

[Representing Data]

(§9.4 worksheet 1)

(Confidence Intervals)

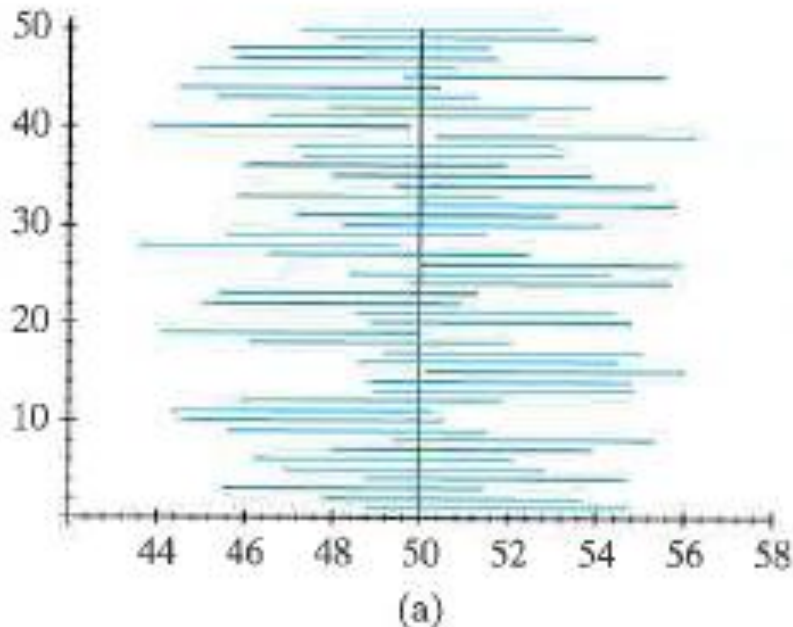
A survey reports that 62% of registered voters will vote in the next election with a $\pm 10\%$ margin of error at the 95% confidence level.

Then the interval (52%, 72%) (i.e. 52%-72%) is a 95% confidence interval. This means we are 95% confident that between 52% and 72% of all registered voters will vote in the next election.

The confidence level of the interval expresses the confidence in the *construction process* of the interval. If new data was collected from a sample of the same size as used in the original sample, then a new interval would likely be constructed containing slightly different values. If this process for constructing intervals was repeated 100 times, then our 95% confidence level tells us that we'd expect 95 of those intervals to contain the true proportion of people who would vote in the next election.

(example)

Suppose we are trying to find a confidence interval showing the mean weight of a certain breed of dog. We take a random sample of size 80 and construct a 95% confidence interval. If we repeated this 100 times with different samples we would get 100 different intervals. The 95% confidence level means we'd expect 95 of these intervals to contain the true mean weight of the dog breed. In some, the true mean might be in the middle, in others toward the high end in others toward the low end. We cannot make any prediction as to *where* in the interval the true mean may lie, just that we are 95% confident that the true mean is somewhere in the interval.



3. One study indicates that 50% of people are happy with the Affordable Care Act health insurance enrollment process with a margin of error of $\pm 5\%$ at a 95% confidence level. A second, larger, survey indicated that 47% of people are happy with the Affordable Care Act health insurance enrollment process with a margin of error of $\pm 2\%$ at a 95% confidence level. Is the percentage of the population who are happy with the Affordable Care Act health insurance enrollment process more likely closer to 50% or 47%? Why?

4. One study indicates that 80% of adults know how to swim with a margin of error of $\pm 8\%$ and a confidence level of 95%. Another student claims they found that only 75% of adults know how to swim with a margin of error of $\pm 3\%$ at a confidence level of 95%. Which study used the larger sample? How can you tell?

Notes:

- Most studies use a 95% confidence level
- If you are constructing a 95% confidence interval with a sample of size n to estimate a proportion of a population/sample then the margin of error can be estimated to be $\sim \pm \frac{1}{\sqrt{n}}$
- If p is the proportion of a sample, then the 95% confidence interval is $\left(p - \frac{1}{\sqrt{n}}, p + \frac{1}{\sqrt{n}}\right)$

5. You are running for city mayor and conducted a survey of 120 people. Of those people 47 said they would vote for you.
 - a. If you construct a 95% confidence interval, what would be your margin of error?

 - b. What is your 95% confidence interval? Do you think you will win?

6. You sample 150 people and find that 48% of them exercise every morning.
 - a. If you construct a 95% confidence interval, what would be your margin of error?

 - b. What is your 95% confidence interval?

7. For 95% confidence, what reasonable sample size would guarantee that you have a margin of error less than $\pm 1\%$?

8. For 95% confidence, what reasonable sample size would guarantee that you have a margin of error less than $\pm 3\%$?