STAT 205 Practice Exam II

March, 17, 2015

Note: this is a practice test. Open note, open book. You do not need to turn in the exam when you are done. Solutions will be posted on Wednesday.

1. The standard error of the sample mean based on a random sample of size n with sample standard deviation s is

   (a) $SE_{\bar{y}} = s/\sqrt{n}$
   (b) $SE_{\bar{y}} = s$
   (c) $SE_{\bar{y}} = s^2/n$
   (d) None of the above.

2. Which of the following is false regarding the shape of the sample mean?

   (a) If the population is not normal, the sample mean does not have a normal distribution, regardless of the sample size.
   (b) If the population is normal, the sample mean has a normal distribution.
   (c) If the sample size is large, the sample mean will always have a normal distribution, regardless of the distribution of the population.
   (d) None of the above.

3. A one sample confidence interval for μ is used to provide

   (a) a single numerical estimate of an unknown population mean
   (b) an interval of values in which the unknown population mean might lie with a specified probability
   (c) an interval of values in which the unknown population mean must lie
   (d) an interval that must contain 1.

4. In a hypothesis testing problem, when do we reject the H_0?

   (a) p-value$< \alpha$
   (b) p-value$> \alpha$
   (c) p-value$= \alpha$
   (d) We always reject H_0

5. Assume the population distribution is normal with mean 2500 and standard deviation 160. If we randomly draw a sample with size 100, let E denote the event that the sample mean for this sample is within ± 100 of the population mean. What best describes the probability of pr$\{E\}$?

   (a) pr$\{2340 < X < 2660\}$ where $X \sim N(2500, 160)$
   (b) pr$\{60 < X < 260\}$ where $X \sim N(2500, 16)$
   (c) pr$\{2400 < X < 2600\}$ where $X \sim N(2500, 16)$
   (d) None of the above.

6. In the above problem, if we change the sample size to 25, what is pr$\{E\}$?

```
> pnorm(2660,2500,160)-pnorm(2340,2500,160)
[1] 0.6826895
> pnorm(260,2500,32)-pnorm(60,2500,32)
[1] 0
> pnorm(2600,2500,32)-pnorm(2400,2500,32)
[1] 0.9982219
> pnorm(260,32,160)-pnorm(60,32,160)
[1] 0.3534612
```

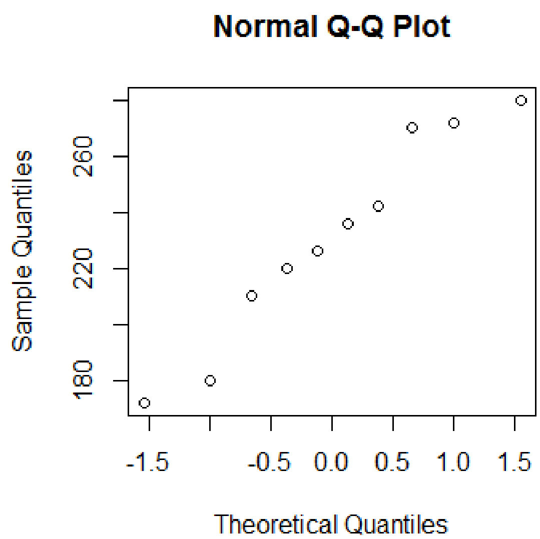
(a) 0.683

(b) 0

(c) 0.998

(d) 0.353

The cholestoral levels in mg/dL are measured in patients a day after they suffered a heart attack. A normal probability plot is given and some R output.




```
chol<-c(270,236,210,172,280,272,180,220,226,242)
t.test(chol)

        One Sample t-test

data:  chol
t = 19.6489, df = 9, p-value = 1.061e-08
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 204.2282 257.3718
sample estimates:
mean of x
    230.8
```

7. What is the population?

(a) 10

(b) The cholestoral levels of patients one day after they suffered a heart attack.

(c) Cholestoral levels

(d) Cholestoral levels of patients.

8. What is the population mean μ?

(a) 230.8

(b) The mean cholestoral level of patients one day after they suffered a heart attack.

(c) 204.2282

(d) 0.

9. Do the assumptions seem to hold?

   (a) Yes, the plot indicates approximate normality, and there is no reason to doubt independence of the observations.
   (b) No, the normal probability plot is not very close to a straight line.
   (c) Yes, because R has successfully printed out the test result.
   (d) No, the output shows the data are not independent.

10. A 95% confidence interval for the population mean is

    (a) $(204.2282, 257.3718)$
    (b) 230.8
    (c) $(9, 19.6489)$
    (d) $(172, 280)$

11. The student t distribution

    (a) has mean 0.
    (b) has fatter tails than the normal distribution.
    (c) is used to make confidence intervals and perform hypothesis tests.
    (d) All of the above.

12. A 99% confidence interval is

    (a) smaller than a 95% confidence interval.
    (b) bigger than a 95% confidence interval.
    (c) the same size as a 95% confidence interval, but has a smaller coverage rate.
    (d) None of these.

13. In a one-sample problem, a 95% confidence interval for μ

    (a) has a 95% chance of covering μ before the experiment is carried out.
    (b) always contains the true unknown population mean μ.
    (c) includes zero only when $\mu = 0$.
    (d) is obtained in R from `wilcox.test`.

14. For a two-sample t-test, the P-value is the probability

    (a) that the alternative $H_A : \mu_1 \neq \mu_2$ is true.
    (b) that $H_0 : \mu_1 = \mu_2$ is true.
    (c) of rejecting $H_0 : \mu_1 = \mu_2$.
    (d) of seeing sample means $\bar{Y}_1$ and $\bar{Y}_2$ even further apart than what we saw when H_0 is true.

Two varieties of lettuce were grown for 16 days in a controlled environment. The total leaf weight (grams) of $n_1 = 9$ “Salad Bowl” plants are to be compared to $n_2 = 6$ “Bibb” plants. Use the R output below to answer the following three questions.

```
saladbowl=c(3.06,2.78,2.87,3.52,3.81,3.60,3.30,2.77,3.62)
bibb=c(1.31,1.17,1.72,1.20,1.55,1.53)
> t.test(saladbowl,bibb)

        Welch Two Sample t-test

data:  saladbowl and bibb
t = 11.4836, df = 12.716, p-value = 4.422e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 1.497569 2.193542
sample estimates:
mean of x mean of y
 3.258889  1.413333
```

15. The 95% confidence interval for $\mu_1 - \mu_2$ is given by

    (a) Cannot be determined from this output.
    (b) $(1.50, 2.19)$ grams.
    (c) $(3.26, 1.41)$ grams.
    (d) 0.000000044.

16. What do we conclude when testing $H_0 : \mu_1 = \mu_2$ at the 5% level?

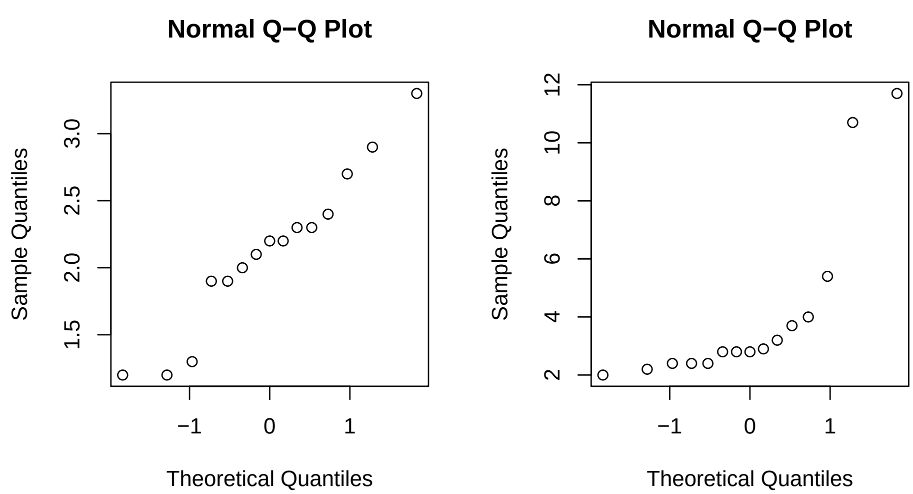
    (a) Cannot be determined from this output.
    (b) We reject H_0 in favor of $H_A : \mu_1 \neq \mu_2$ because the P-value is less than 0.05.
    (c) We accept H_0 because the 95% confidence interval includes zero.
    (d) `df = 12.716` indicates that the degrees of freedom for the test is too small to reject H_0.

17. Choose the correct statement.

    (a) The salad bowl mean $\mu_1 = 3.26$ grams is significantly different than the bibb lettuce leaf mean $\mu_2 = 1.41$ grams at the 5% level.
    (b) We are 95% confident that the mean difference $\bar{y}_1 - \bar{y}_2$ is between 1.50 and 2.19 grams.
    (c) The unknown population salad bowl mean weight μ_1 is 3.26 grams.
    (d) None of these are correct.

In a study of preening behavior in the fruitfly *Drosophila melanogaster*, a fly was observed for three minutes while in a chamber with other flies. The time spent preening (seconds) was recorded for 15 male flies and 15 female flies (different flies each time). The researchers were wondering if there is a sex difference in preening behavior. Use the R output and plot below to answer the following two questions.

```
> male=c(1.2,1.2,1.3,1.9,1.9,2.0,2.1,2.2,2.2,2.3,2.3,2.4,2.7,2.9,3.3)
> female=c(2.0,2.2,2.4,2.4,2.4,2.8,2.8,2.8,2.9,3.2,3.7,4.0,5.4,10.7,11.7)
> par(mfrow=c(1,2))
> qqnorm(male)
> qqnorm(female)
> > twot.permutation(male,female)
[1] 0
```



MALES FEMALES

18. Which of the following is true?

(a) The normality assumption is okay in both male and female groups.
(b) The normality assumption is *not okay* in the male group.
(c) The normality assumption is *not okay* in the female group.
(d) We need to difference the male and female observations and do a paired analysis here.

19. Which of the following is true?
(a) We accept H_0 : *males and females have the same mean of preening time* at the 5% level."
(b) We reject H_0 : *males and females have the same mean of preening time* at the 5% level."
(c) We cannot perform a hypothesis test based on this output.
(d) Males tend to preen longer than females.