

# STAT212 Assignment 1

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## 1 Question 1

### 1.1 Part 1

The formula for a  $(1 - \alpha_0)\%$  CI for  $\mu$  is given by:

$$\bar{X} - z_{\alpha_0/2} \times (\sigma_0/\sqrt{n}), \bar{X} + z_{\alpha_0/2} \times (\sigma_0/\sqrt{n})$$

Using excel for calculations:

$$\bar{X} = 102.0765957$$

$$s.d = 13.86773053$$

$$n = 470$$

$$levelofconfidence = 0.9$$

$$\alpha = 1 - 0.9 = 0.1$$

$$\frac{\alpha}{2} = 0.05$$

$$t - cutoff = 1.648109068$$

$$upper = 101.0223486$$

$$lower = 103.1308428$$

### 1.2 Part 2

The half-width of a  $(1 - \alpha_0)\%$  CI is referred to as the CIs precision.

$$z_{\alpha_0/2} \times \left(\frac{\sigma_0}{\sqrt{n}}\right)$$

$$1.648109068 \times \left(\frac{13.86773053}{\sqrt{470}}\right)$$

$$precision = 1.054247097$$

### 1.3 Part 3

$$variance = 200$$

$$s.d = \sqrt{200} = 14.14213562$$

$$precision = 0.5$$

$$levelofconfidence = 0.9$$

To find number of students we use the following formula

$$\begin{aligned} n &= \left[ \left( \frac{z_{\alpha_0/2} \times \sigma_0}{I_0} \right)^2 \right] \\ &= \left[ \left( \frac{1.648109068 \times 14.14213562}{0.5} \right)^2 \right] \\ &= 2173.0108 \end{aligned}$$

2174 students needed to be sampled to achieve a precision of 0.5 at a level of confidence of 90%.