Name: Key
Period:____
Date:____

Probability & Statistics
Chapter 8 Test Review
Ms. Harrison

1. **Use z-test for the mean**

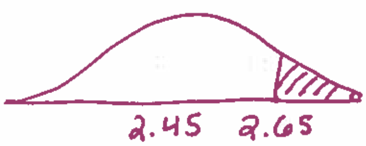
The mean grade point average for one college is 2.45, with a standard deviation of .69. An engineering professor believes that engineering majors have a higher grade point average than the college's mean. A sample of 20 engineering majors had a mean grade point average of 2.65. Test the professor's claim at the .01 level of significance.

μ = GPA of engineering students

$H_0: \mu \leq 2.45$

$H_a: \mu > 2.45$

Right tailed z test, $\alpha = .01$



$$z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{2.65-2.45}{.69/\sqrt{20}} = 1.296$$

$P = .0968$

Since $P > \alpha$, we fail to reject H_0. We dont have enough evidence to conclude that engineers have higher GPA's.

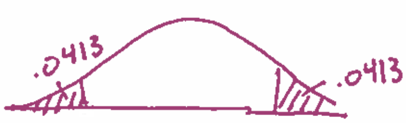
2. **Use z-test for the mean**

Last year, a grocery store had a mean of \$1850 with a standard deviation of \$150 in daily sales. This month, a new advertising approach was used. The store manager wants to know if the new advertising had any effect on the daily sales. If this month sales had a mean of \$1780 for 22 days, did the new advertising affect the daily sales at the .05 level?

μ = average daily sales

$H_0: \mu = 1850$

$H_a: \mu \neq 1850$



Two tailed z test, $\alpha = .05$

$$z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{1780-1850}{150/\sqrt{22}} = -2.189$$

$P = 2(.0143) = .0286$

Since $P < \alpha$, reject H_0. There is enough evidence to conclude that there was an effect on average daily sales.

3. Find the confidence Interval for #1.

one tail

$\alpha = \frac{1}{2}(100-c)$

$\bar{x} \pm z(s/\sqrt{n})$

$2.65 \pm 2.33(.69/\sqrt{20})$

$(2.291, 3.009)$

Since 2.45 is in the interval, Engineers do not have higher GPA's.

4. Find the confidence Interval for #2.

$z = 2.33$

two tailed

$\alpha = 100 - c$

$\bar{x} \pm z(s/\sqrt{n})$

$1780 \pm 1.96(150/\sqrt{22})$

$(1717.3, 1842.7)$

Since 1850 is not in the interval, we can conclude daily sales have changed

5. **Use t test for the mean**

A consumer tested 18 bottles of a soft drink and found a sample mean of 15.8 ounces, with a standard deviation of .4 ounces. If the bottles are supposed to contain 16 ounces, is the consumer being cheated?

μ = mean ounces in bottle

$H_0: \mu \geq 16$

$H_a: \mu < 16$

left tailed one sample t test

$df = 17, \alpha = .05$

$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$

$t = \frac{15.8 - 16}{.4/\sqrt{18}}$

$= -2.121$

$.025 < P < .01$

Since $P < \alpha$, reject H_0.

There is enough evidence that the mean is less than 16 ounces.

The consumer is being cheated.

6. use t test for the mean

A professor claims that the average on the first test n a statistics course is about 73. At the .01 level, test her statement. The following grades were recorded for the first test.

65	95	60	81	82	84	50	40	82	96	81	85
72	74	83	70	69	85	56	90	71	73	82	79

μ = average test score

$H_0: \mu \leq 73$

$H_a: \mu > 73$

Right tailed one sample t test

df = 23, $\alpha = .01$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$= \frac{75.21 - 73}{13.63/\sqrt{24}}$$

$$= .794$$

$$.2 < P < .25$$

Since $P > \alpha$, fail to reject H_0. There is not enough evidence to support the professor's claim.

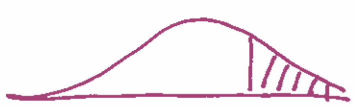
7. Z test for proportions

A college professor feels that females are doing better in a certain math class than the population. The college has a 52% passing rate in that particular course. If 16 out of 27 females pass the test, is the proportion of females that passed higher than the proportion of the population that passed? Test at the .01 level.

p = proportion of females that pass class.

$H_0: p \leq .52$

$H_a: p > .52$



Right tailed 1 proportion z test

$\alpha = .01$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

$$= \frac{16/27 - .52}{\left(\sqrt{\frac{.52(1-.52)}{27}}\right)}$$

$$= .755$$

$$P = .2236$$

Since $P > \alpha$, we fail to reject H_0. There is not enough evidence to claim that females do better in the class.

8. **Single variance**

A manufacturer wants to know if the variance of the size of the diameter of a nut is equal to 12. A sample of 17 nuts had a variance of 10.6. Test if the variance is 12 at the .01 level.

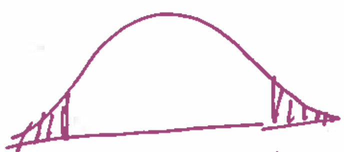
$H_0: \sigma^2 = 12$

$H_a: \sigma^2 \neq 12$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$= \frac{(17-1)(10.6)}{12}$$

$$= 14.133$$



5.142 34.267

Fail to reject H_0.

The variance is 12.

9. **Single variance**

A teacher claims that the variance on a certain test is less than 68. A sample of 58 students had a standard deviation of 5.8. Test the teacher's claim at the .01 level.

$H_0: \sigma^2 \geq 68$

$H_a: \sigma^2 < 68$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$= \frac{(58-1)(5.8)^2}{68}$$

$$= 28.148$$

29.707

Reject H_0. The variance is less than 68.