper is planning to select a random sample of community members to determine what proportion of the community supports a proposal on the upcoming election. Suppose that 64% of the community supports the proposal. Assume that there are at least 10,000 community members.
- What condition must be met in order to use the formula to calculate the standard deviation of the sampling distribution of the sample proportion in this setting?
 - Calculate the standard deviation of the sampling distribution of the sample proportion for samples of size $n = 100$.
 - Calculate the standard deviation of the sampling distribution of the sample proportion for samples of size $n = 400$. How does this standard deviation compare to the one for $n = 100$.
 - Calculate the standard deviation of the sampling distribution of the sample proportion for samples of size $n = 900$. How does this standard deviation compare to the one for $n = 100$.
 - How does the standard deviation change when the sample size is multiplied by some value k ?

4. The National Center for Education Statistics reports that 18.8% of public schools require students wear uniforms. A curious high school student wants to investigate this claim and plans to select a random sample of 80 schools, and then calculate the proportion of these schools that require students wear uniforms ($\hat{p}$). Assume the 18.8% claim is true.
- Describe the shape, center (mean), and variability (standard deviation) of the sampling distribution of $\hat{p}$.
 - The student finds that 12 of the 80 schools (15%) selected require students wear uniforms. Use a normal approximation to find the probability that the student would get a sample proportion of 0.15 or lower, if the 18.8% claim is true.
 - Use a binomial distribution to find the probability that the sample of 80 schools would have 12 or fewer that require students wear uniforms, if the 18.8% claim is true.
5. In a recent report, Gallup determined that 32% of employees in the United States are considered “engaged employees,” meaning they are highly involved and enthusiastic about their work. Suppose that a very large U.S. company plans to select a random sample of 50 of their employees to assess if they are “engaged employees”.
- Assuming the Gallup poll claim is true for this large company, what is the approximate probability that the sample proportion would be greater than 0.46?
 - When the large company conducted the survey, they found that 46% of the employees in the sample were engaged. Does this result provide convincing evidence that this company has a higher employee engagement rate than the national rate? Explain.

6. A popular board game uses a fair twenty-sided die (D20) with numbers from 1 to 20. A player conducts 200 trials. In each trial, they roll the die 10 times and record the number of rolls that result in 15 or higher. What type of distribution has the player generated?
- A) The sampling distribution of the sample proportion with $n = 200$ and $p = \frac{1}{20}$.
 - B) The binomial distribution with $n = 200$ and $p = \frac{6}{20}$.
 - C) The binomial distribution with $n = 10$ and $p = \frac{6}{20}$.
 - D) The sampling distribution of the sample proportion with $n = 10$ and $p = \frac{6}{20}$.
7. Which of the following combinations of sample size n and population proportion p would yield the smallest standard deviation for the sampling distribution of the sample proportion $\hat{p}$?
- A) $n = 10$ and $p = 0.10$
 - B) $n = 10$ and $p = 0.5$
 - C) $n = 100$ and $p = 0.10$
 - D) $n = 100$ and $p = 0.5$