Quiz_4

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R Markdown

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When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. A random sample of n = 1000 observations from a binomial population produced x = 728 successes. Estimate the binomial proportion p.

```
p <- 728/1000
p

## [1] 0.728
```

Calculate the margin of error. The $ME = z_{\alpha/2} * \sqrt{p * (1-p)/n}$

```
1.96*sqrt(p*(1-p)/1000)

## [1] 0.02758076
```

Find 95 Confidence Interval for p. (point est -/+ ME)

```
p +c(-1,1)*1.96*sqrt(p*(1-p)/1000)

## [1] 0.7004192 0.7555808
```

The 95 % Confidence interval is (0.7004192, 0.7555808).

2. Some people claim there are health benefits to eating less meat. A health club committee reported the proportion of vegetarians in their city is 0.13. Suppose this estimate was based on a random sample of 80 people. Construct a 99% confidence interval for p, the true proportion of allvegetarian eaters in this particular city.

```
p.hat<- 0.13
n <- 80
alpha <- 0.01
z01 <- qnorm(0.995)
CI <- p.hat+c(-1,1)*z01*sqrt(p.hat*(1-p.hat)/n)
CI

## [1] 0.03314916 0.22685084
```

The 99% CI for p is (0.03314916, 0.22685084).

3. A stylist at The Hair Care Palace gathered data on the number of hair colorings given on Saturdays and on weekdays. Her results are listed below. Assume the two samples were independently taken from normal populations.
Saturday $n_1 = 50$ and $x_1 = 14$. Weekday $n_2 = 65$ and $x_2 = 13$.

Find the point estimate of p1 - p2.

```
p1.hat <- 14/50
p2.hat <- 13/65
p1.hat-p2.hat

## [1] 0.08
```

Find the margin of error.

```
s1<- p1.hat*(1-p1.hat)/50
s2 <- p2.hat*(1-p2.hat)/65
1.96*sqrt(s1+s2)

## [1] 0.1579417
```

Estimate the difference in the true proportions with a 99% confidence interval.

```
z01<- qnorm(0.995)
p1.hat-p2.hat +c(-1,1)*z01*sqrt(s1+s2)

## [1] -0.1275668  0.2875668
```

The 99% confidence interval for $p_1 - p_2$ is $(-0.1275668, 0.2875668)$.

Interpret this interval.
Since this interval contains zero, it is highly possible that there may be no difference in these proportions.

4. A group in favor of freezing production of nuclear weapons believes that the proportion of individuals in favor of a nuclear freeze is greater for those who have seen the movie "The Day After" (population 1) than those who have not (population 2). In an attempt to verify this belief, random samples of size 500 are obtained from the populations of interest. Among those who had seen "The Day After", 228 were in favor of a freeze. For those who had not seen the movie, 196 favored a freeze. Test using ??? = 0.05.

Test statistic = ____________

```
p1.hat4 <-228/500
p2.hat4 <- 196/500
phat.pool <- (228+196)/1000
SE<- sqrt(phat.pool*(1-phat.pool)*(1/500+1/500))
tcal <- (p1.hat4-p2.hat4)/ SE
tcal

## [1] 2.04765
```

Critical Value(s) = ____________

```
t01 <-  qt(0.95,998 )
t01

## [1] 1.646382
```

Since $t_{cal} = 2.04765 > 1.646382$, we reject the null hypothesis.

Conclusion: **Reject** H_0 **T**_________ Interpretation:The proportion in favor of a freeze is greater in population 1.

5. A national survey stated that 30% of the population prefers to use a pen with black ink, 30% prefer blue ink, 25% prefer red ink and 15% prefer some other color. A statistics professor took a random sample of 80 students and asked them to state their ink color preference. The following data was recorded:

Test whether the data agrees with the percentages stated in the national survey.

Let p_1 be the population proportion of those who prefers to use a pen with black ink, p_2 be the population proportion of those who prefers to use a pen with red ink, p_3 be the population proportion of those who prefers to use a pen with blue ink, $p_4 $ be the population proportion of those who prefers some other colors.

We want to test the hypothesis:
$H_0: p_1 = 0.3, p_2 = 0.3, p_3 = 0.25, p_4 = 0.15$
against the alternative hypothesis:
H_1: At least one of $p_i (i = 1,2,3,4)$ is not the same as the hypothesized value.

```
Dat=cbind.data.frame("Color"="Frequency", "Black"= 28, "Blue"=26, "Red"=18,
"Other"= 8)
Dat

##       Color Black Blue Red Other
## 1 Frequency    28   26  18     8
```

Compute the value of the test statistic. What is X^2?

```
obs <-c(28,26,18,8)
prob <- c(0.3,0.3,0.25,0.15)
chisq.test(obs,p=prob)

##
##  Chi-squared test for given probabilities
##
## data:  obs
## X-squared = 2.3667, df = 3, p-value = 0.4999
```

Set up the appropriate rejection region for $\alpha ? ? ? 0.05$). eject Ho when $X^2 >$ ___________.

```
qchisq(0.95,3)

## [1] 7.814728
```

Since the $p - value = 0.4999 > 0.05$, we do not reject H_0. (Since $X - squared = 2.3667 < 7.814728$, we do not reject H_0.)

What is the appropriate conclusion? We conclude that the data ___agree________ with the national survey.