Intro Stats Quiz A – Chapter 18 – Key

2. The average composite ACT score for Ohio students who took the test in 2003 was 21.4. Assume that the standard deviation is 1.05. In a random sample of 25 students who took the exam in 2003, what is the probability that the average composite ACT score is 22 or more? (Make sure to identify the sampling distribution you use and check all necessary conditions.)

Check the conditions:
1. Random sampling condition: We have been told that this is a random sample.
2. Independence assumption: It's reasonable to think that the scores of the 25 students are mutually independent.
3. 10% condition: 25 students is certainly less than 10% of all students who took the exam

We're assuming that the model for composite ACT scores has mean $\mu = 21.4$ and SD $\sigma = 1.05$.

Since the sample size is large enough and the distribution of ACT scores is most likely unimodal and symmetric, CLT allows us to model the sampling distribution of $\bar{y}$ with a Normal distribution with

mean 21.4 and $SD(\bar{y}) = \dfrac{1.05}{\sqrt{25}} = 0.21$.

An average score of 22 is $z = \dfrac{22 - 21.4}{0.21} = 2.86$ SDs above the mean.

$P(Z > 2.86) = 1 - 0.9979 = 0.0021$, so the probability that the average composite ACT score for a sample of 25 randomly selected students is 22 or more is 0.0021.

Intro Stats Quiz B – Chapter 18 – Key

2. Herpetologists (snake specialist) found that a certain species of reticulated python have an average length of 20.5 feet with a standard deviation of 2.3 feet. The scientists collect a random sample of 30 adult pythons and measure their lengths. In their sample the mean length was 19.5 feet long. One of the herpetologists fears that pollution might be affecting the natural growth of the pythons. Do you think this sample result is unusually small? Explain.

We have a random sample of adult pythons drawn from a much larger population. With a sample size of 30, the CLT says that the approximate sampling model for sample means will be N(20.5, 0.42). A sample mean of only 19.5 feet is about 2.38 standard deviations below what we expect. The sample mean of 19.5 feet is unusually small.