STATISTICS FOR MANAGEMENT (IDS 570)

HOMEWORK 7 SOLUTION

Problem 1

(a) Yes, the analysis involves hypothesis testing We define μ_m to be mean heart rate for males being admitted to an ICU and μ_f to be mean heart rate for females being admitted to an ICU. The hypotheses are:

$$\begin{aligned} H_0 : \mu_m &= \mu_f \\ H_0 : \mu_m &> \mu_f \end{aligned}$$

(b) This analysis does not include a test because from the information in a census, we can find exactly the true population proportion.

(c) Yes, the analysis involves hypothesis testing. We define μ to be the mean age of ICU patients. The hypotheses are:

$$\begin{aligned} H_0 : \mu &= 50 \\ H_0 : \mu &> 50 \end{aligned}$$

(d) Yes, the analysis involves hypothesis testing We define ρ to be the correlation between systolic blood pressure and heart rate for patients admitted to an ICU. The hypotheses are:

$$\begin{aligned} H_0 : \rho &= 0 \\ H_0 : \rho &> 0 \end{aligned}$$

Note: The hypotheses could also be written in terms of b_1, the slope of a regression line to predict one of these variables using the other.

(e) This analysis does not include a statistical test. Since we have all the information for the population, we can compute the proportion who voted exactly and see if it is greater than 50%.

Problem 2

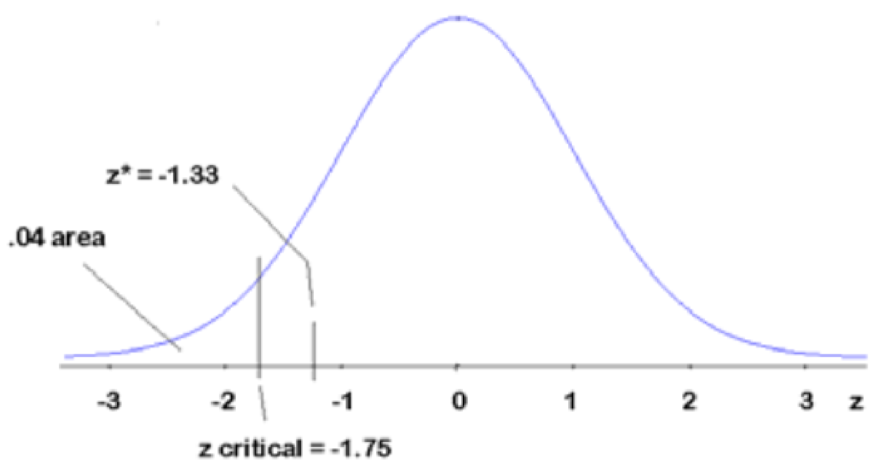
(a) We have

$$\begin{aligned} H_0 : \mu &= 34 \\ H_0 : \mu &< 34 \end{aligned}$$

(b) Since the population standard deviation σ is given, we use z-score. To find z^* we can use the following code in R:

> xbar = 32.5, sigma = 8, mu = 34, n = 50
> zstar = (xbar - mu)/(sigma/sqrt(n))
> zstar
> [1] -1.325825

To get the p-value we have
> p.value = pnorm(zstar, 0, 1, lower.tail = T)
> p.value
> [1] 0.0924488



(c) Since p-value $> \alpha$, our decision is not to reject H_0.

(d) Based on this one sample of size 50 with a one-tailed test on the left and $\alpha = 0.04$, it seems as though we can not believe the factories claim that the mean amount of pollutant is less than 34 ppm. The lower value of 32.5 ppm is probably due to random chance.

Problem 3

(a) We have

$$H_0 : \mu = 0.5$$
$$H_0 : \mu \neq 0.5$$

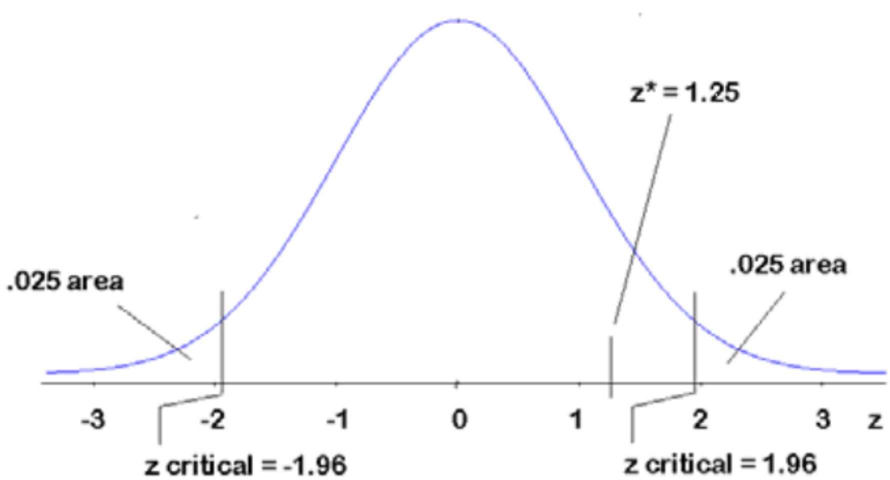
(b) Since the population standard deviation σ is given, we use z-score. To find z^* we can use the following code in R:
> xbar = 0.51, sigma = 0.04, mu = 0.5, n = 25
> zstar = (xbar - mu)/(sigma/sqrt(n))
> zstar
> [1] 1.25

To get the p-value we have

> p.value = 2 * pnorm(zstar, 0, 1, lower.tail = F)

> p.value

> [1] 0.2112995



(c) Our decision is not to reject H_0.

(d) Based on this one sample of size 25 with a two-tailed test and $\alpha = 0.05$, it seems as though we can believe the claim that the mean diameter still is 0.5 centimeters. The larger value of 0.51 centimeters is probably due to random chance.

Problem 4

(a) We have

> data = c(2.7, 2.8, 3.0, 2.3, 2.3, 2.2, 2.8, 2.1, 2.4)

> mean(data)

[1] 2.511111

> sd(data)

[1] 0.3179797

(b) After installing the "Rmisc" package, we can use the "CI" function to get the confidence interval:

> CI(data, ci = 0.95)

upper mean lower

2.755532 2.511111 2.266690

Therefore the confidence interval is (2.27, 2.76)

(c) We know $|m| = z^* \cdot \dfrac{\sigma}{\sqrt{n}}$. Therefore,

> n = 9

> SE = sd(data)/sqrt(n)

> E = qt(0.975, df = n-1)*SE

```
> E
[1] 0.2444209
```

(d) 95% of samples of 9 patients will have an average effectiveness time between 2.27 and 2.76 hours.