Stat 418 – Day 3
One Proportion Inference

Exact Binomial test of $H_0: \pi = 1/3$ vs. $H_a: \pi < 1/3$ with $x = 2$ and $n = 10$.

Minitab: Stat > Descriptive Statistics > 1 Proportion

R

> binom.test(x=2, n=10, p=1/3, alternative="less")

Exact binomial test
data:  2 and 10
number of successes = 2, number of trials = 10, p-value = 0.2991
alternative hypothesis: true probability of success is less than 0.333333
95 percent confidence interval:
  0.000000  0.5069013
sample estimates:
  probability of success
        0.2

JMP (Analyze > Distributions)
Winter, 2014  Wednesday, Jan. 8

One Proportion Inference Applet

Probability of success (π): 0.33333
Sample size (n): 10
Number of samples: 1

Animate
Draw Samples

Number of successes
Proportion of successes

As extreme as ≤ 2 Count

☐ Two-sided
☑ Exact Binomial

P(X≤2)=0.2992

☑ Normal Approximation
p-value = 0.1856 (Z = -0.89)

Normal approximation with continuity correction

Probability of success (π): 0.33333
Sample size (n): 10
Number of samples: 1

Animate
Draw Samples

Number of successes
Proportion of successes

As extreme as ≤ 2.5 Count

☐ Two-sided
☑ Exact Binomial

P(X≤2)=0.2992

☑ Normal Approximation
p-value = 0.2881 (Z = -0.56)
Exact Binomial Confidence Intervals

Minitab: Stat > Descriptive Statistics > One Proportion

\[ \text{Minitab: Test and CI for One Proportion} \]
\[
\begin{array}{cccc}
\text{Sample} & X & N & \text{Sample p} & \text{95\% CI} \\
1 & 2 & 10 & 0.200000 & (0.025211, 0.556095) \\
\end{array}
\]

\[ \text{R} \]
\[
> \text{binom.test(x=2, n = 10, conf.level=.95)}
\]

\text{Exact binomial test}

data: 2 and 10
number of successes = 2, number of trials = 10, p-value = 0.1094
alternative hypothesis: true probability of success is not equal to 0.5
95 percent confidence interval:
0.02521073 0.55609546
sample estimates:
probability of success
0.2

JMP (Help > Sample Data > Calculators)
Normal Approximation Confidence Intervals

**Minitab**: Stat > Descriptive Statistics > One Proportion

![Minitab screenshot](image)

**Test and CI for One Proportion**

<table>
<thead>
<tr>
<th>Sample</th>
<th>X</th>
<th>N</th>
<th>Sample p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>10</td>
<td>0.200000</td>
<td>(0.000000, 0.447918)</td>
</tr>
</tbody>
</table>

Using the normal approximation.
The normal approximation may be inaccurate for small samples.

**R**

```r
> prop.test(x=2, n = 10, conf.level=.95, correct=FALSE)
```

1-sample proportions test without continuity correction
data: 2 out of 10, null probability 0.5
x-squared = 3.6, df = 1, p-value = 0.05778
alternative hypothesis: true p is not equal to 0.5
95 percent confidence interval:
0.05668215 0.50983753

**JMP**

![JMP screenshot](image)

**Minitab – Adjusted Wald**

**Test and CI for One Proportion**

<table>
<thead>
<tr>
<th>Sample</th>
<th>X</th>
<th>N</th>
<th>Sample p</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>14</td>
<td>0.285714</td>
<td>(0.049075, 0.522353)</td>
</tr>
</tbody>
</table>