A large high school in Michigan is concerned that too many of the Seniors have contracted the Senioritis-20 virus. The administrators have decided that if more than 30% of the Seniors have the virus, they will cancel Spring Break. To make this decision, they will select a random sample of 50 Seniors and have them tested.

1. State appropriate hypotheses for performing a significance test. Use $\alpha = 0.05$.

2. (a) Describe a Type I error in this setting.

(b) Describe a Type II error in this setting.

(c) From the administrator’s perspective, which error has more serious consequences?
3. Draw a picture of the sampling distribution under the assumption that $H_0$ is true.

4. Suppose that the true percent of Seniors at this school with Senioritis-20 is 50%.
   Draw a picture of the sampling distribution under the assumption that $H_a$ is true.

5. In this setting, the power of the administrator’s significance test is 0.91. Interpret.

6. Use the applet at https://istats.shinyapps.io/power/ and input the values from this context.
   Click Display Power. Sketch the graphs below.

7. The administration wants to increase the power of the test. How could they adjust each of
   the following factors to increase the power? Use the applet to explore each.
   a. Sample size:
   b. $\alpha$ level:
   c. Alternative p:
Check Your Understanding

A one-sided hypothesis test is to be performed with a significance level of 0.05. Suppose that the null hypothesis is false. If a significance level of 0.01 were to be used instead of a significance level of 0.05, which of the following would be true?

A. Neither the probability of a Type II error nor the power of the test would change.

B. Both the probability of a Type II error and the power of the test would decrease.

C. Both the probability of a Type II error and the power of the test would increase.

D. The probability of a Type II error would decrease and the power of the test would increase.

E. The probability of a Type II error would increase and the power of the test would decrease.