MAT9D2: Practical Statistics Spring 2016
Practical 3: Hand Calculations: Solutions

Question 1

(a) $H_0: \mu = 9.5$ Significance Level 0.05

$H_1: \mu \neq 9.5$

(known sd - so Z test)

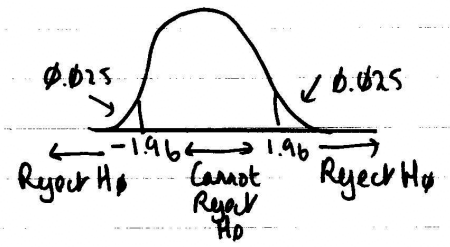
(b) Test Statistic $Z = \dfrac{\bar{x} - 9.5}{\sigma/\sqrt{n}} \sim N(0,1)$ under H_0

Observed Test Statistic

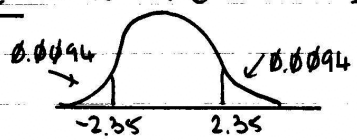
$n = 180 \quad \bar{x} = 9.57 \quad \sigma = 0.4$

$$Z = \frac{9.57 - 9.50}{0.4/\sqrt{180}} = 2.348$$

Rejection Region 2 sided ; 0.05 ; N(0,1) tables



p value $= 2 \times P(Z > 2.35) = 2 \times (1 - 0.9906) = 0.0188$



Conclusion

Observed Test Statistic is in the Rejection Region so can reject H_0 in favour of H_1 at 5% (can also draw same conclusion using $p = 0.0188 < 0.05$). So can conclude that mean is significantly different to 9.5 mg/dl.

(c) 95% CI for μ (Z interval since sd known)

$\bar{x} \pm 1.96\ \sigma/\sqrt{n}$

$9.57 \pm 1.96 \times 0.4/\sqrt{180}$

9.57 ± 0.06

ie $(9.51, 9.63)$

So true mean lies in this range with probability 0.95.

Question 2.

H_0: μ = £160000
H_1: μ > £160000

Standard deviation = £26250

$$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{176400 - 160000}{26250 / \sqrt{345}} = \frac{10650}{26250 / 18.574} = 11.604$$

From the standard normal table $P(Z>11.60) \approx 0.0 < \alpha$

Rejection region ($\alpha = 0.01$): Reject H_0 if $11.604 > Z_{0.01} = 2.33$

Conclusion: We reject H_0 in favour of H_1 at the 1% significance level because 1) the z score lies in the rejection region 2) the p-value (=0.0000001) < α (=0.01).