

## Mini Math

February 4

1. Use your calculator to find the critical value of  $t^*$  that you would use for a confidence interval for a population  $\mu$  in each of the following settings.

(a) A 98% confidence interval based on a random sample of 26 observations.

**Solution:**

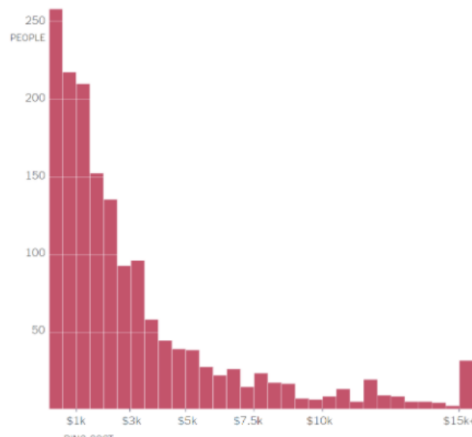
$$t^* = 2.485$$

(b) A 99% confidence interval from an SRS of 85 observations.

**Solution:**

$$t^* = 2.639$$

2. A national poll of a random sample of 1640 adults was carried out by Morning Consult. Each person reported how much they (or their significant other) spent on an engagement ring. The histogram below displays the results. Determine if the conditions for constructing a confidence interval for a mean have been met in this context.



**Solution: Random:** Random sample is clearly stated, so we may assume our sample generalizes to the population.

**Independence:** The sample 1640 is clearly less than the population of all adults. **Normal:**  $n = 1640 \geq 30$ , So the central limit theorem applies. This allows us to assume that  $\bar{x} \sim \text{Normal}\left(\mu, \frac{\sigma}{\sqrt{n}}\right)$ .

3. A group of children are interested in estimating the average number of Pokémon that a grade 5 student can say in 1 minute. They select a random sample of 32 students that has a mean of 16.813 Pokémon and a standard deviation of 5.527 Pokémon. With 95% confidence, provide an interval estimate for the mean number of Pokémon a grade 5 student can say in a minute.

**Solution: State:**  $n = 32$ ,  $\bar{x} = 16.813$ ,  $s_x = 5.527$ .

**Plan:** We are constructing a 95%  $t$  interval for the mean number of Pokémon a child can say in a minute. Condition checking is shown below:

Random Sample: Clearly stated in the problem so we may generalize our sample to all grade 5 students.

Independence: Our sample of 32 students is clearly less than 10% of the population of all students, so observations are independent.

Normality: Here we have a sample of  $32 > 30$  so the central limit theorem applies. We may assume  $\bar{x} \sim \text{Normal}\left(\mu, \frac{s}{\sqrt{n}}\right)$ .

**Do:**

Point Estimate  $\pm$  Margin of Error

$$\bar{x} \pm t_{30}^* \frac{s}{\sqrt{n}}$$

$$16.813 \pm 2.042 \left( \frac{5.527}{\sqrt{32}} \right)$$

Our confidence interval is (14.818, 18.808).

Conclude: We are 95% confident that the interval from 14.818 to 18.808 captures the true mean number of Pokémon that a grade 5 student can name in 1 minute.