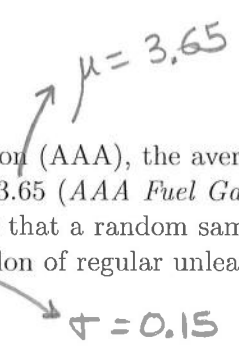


6.38

Cost of unleaded fuel. According to the American Automobile Association (AAA), the average cost of a gallon of regular unleaded fuel at gas stations in May 2014 was \$3.65 (AAA Fuel Gauge Report). Assume that the standard deviation of such costs is \$.15. Suppose that a random sample of $n = 100$ gas stations is selected from the population and the cost per gallon of regular unleaded fuel is determined for each. Consider \bar{x} , the sample mean cost per gallon.



- a. Calculate $\mu_{\bar{x}}$ and $\sigma_{\bar{x}}$.
- b. What is the approximate probability that the sample has mean fuel cost between \$3.65 and \$3.67?
- c. What is the approximate probability that the sample has a mean fuel cost that exceeds \$3.67?
- d. How would the sampling distribution of \bar{x} change if the sample size n were doubled from 100 to 200? How do your answers to parts **b** and **c** change when the sample size is doubled?

a. $\mu_{\bar{x}} = E(\bar{X}) = 3.65$ $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{0.15}{\sqrt{100}} = 0.015$

b. $P\{3.65 < \bar{X} < 3.67\} \underset{\text{CLT}}{\approx} P\left\{\frac{3.65 - 3.65}{0.015} < Z < \frac{3.67 - 3.65}{0.015}\right\}$
 $\bar{X} \sim N(3.65, 0.015)$

$= P\{0 < Z < 1.33\} = 0.4082$

c. $P\{\bar{X} > 3.67\} \underset{\text{CLT}}{\approx} P\{Z > 1.33\} = 0.5 - 0.4082 = 0.0918$

d. $n = 200 \rightarrow \bar{X} \sim N\left(3.65, \frac{0.15}{\sqrt{200}} \approx 0.011\right)$

$P\{3.65 < \bar{X} < 3.67\} \approx P\{0 < Z < 1.82\} = 0.4656$

$P\{\bar{X} > 3.67\} \approx P\{Z > 1.82\} = 0.5 - 0.4656 = 0.0344$