
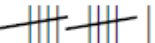
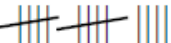


SM3 HW 14.4 Margin of Error

1. A spinner like the one shown was spun 40 times and the number it landed on was recorded as shown below.

1	2	3	4
			

For each situation, find the sample proportion, the margin of error for a 95% confidence level, the 95% confidence interval for the population proportion, and determine if the theoretical proportion of $p=0.25$ would be within the confidence interval found.

- a. the probability of the spinner landing on 1

$\rho = 0.225$

Margin of Error= 0.132

Confidence Interval: $(0.09,0.357)$

- b. the probability of the spinner landing on 2

$\rho = 0.125$

Margin of Error= 0.105

Confidence Interval: $(0.02,0.23)$

- c. the probability of the spinner landing on 4

$\rho = 0.35$

Margin of Error= 0.151

Confidence Interval: $(0.2,0.5)$

2. A consumer research group tested battery life of 36 randomly chosen cell phones to establish the likely battery life for the population of the same type of cell phone.

- a. Find the mean and standard deviation for the sample.
(Round to the nearest tenth)

$\bar{x} \approx 68.6, s \approx 10.6$

- b. Find the margin of error for a 95% confidence level and round to the nearest tenth.

3.5

- c. Find the 95% confidence interval.

$(65.1,72.1)$

- d. Interpret the meaning of the interval in terms of battery life for this type of cell phone.

We are 95% confident that the average value of the population's battery life in hours is in the interval $(65.1,72.1)$.

Battery Life in Hours			
55.4	63.3	72.7	70.6
50.2	85.4	85.2	83.2
72.0	69.5	65.4	65.1
55.7	73.1	47.9	72.9
55.3	58.6	81.1	58.5
64.0	83.7	73.0	74.7
80.0	73.9	75.4	58.9
61.3	69.8	83.3	61.2
63.0	63.1	85.0	57.6

3. In a poll of 650 likely voters, 338 indicated that they planned to vote for a particular candidate.
- Find the sample proportion.
 0.52
 - Approximate the margin of error for a 95% confidence level.
 0.039
 - Find the 95% confidence interval.
 $(0.481, 0.559)$
 - Interpret the meaning of the interval in terms of the election.
We are 95% confident that the probability that a voter will vote for a particular candidate is on $(0.481, 0.559)$.
 - If there are only two candidates in the election, based on the confidence interval is it plausible that the candidate could win the election? Explain your reasoning. Yes since 0.50 is within the interval so it is plausible that the candidate could get more than 50% of the vote.
 - Is it plausible that the candidate could lose the election? Explain your reasoning
Yes since proportions less than 0.50 are within the interval it is plausible that the candidate could get less than 50% of the vote and could lose the election.
4. A sample of 100 patients suffering from high blood sugar were given a new medication to see if it lower their long term blood sugar levels called A1C. Each patient was tested for their A1C level at the beginning of the trial and then after 6 months of taking the new medication each patient was again tested for their A1C. The experimenters then calculated the difference in their A1C levels by finding Start A1C – End A1C. So a positive difference indicates the A1C lowered over the 6 months and a negative difference indicates the A1C increased over the 6 month trial.

The average A1C difference for the 100 patients was $\bar{x} = 2.3$ and the standard deviation of \bar{x} is $\sigma_{\bar{x}} = 1.7$

- Approximate the margin of error for a 95% confidence interval.
 $2 \cdot 1.7 = 3.4$
- Find the 95% confidence interval.
 $2.3 \pm 3.4 = 2.3 - 3.4$ to $2.3 + 3.4 = (-1.1, 5.7)$
- Interpret the meaning of the interval in terms of the medication experiment.
We are 95% confident that the true average difference in A1C scores for patients suffering from high blood sugar is between $(-1.1, 5.7)$.
- Does it appear that the medication may help lower A1C levels? Explain your reasoning.
Positive differences indicate improvement in A1C and the interval indicates the average improvement could be as high as 5.7 so it is plausible that it helps lower A1C levels.
- Does it appear that the medication is guaranteed to lower A1C levels? Explain your reasoning.
No, since the interval also includes negative values, which indicates the A1C level got worse it is plausible that the medication does not improve A1C levels.
- If I decided to only add or subtract one standard deviation to \bar{x} instead of two, what would my confidence level be? 68% Would the interval be wider or narrower than the 95% confidence interval? Narrower
- How many standard deviations would I need to have a 99.7% confidence level? 3
- Calculate the 99.7% confidence interval for this problem. $2.3 \pm 3(1.7) = (-2.8, 7.4)$