Example 1 (Proportions) *In January 2011, The Marist Poll published a report stating that 66% of adults nationally think licensed drivers should be required to retake their road test once they reach 65 years of age. In that same year, 200 random citizens of New Hampshire were asked whether they were in favor of an additional road test for drivers at 65 years of age – 118 responded that they were in favor. Construct a 95% confidence interval for the true proportion of citizens of New Hampshire who are in favor of this policy change.*

Solution. Before doing either part to the problem we can notice that the sample proportion of citizens of New Hampshire in favor of the policy is $\hat{p} = \dfrac{118}{200} = 0.59$.

Notice that the critical value for a 95% confidence interval is 1.96 (using either `qnorm` or the mini table at the top of the standard error decision tree document). We are working with a single proportion and so the Standard Error is given by:

$$S_E = \sqrt{\frac{0.59\,(1-0.59)}{200}} \approx 0.0348$$

Notice that we used the sample proportion here since we are estimating for New Hampshire only – not the rest of the Nation. We now construct our confidence interval:

$$(\textit{point estimate}) \pm (\textit{critical value})\,(S_E)$$

$$\implies 0.59 \pm 1.96\,(0.0348)$$

$$\implies (0.522, 0.658)$$

We are 95% confidence that the true proportion of adults in New Hampshire who favor this policy is between 52.2% and 65.8%.