Sampling Distributions

6.2 Using the Central Limit Theorem

1. The average time to complete this question is 4.21 minutes with a standard deviation of 0.51 minutes. What is the probability that a random group of 55 students has an average completion time of less than 4 minutes for this question?

2. Cars and light trucks are getting heavier. The average weight of cars and light trucks in the US was 4,021 pounds with a standard deviation of 726 pounds. What is the probability that a randomly selected group of 32 vehicles crossing a small bridge will have an average weight of more than 4,100 pounds which would mean the weight of the 32 cars would exceed the bridge's weight limit?

3. It is recommended that backpacks weigh less than 1/4th of your body weight. The average backpack with four textbooks and school supplies weighs 38.2 pounds with a standard deviation 7.1 pounds. If a randomly selected group of 36 backpacks is weighed what is the probability that the average weight for the packs is between 40 and 41 pounds? VS

Answers:

1. The standard error of the sample means is: $\sigma_{\bar{x}} = \frac{0.51}{\sqrt{55}} \approx 0.068768$

   $P(\bar{x} < 4) = P(Z < -3.05) = 0.5000 - 0.4989 = 0.0011$

   Graphing calculator answer: 0.00113

2. The standard error of the sample means is: $\sigma_{\bar{x}} = \frac{726}{\sqrt{32}} \approx 128.3398808$

   $P(\bar{x} > 4100) = P(Z > 0.62) = 0.5000 - 0.2324 = 0.2676$

   Graphing calculator answer: 0.2691

3. The standard error of the sample means is: $\sigma_{\bar{x}} = \frac{7.1}{\sqrt{36}} \approx 1.18333$

$$P(40 < \bar{x} < 41) = P(1.52 < Z < 2.37) = 0.4911 - 0.4357 = 0.0554$$

Graphing calculator answer: 0.0551