◉ Rolling 3 dice ◉

New game

- Rolling 3 dice
- Winning

  (Bet) × No. of Sixes rolled

- Result of 100 games

No. of Sixes	No. of Rolls
0	48
1	35
2	15
3	3

Are the dice FAIR without any trick?

- Null Hypothesis

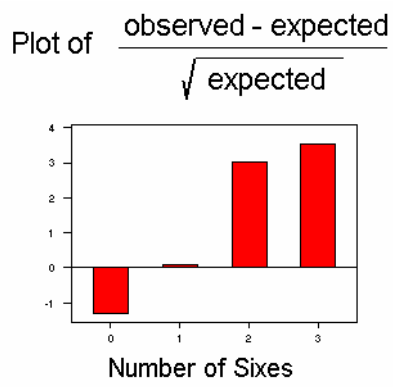
  Probability of Rolling k sixes from 3 dice = $\frac{3!}{k!(3-k)!}\left(\frac{1}{6}\right)^k\left(\frac{5}{6}\right)^{3-k}$

P (k = 0) = 0.58
P (k = 1) = 0.345
P (k = 0) = 0.07
P (k = 0) = 0.005

No. of Sixes	Expected
0	58
1	34.5
2	7
3	0.5

- Hypothesis Testing

χ^2-statistic: $$\frac{\textbf{(Observed} - \textbf{Expected)}^2}{\textbf{Expected}}$$



$$\chi^2 = \frac{(48-58)^2}{58} + \frac{(35-34.5)^2}{34.5} + \frac{(15-7)^2}{7} + \frac{(3-0.5)^2}{0.5} = 23.367$$

Degree of Freedom $\nu = 4$ (4 possibilities of 0, 1, 2, 3)
- 1 (Fixed Total rollings)
= 3

Probability of Getting χ^2 less than 7.815 with $\nu = 3$

☞ 95 %

Observed χ^2 = 23.367 > 7.815

: Very rare results

The casino may ask the gambler to take his dice elsewhere!