\[ M = -1 + \ldots + (1) + 2 (17) = \frac{-1}{30} = -b \cdot 0.052 \]

Expect to lose about the same amount of money on every bet made.

\[ \frac{5}{5} \text{ Stats Friday} \]

Probability measurements for means (measurement error)

Relationship between SRS (sampling @ random w/out replace.) & IID (random w/ replace.)

1. SRS is more informative than IID, b/c there's no point in sampling the same element of the pop. more than once. 2. When n = 1 then SRS = IID. 3. When n \ll N (n is a lot smaller than N) SRS \approx IID. 4. The math is easier with IID, but SRS is what usually occurs in the real world. 5. When n \ll N the sample may be SRS but we will use formulas from IID

C.S. #8 For split bet

\[ N = 38 \]

Mean = -0.052

\[ \sigma = 4.02 \]

- Look at graphs

\[ \text{Pop. hist. for split, pop. hist. for single} \]

* Makes sense that SD smaller for split
5/5 Stats Friday

\[ E_{11D}(S) = N \times \left( \text{mean} \right) = (1000)(-\$0.052) = -\$52 \text{ (same as single # bet)} \]

\[ \therefore \text{long run mean} = -\$52 \]

\[ SE_{11D}(S) = \sigma \sqrt{n} = \left( \frac{\text{pop SD}}{\text{# draws}} \right) \sqrt{\text{# draws}} = (\$4.02)\sqrt{1000} \approx \$127 \]

\[ \therefore \text{long run SD} = \$127 \text{ (which is smaller than single # bet)} \]

Long-run hist. of $S$ for split

- $SE = \$127$
- $-52 \$ \% 34\%$
- $0.4 - 0.4$

\[
\frac{52}{127} = 0.4
\]

**Conclusion:** Single # bet has a higher chance of coming out ahead than split (also than any other gamble at Roulette: "bold play is optimal.") But it also has a higher chance of losing $\$100$ or more.

Weight of "1 lb" of butter to nearest 0.2:

\[
\begin{bmatrix}
16 \\
16 \\
16 \\
\vdots
\end{bmatrix}
\]

\[
\begin{bmatrix}
16.1 \\
16.0 \\
15.8 \\
\vdots
\end{bmatrix}
\]

\[
\begin{bmatrix}
16.12 \\
16.08 \\
15.84 \\
15.78 \\
\vdots
\end{bmatrix}
\]

Any measurement no matter how carefully made could come out differently the next time. Why? If the thing being measured doesn't change then it's "measurement error."

**Basic meas. error model:** each individ. measurement = (exact \text{ value}) + (bias) + (error)  

\[
\sigma \rightarrow \text{mean} \rightarrow \text{random}
\]
Stats

\[ 3.7 = \text{Potassium on meas. 1} = 3.8 + 0 + (-0.1) \]

\[ 4.0 = \text{"meas. 2"} = 3.8 + 0 + (+0.2) \]

Pop. conceptual:
- all possible potas. readdings on blood

\[ N = \infty \]

\[ \text{mean } \mu = 3.8 \]

\[ \text{SD } \sigma = 0.2 \]

Sample observed measurements:

\[ [Y_1, \ldots, Y_n]^\top \]

Potassium level

\[ \text{mean } \bar{Y} \]

\[ P(\text{misdiagnosis w/ a single observation}) = ? \]

\[ P(\text{misdiag. w/ } n=1) = \frac{6.5\%}{\text{high for medical}} \]