STAT345: Homework 8

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Problem 1

a

$Z = \frac{\bar{x}-\mu_0}{\sigma/\sqrt{n}}$
$Z = \frac{19.8889-20}{0.75/\sqrt{10}}$
$Z = \frac{-0.1111}{0.2371708245}$
$Z = \frac{-0.1111}{0.2371708245}$
$Z = -0.4684387308$

b

$z_{\frac{\alpha}{2}}\frac{s}{\sqrt{n}} = 1$
$1.96(\frac{2}{\sqrt{n}}) = 1$
$1.96(2) = \sqrt{n}$
$1.96(2)^2 = n$
$15.3664 = n$
$n = 16$

Problem 2

a

$\bar{x} = 65.57725$
$s = 4.225464$
$CI = [\bar{x} - z_{\frac{\alpha}{2}}\frac{s}{\sqrt{n}}, \bar{x} + z_{\frac{\alpha}{2}}\frac{s}{\sqrt{n}}]$
$CI = [65.57725 - 1.645\frac{4.225464}{\sqrt{16}}, 65.57725 + 1.645\frac{4.225464}{\sqrt{16}}]$
$CI = [65.57725 - 1.73772207, 65.57725 + 1.73772207]$

$CI = [63.83952793, 67.31497207]$

We are 90% sure that the population's mean is between 63.83952793 and 67.31497207.

b

$\bar{x} = 65.57725$
$s = 4.225464$
$CI = [\bar{x} - z_{\frac{\alpha}{2}} \frac{s}{\sqrt{n}}, \bar{x} + z_{\frac{\alpha}{2}} \frac{s}{\sqrt{n}}]$
$CI = [65.57725 - 1.96 \frac{4.225464}{\sqrt{16}}, 65.57725 + 1.96 \frac{4.225464}{\sqrt{16}}]$
$CI = [65.57725 - 2.07047736, 65.57725 + 2.07047736]$
$CI = [63.50677264, 67.64772736]$

We are 95% sure that the population's mean is between 63.50677264 and 67.31497207.

Problem 3

a

$\hat{p} = \frac{x}{n}$
$\hat{p} = \frac{823}{1000}$
$\hat{p} = 0.823$
$CI = [\hat{p} - z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}, \hat{p} - z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}]$
$CI = [0.823 - 1.96 \sqrt{\frac{0.823(1-0.823)}{1000}}, 0.823 - 1.96 \sqrt{\frac{0.823(1-0.823)}{1000}}]$
$CI = [0.823 - 1.96 * 0.01206942418, 0.823 - 1.96 * 0.01206942418]$
$CI = [0.7993439286, 0.8466560714]$
$CI = [79.9\%, 84.7\%]$

b

$n = (\frac{z_{\frac{\alpha}{2}}}{E})^2 \hat{p}(1 - \hat{p})$
$n = (\frac{1.96}{0.03})^2 0.823(1 - 0.823)$
$n = 622$