

## Solutions to Weekly Assignment 3

Q1. One sample, known sd, independent random sample,  
Normally distributed, question about the mean.  
so Z test appropriate.

$H_0: \mu = 15$  let  $\mu$  = true mean population weight loss  
in 6 months.  
 $H_1: \mu > 15$  ← One tailed since question asks "does  
diet produce greater weight losses?"

Significance level  $\phi.05$

Test Statistic  $Z = \frac{\bar{x} - 15}{\sigma/\sqrt{n}} \sim N(0,1)$  under  $H_0$

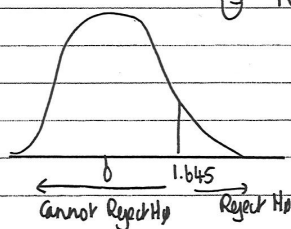
Observed Test statistic

$$n=12 \quad \bar{x} = \frac{\sum x}{n} = \frac{254.5}{12} = 21.21$$

$$\sigma = 9$$

$$Z = \frac{21.21 - 15}{9/\sqrt{12}} = \frac{6.21}{2.598} = 2.390$$

Rejection Region ① Significance level  $\phi.05$   
② One sided ( $H_1: \mu > 15$ )  
③ Normal Tables

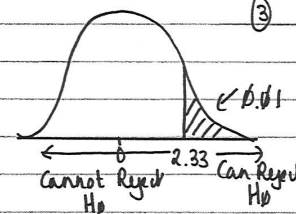


$$P(Z > z) = \phi.05 \\ \Rightarrow z = 1.645$$

Conclusion : Observed Test Statistic (2.39) is in the Rejection Region ( $2.39 > 1.645$ ) so we can reject  $H_0$  in favour of  $H_1$  at 5% level and conclude that we have evidence, at 5% level, that the mean weight loss is significantly more than 15 pounds on this diet.

Note : Significance level  $\phi.01$

Rejection Region ① Significance level  $\phi.01$   
② One sided ( $H_1: \mu > 15$ )  
③ Normal Tables



$$P(Z > z) = \phi.01 \\ \Rightarrow z = 2.33$$

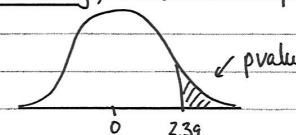
Conclusion : Observed Test Statistic (2.39) is in the Rejection Region ( $2.39 > 2.33$ ) so we can reject  $H_0$  in favour of  $H_1$  at 1% level & conclude that mean weight loss is significantly greater than 15 pounds on this diet.

So test is significant not only at 5% level but 1% level.

Alternatively, calculate the p-value  $P(Z > \text{Obs Test Statistic})$   
 $= P(Z > 2.39) =$

$$1 - P(Z < 2.39) =$$

$$1 - 0.9916 = 0.0084$$



$p < 0.01$  so can reject  $H_0$  in favour of  $H_1$  at 1% (5%)  
!! SAME CONCLUSION !!