Sampling Distribution – Exercise

Cont'd

2. Will the chance be the same if the sample consists of 30 individuals? Why? If your answer is "NO", what the chance should be?

No. As by increasing the sample size, the standard error will drop, leading to a larger Z value, and a smaller upper-tail area.

$\bar{X} \sim N\left(140, \left(\frac{20}{\sqrt{30}}\right)^2\right)$

$P(\bar{X} > 150) = P\left(Z > \frac{150 - 140}{20/\sqrt{30}}\right) = P(Z > 2.739)$

$= 1 - 0.9969 = 0.0031$

Sampling Distribution – Exercise

Cont'd

3. If the 20 individuals are randomly selected from a non-Normal population, what is the probability that its mean weight exceeds 150lb.?

Since the population is non-Normal, and the sample size is small, we are unable to tell how the sample mean is being distributed, and the corresponding probability.

Sampling Distribution – Exercise

Cont'd

4. For a sample consists of 30 individuals from a non-normal population, what is the probability that its sample mean weight falls between 135 lb. and 150 lb.?

The population distribution is non-normal, but the sample size is large ($n \geq 30$), we can conclude that $\bar{X} \sim N(140, (\frac{20}{\sqrt{30}})^2)$ according to the Central Limit Theorem.

$P(135 < \bar{X} < 150) = P\left(\frac{135-140}{20/\sqrt{30}} < Z < \frac{150-140}{20/\sqrt{30}}\right)$

$= P(-1.369 < Z < 2.739)$

$= 0.9969 - 0.0853 = 0.9116$