A. Problem Statement

We would like to test the following hypotheses:

$$H_0: p = 0.8$$
$$H_A: p \neq 0.8,$$

Where:

- p is the proportion of all former students of Dr. Difficult's Calculus class who got A's.

In order to test this, we need to know more about the sampling distribution of (1)_____.

***B. Actual* Sampling Distribution Creation**

If we wanted to create this sampling distribution by hand, that would help us test these hypotheses we would need to do the following.

1. Collect *M* random samples (2)_____ (WITH/WITHOUT)replacement from the population of all former Dr. Difficult calculus students.
2. Then calculate the (3)_____ of each of these random samples and put them in a list.

C. Theoretical Sampling Distribution

HOWEVER, we don't actually need to create this sampling distribution above, because we know the following things about this sampling distribution.

1. The mean of this sampling distribution is approximately (4) _____.
2. The standard deviation of this sampling distribution (aka the standard error) is approximately (5) _____.
3. Because the following (6)_____ Theorem conditions for (1)_____ below hold, then the distribution of (1)_____ is (7)_____.
    a) _____.
    b) _____.
    c) _____.

D. What does a p-value really mean?

Because the sampling distribution of (1)_____ is (7)_____, we are able to calculate the p-value which represents

p-value = P((1) _____ that are at least as suspicious (of the alternative hypothesis) as (8)_____ *assuming that* (9)_____)

in favor

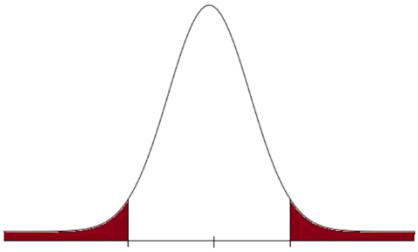
For this problem, a (1)_____ that is at exactly as suspicious (of the alternative hypothesis as (8)_____ is (10)_____.

in favor

E. Calculating the p-value

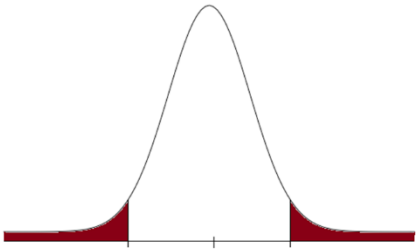
We will assume $H_0: p = 0.8$ in this entire box.

Sampling Distribution of (1)_____



(8)_____ (11)_____ (10)_____

Distribution of the Z-scores of (1)_____



-|z-score of (8)_____| (13)_____ |z-score of (8)_____|

Furthermore, because the sampling distribution of (1)_____ is (7)_____, the distribution of the **z-scores** of the (1)_____ follows the (12) _____ distribution, which we know has a mean of (13)_____ and a standard deviation of (14)_____.

The z-score of (8) = (15)_____.

Interpreting the p-value

The p-value is the area represented in red (in all two plots to left).

Therefore, because our p-value that we calculated (16)_____(IS/IS NOT) smaller than $\alpha = 0.01$, it (17) _____(DOES/DOESN'T) make us suspicious enough of our base assumption, to make us claim that there is sufficient evidence to suggest $H_A: p \neq 0.8$.