

Key

Matched Pairs Problem: Is the express lane faster?

Libby and Kathryn decided to investigate which line was faster in the supermarket: the express lane or the regular lane. To collect their data, they randomly selected 15 times during a week, went to the same store, and bought the same item. However, one of them used the express lane and the other used a regular lane. To decide which lane each of them would use, they flipped a coin. If it was heads, Libby used the express lane and Kathryn used the regular lane. If it was tails, Libby used the regular lane and Kathryn used the express lane. They entered their randomly assigned lanes at the same time, and each recorded the time in seconds it took them to complete the transaction.

$$\text{diff} = \text{reg} - \text{express}$$

- a) Construct and interpret a 99% confidence interval for the average difference in their times.

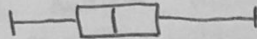
State: want to estimate the avg. difference in wait times

Plan: one samp t interval

Random: Randomly selected times and randomly selected who got which lane

Indep: $N > 10$ (15) weekly pop
 $N > 150$ of customers > 150

Approx Normal: Boxplot of diff looks symmetric



Do: $\bar{x}_{\text{diff}} \pm t^* \left(\frac{s_{\text{diff}}}{\sqrt{n}} \right)$
 $42.67 \pm 2.947 \left(\frac{84.02}{\sqrt{15}} \right)$
 $(-21.91, 107.25)$

Time in express lane (seconds)	Time in regular lane (seconds)
337	342
226	472
502	456
408	529
151	181
284	339
150	229
357	263
349	332
257	352
321	341
383	397
565	694
363	324
85	127

Conclude: I am 99% confident that the interval from -21.91 seconds to 107.25 seconds captures the true avg. difference in wait times.

- b) Is there a difference in wait times between the two lanes?

Because the interval contains zero, this implies that perhaps there is no significant difference in wait times btw the two lanes.

Confidence Intervals for Means with σ known

A study of the career paths of hotel general managers sent questionnaires to an SRS of hotels belonging to major U.S. hotel chains. There were 114 responses. The average time these 114 general managers had spent with their current company was 11.78. If the population standard deviations is known to be 3.2 years, construct and interpret a 99% confidence interval for the mean number of years general managers of major-chain hotels in the U.S. have spent with their current company.

State: Want to estimate w/ 99% confidence the mean # of yrs. managers have spent w/ current company

Plan: 1 Sample \bar{x} Interval

SRS: stated

Normal: Because $114 > 30$, CLT applies

Indep: $N > 10(114)$
 $N > 1140$

and we can use Normal approx.

$$\text{Do: } 11.78 \pm 2.576 \left(\frac{3.2}{\sqrt{114}} \right)$$
$$(11.008, 12.552)$$

Conclude: I am 99% confident that the interval from 11.008 yrs to 12.552 yrs captures the true mean number of years managers have spent with their current company

Sample Size Problem

Administrators at your school want to estimate how much time students spend on homework, on average, during a typical week. They want to estimate μ at the 90% confidence level with a margin of error of at most 30 minutes. A pilot study indicated that the standard deviation of time spent on homework per week is about 154 minutes. How many students need to be surveyed to estimate the mean number of minutes spent on homework per week with 90% confidence and a margin of error of at most 30 minutes?

$$z^* = 1.645$$

$$M.E. \leq 30$$

$$z^* \left(\frac{s}{\sqrt{n}} \right) \leq 30$$

$$1.645 \left(\frac{154}{\sqrt{n}} \right) \leq 30$$

$$\frac{154}{\sqrt{n}} \leq 18.237$$

$$\frac{154}{18.237} \leq \sqrt{n}$$

$$8.44 \leq \sqrt{n}$$

$$71.31 \leq n$$

OR
 $n \geq 71.31$

$$\boxed{n \geq 72}$$