STAT212 Assignment 3

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Question 1

We calculate p-value as following:

$$\text{p-value} = Pr(T_{n-1} \geq \frac{\bar{x} - \mu_0}{s/\sqrt{n}})$$

We know the following variables:

$$\bar{x} = \$25.836$$

$$\mu_0 = 22.50$$

$$s = 16.153$$

$$n = 50$$

Plugging in these we get:

$$\text{p-value} = \mathbf{0.075}$$

Question 2

WatchDogs would have been able to perform the same hypothesis test and still arrive at a conclusion to reject the null hypothesis at level of significance as low as $\alpha_0 = \mathbf{0.075}$

Question 3

We calculate the power as following:

$$\text{Power} = 1 - \beta = 1 - \Phi\left(\frac{(\mu_o - \mu_A) + \frac{\sigma}{\sqrt{n}} \times z_{0.05}}{\sigma/\sqrt{n}}\right)$$

given following variables,

$$n = 50$$
$$\sigma = 16$$
$$\mu_0 = 22.50$$
$$\mu_A = 23$$
$$z_{0.05} = 1.645$$

Power is equal to:

$$\text{Power} = \mathbf{0.077}$$

Question 4

We calculate $P(\text{Type II Error}) = \beta$ as following:

$$Power = 1 - \beta$$

$$\beta = 1 - Power$$

$$\beta = 1 - 0.077 = \mathbf{0.923}$$

Question 5

We calculate it as follows:

$$n = \left\lceil \left(\sigma \times \frac{z_\beta + z_{\alpha_0}}{\mu_0 - \mu_A}\right)^2 \right\rceil$$

given the following variables,

$$\sigma = 16$$
$$\mu_0 = 22.50$$
$$\mu_A = 23.00$$
$$z_\beta = z_{0.2} = 0.842$$
$$z_\alpha = 1.645$$

n is equal to,

$$n = \mathbf{6331}$$