Example 4: Suppose students in the US average 494 point on the SAT-I math exam with a standard deviation of 124 points. At one school, 86 students are registered in a special math program and when they took the SAT-I math exam they achieved an average of 517 points. The administration wants to know if the special program had an effect (either positive or negative) on test scores. Test at the $\alpha = 0.05$ significance level.

$n = 86$ is large $\Rightarrow$ $\bar{x}$ is normally distributed

1. Define the parameter of interest using the correct notation. Then, state the null and alternative hypotheses for this study.

testing μ - the true mean points on the SAT-I exam.

$H_0: \mu = 494$

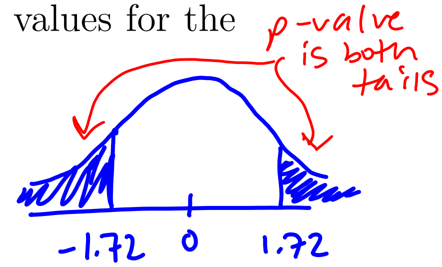
$H_1: \mu \neq 494$

two-tailed test

2. Calculate the observed value of the test statistic. State the distribution (and degrees of freedom if needed) it follows. use z distribution

$$z_{obs} = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{517 - 494}{124/\sqrt{86}} = 1.72$$

3. Compute the p-value or provide a range of appropriate values for the p-value. ⊛ pick whichever tail is easier to look up on the stat table.



$$\begin{aligned} p\text{-value} &= P(z < -1.72) + P(z > 1.72) \\ &= 2 \cdot P(z < -1.72) \\ &= 2(0.0427) = 0.0854 \end{aligned}$$

4. Using the significance level $\alpha = 0.05$, state your conclusions about the math program.

p-value $= 0.0854 > \alpha = 0.05 \Rightarrow$ p-value is big $\Rightarrow$ keep H_0.
(not enough evidence for H_1)

We conclude that there is not enough evidence to say that the special math program had an effect (either positive or negative) on test scores.