Problem Set 5

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Problems 5.2, 5.5, 5.7, 5.9, 5.15, 5.25, 5.26, 5.37

Problem 5.2:

a) proportion
b) proportion
c) mean
d) mean
e) mean

Probelm 5.5:

a) Sampling Distribution
b) Symmetric from the central limit theorem, since np and n(1-p) are both greater than 10.
c) The variability is: 0.0096
d) Standard error
e) The variability will increase as the number of observations per sample is lower.

```
p <- 0.08
n <- 800
print("Variability (c) : ")
```

```
## [1] "Variability (c) : "
```

```
se <- sqrt((p*(1-p))/n)
se
```

```
## [1] 0.009591663
```

```
n <- 250
print("Variability (e) : ")
```

```
## [1] "Variability (e) : "
```

```
se <- sqrt((p*(1-p))/n)
se
```

```
## [1] 0.01715809
```

Problem 5.7:

95% Confidence Interval: (0.4264, 0.4735)

The population proportion of U.S. adults who live with one or more chronic conditions is within (0.4264, 0.4735) with 95% confidence.

```
SE <- .012
p <- .45
z <- 1.96
p + z * SE
```

```
## [1] 0.47352
```

```
p - z * SE
```

```
## [1] 0.42648
```

Problem 5.9:

a) False, we can only say with 95% confidence that the population proportion is within the interval.
b) True, the confidence interval in this case is what percentage intervals contain the population proportion.
c) True, the range of proportions is 0.4446 to 0.4735 for a 95% confidence interval, which is below 0.5
d) False, standard error applies to the sample proportion in general.

5.15,

a) The null hypothesis states that student grades would be unchanged from the previous year. The alternative hypothesis states that student grades will be improved or worse from the previous year H_o: new_grades = previous_grades H_a: new_grades /= previous_grades (does not equal)

b) The null hypothesis states that non-business activity time will be around 15 minutes during March Madness. The alternative hypothesis states that there will be an increase or decrease in non-business activity time over 15 minutes during March Madness. H_o: time = 15 minutes H_a: time /= 15 minutes (does not equal)

5.25,

h_o - what doctor says h_a - what she believes a) The anti-depressants have no effect on her Fibromyalgia symptoms. b) Rejecting the null hypothesis that anti-depressants would help, when in fact the anti-depressants do help. c) Not rejecting the null hypothesis that anti-depressants help, and thinking they do help, when they actually do not help.

5.26,

a) I.The standard error decreases as n increases.

b) II. As there is 10% more room for error.

c) Equal, since the p-value is a probability for observing data.

d) I, it will be more likely to fail to reject the null hypothesis at that significance level than at a higher one.

5.37

A study examined the average pay for men and women entering the 26. Men were, on average, paid more in 19 of those 21 positions.

a) Null Hypothesis: Gender is equally paid. Alternative Hypothesis: Gender is not equally paid. H_o: p = 0.5 H_a: p /= 0.5 (does not equal)

b) With n = 21 and p = 0.5, np = 10 and n(1-p) = 10. The sample was done randomly, so the success-failure and independence conditions hold. p_hat = 19/21 = 0.9048 SE = 0.1118

   z value = 0.0203

   p value: 0.508

   Using a significance level of 0.05, we reject the null hypothesis and accept the alternative hypothesis that gender is not equally paid. (50% of the)

```
n <-20
p <-.5
p_hat <- 19/21
n*p
```

```
## [1] 10
```

```
n*(1-p)
```

```
## [1] 10
```

```
SE <- sqrt((p*(1-p))/n)
Z <- (p_hat - p)/n

pnorm(Z)
```

```
## [1] 0.5080733
```