In one example above, we tested $\pi_1 - \pi_2$, where $\pi_1$ = prop. of students in pop. who like The Lab in Spring. $\pi_2$ = prop. of students in pop. who like The Lab in Winter. We found that we are 95% confident that $\pi_1 - \pi_2 > 0.02$. That certainly does suggest that $\pi_1 - \pi_2 > 0$ (i.e. $\pi_1 > \pi_2$), but not with 95% confidence. Determine the confidence level at which $\pi_1 - \pi_2 > 0$.

This problem is asking us to find the conf. level such that the lower confidence bound for $\pi_1 - \pi_2$ is zero.

Using the same data,

$$(\pi_1 - \pi_2) - z^* \sqrt{\frac{\pi_1(1-\pi_1)}{n_1} + \frac{\pi_2(1-\pi_2)}{n_2}} = 0$$

$$(0.21 - 0.10) - z^* \sqrt{\frac{0.21(0.79)}{80} + \frac{0.1(0.9)}{100}} = 0$$

$0.1 - z^* (0.0545) = 0 \Rightarrow z^* = 1.83$$

Which side of 1.83 is the conf. level?

Recall $p(-z^* < z < z^*) = \text{Conf. level}$

$$0.9664 \quad (\text{Table 1})$$

So $\pi_1 - \pi_2 > 0$ with 96.6% confidence.
A sample of 2000 aluminum screws used in the assembly of electronic components was examined, and it was found that 44 of these screws stripped out during the assembly process. Does it appear that at most 2.5% of these screws suffer from this defect? Explain your reasoning for what is the most appropriate type of interval, and the conclusion that follows from it.

I revised 7.176 so that you have to determine what is the most appropriate interval to compute. Given the statement of the problem, we need an interval for

a) a proportion
b) 1-sample
c) 1-sided, specifically upper conf. bound.

(To see if \( p \) is at most something, we need to compute an upper conf. bound.)

For the rest of the solution, see the solution of 7.176 in the master list.
In the above example, we have \( n=16 \), and so \( df=n-1=15 \). One way to get \( t^* \) for the C.I. is from Table IV (4). Under the 2-sided 95% interval, for \( df=15 \), you will find 2.131.

a) Now, use Table VI (6); what value of \( t^* \) do you get?

\[ t^* \]

\[ \Rightarrow \text{From Table VI (6), the value of } t^* \text{ is about halfway between 2.1 and 2.2, i.e. 2.15, close enough to 2.131.} \]

b) Now, suppose we are interested in building a 1-sided C.I. for \( \mu \). According to Table IV (4), with \( df=15 \), and 95% confidence level, the value of \( t^* \) is 1.753. Again, what value of \( t^* \) do you get from Table VI (6)?

\[ t^* \]

\[ \Rightarrow \text{From Table VI (6), the value of } t^* \text{ is halfway between 1.7 and 1.8, i.e. 1.75, again close enough to 1.753.} \]