

# Assignment 10

## Question 1

Define  $\alpha$  and  $\beta$  for a test of hypothesis. What is the quantity  $1 - \beta$  called?

## Question 2

Using a 5% significance level, what is the power of the test  $H_0 : \mu = 100$  versus  $H_1 : \mu \neq 100$  if a sample of size 36 is taken from a  $N(120, 50)$ ?

## Question 3

The research and development department of an appliance company suspects the energy consumption required of their 18-cubic-foot refrigerator can be reduced by a slight modification to the current motor. Sixty 18-cubic-foot refrigerators were randomly selected from the company's warehouse. The first 30 had their motors modified while the last 30 were left intact. The energy consumption (kilowatts) for a 24-hour period for each refrigerator was recorded and stored in the data frame `REFRIGERATOR`. Is there evidence that the design modification reduces the refrigerators' average energy consumption?

## Question 4

According to the Pamplona, Spain, registration, 0.4% of immigrants in 2002 were from Bolivia. In June of 2005, a sample of 3740 registered foreigners was randomly selected. Of these, 87 were Bolivians. Is there evidence to suggest immigration from Bolivia has increased? (Use  $\alpha = 0.05$ .)

## Question 5

A cell phone provider has estimated that it needs revenues of £2 million per day in order to make a profit and remain in the market. If revenues are less than £2 million per day, the company will go bankrupt. Likewise, revenues greater than £2 million per day cannot be handled without increasing staff. Assume that revenues follow a normal distribution with  $\sigma = \text{£}0.5$  million and a mean of  $\mu$ .

- Graphically depict the power function for testing  $H_0 : \mu = 2$  versus  $H_1 : \mu \neq 2$  if  $n = 150$  and  $\alpha = 0.05$  for values of  $\mu$  ranging from 1.8 to 2.2.
- Graphically depict the power for testing  $H_0 : \mu = 2$  versus  $H_1 : \mu \neq 2$  when  $\mu_1 = 2.1$  and  $n = 150$  for values of  $\alpha$  ranging from 0.001 to 0.999.
- Graphically depict the power for testing  $H_0 : \mu = 2$  versus  $H_1 : \mu \neq 2$  when  $\mu_1 = 2.1$  and  $\alpha = 0.05$  for values of  $n$  ranging from 1 to 500.
- Generalize what is seen in the graphs for (a), (b), and (c).