Ch 18, Preview Ch 19, In Class Assignment.

Bernoulli Trials: \( Y \sim P(Y) = \frac{1}{2} \) in independent trials.

Binomial: \( X = \# Y \) in \( n \) trials.

- \( X = \# \text{ HEADS} (Y) \) in \( n = 100 \) tosses of coin.
- (Pensy Diaconis) Discrete \( F \) \( P(X = x) = \frac{m!}{x!(m-x)!} p^x (1-p)^{m-x} \)

\( \frac{\theta}{1 \rightarrow 3} = \frac{3}{2} \) \( (2) (1) \)

Notice \( m \rightarrow \infty \), \( \lim_{mp \rightarrow 10} \sqrt{mp} \rightarrow x \)
We are in many instances interested in \( \hat{p} = \frac{x}{m} \)

So \( \hat{p} \) = sample proportion answering 'y'

1. Draw a sample of \( n = 62 \) parts.
   Finding \( x = 14 \) are defective

   So \( \hat{p} \) (our estimate of \( p \)) is \( \hat{p} = \frac{14}{62} \)

   Example of use of \( \hat{p} \) might be

   "Sample \( n = 62 \) "parts" - test these
   \( \hat{p} = \frac{x}{n} = \frac{\# \text{ of 62 found defective}}{62} \)

   Reject shipment if \( \hat{p} > 0.1 \) (just example)
ANOTHER IMPROVEMENT OF NORMAL APPROX.

\[ \hat{p} \sim \frac{p \pm \sqrt{p(1-p)}}{\sqrt{n}} \]

( \Rightarrow P(1\hat{p} - p \leq 2\sqrt{\frac{p(1-p)}{n}}) \approx 0.95)

Statement above would be useful if \sqrt{\frac{p(1-p)}{n}} is known. Wonderfully, it is also true that

\[ P(1\hat{p} - p \leq 2\sqrt{\frac{p(1-p)}{n}}) \approx 0.95 \]
To see how this is used:

If sample \( m = 100 \) parts.

Finding \( X = 42 \) defective.

\[ \frac{x}{m} = \frac{42}{100} = 0.42 \]

Look at interval \( \hat{p} \pm 2 \sqrt{\frac{\hat{p}(1-\hat{p})}{m}} \)

\[ 0.42 \pm 2 \sqrt{\frac{0.42(0.58)}{100}} \approx 0.1 \]

\( p \) in range \( 0.42 - 0.1, 0.42 + 0.1 \)

\( (0.32, 0.52) \), not real accurate.

Either the interval enclosure or not.

A bad guess at \( p \) : \( \hat{p} \pm 2 \sqrt{\frac{\hat{p}(1-\hat{p})}{m}} \).
\[ P(\hat{p} \text{ in } \hat{p} \pm 2 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}) \approx 0.95 \]

\[ \hat{p} = \text{est of } p \quad \text{est of SD of } \hat{p}. \]

Likewise \[ P(\hat{p} \text{ in } \hat{p} \pm 1 \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}) = 0.68 \]

Example of use: \[ X = \# \text{ of students with even student # in sample of } n \]

\[ m = 23 \quad x = 12 \]

\[ \text{Fat Guess:} \quad \frac{12}{23} \pm 2 \sqrt{\frac{\frac{12}{23} \cdot \frac{11}{23}}{23}} \]

\[ \hat{p} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \]
Claim: My sample of \( n = 23 \) produced \( \hat{\rho} \pm 2 \sqrt{\frac{\hat{\rho}(1-\hat{\rho})}{n}} \),

\[
\frac{12}{23} \pm 2 \sqrt{\frac{\frac{12}{23} \frac{11}{23}}{23}} = [0.313, 0.730]
\]

90% confidence interval for \( \rho \)

For assignment use 68% C.I.

\[
\hat{\rho} \pm 1 \sqrt{\frac{\hat{\rho}(1-\hat{\rho})}{n}}
\]
1. Each of you is using your own block of Y & N (Put your name above your block)

2. Form 68% CI \( \hat{p} \pm 1 \sqrt{\frac{\hat{p}(1-\hat{p})}{N}} \)

3. I will later tell you what your \( \hat{p} \) (true \( p \)) is. For each block.

4. You will then say (on the sheet by your name) whether your (true) \( p \) is enclosed by your 68% CI.

5. If all goes well around 68% of students in the class will find that their own 68% CI covers their true \( p \).
\[
\begin{bmatrix}
1 \\
1 \\
.6 \\
.7 \\
.7 \\
.7 \\
100 \quad m=100
\end{bmatrix}
\]

II cover
6 Nov

\[ \sim 68\% \text{ of ID} \]

C1 krémps