May 3, 2017

This time: probability models for sums

Next time: " " " means

read: DD ch. 11

LN pp. L131 → 136

P(1 or more T-S babies in family of 5, both ~~patient~~ parents carriers) = ?

Looks bad to do it directly: (1 or more) → (1 or 2 or 3 or 4 or 5)

So lets complete ~~in~~ it indirectly:

$P(1 \text{ or more}) = 1 - P(0 \text{ T-S babies})$

$= 1 - P\left(\begin{smallmatrix}\text{not T-S}\\ \text{on 1st}\end{smallmatrix} (\text{and}) \begin{smallmatrix}\text{not T-S}\\ \text{on 2nd}\end{smallmatrix} (\text{and}) \ldots (\text{and}) \begin{smallmatrix}\text{not T-S}\\ \text{on 5th}\end{smallmatrix}\right)$

indep

$= 1 - P\left(\begin{smallmatrix}\text{not T-S}\\ \text{on 1st}\end{smallmatrix}\right) \cdot P\left(\begin{smallmatrix}\text{not T-S}\\ \text{on 2nd}\end{smallmatrix}\right) \ldots P\left(\begin{smallmatrix}\text{not T-S}\\ \text{on 5th}\end{smallmatrix}\right)$

[identical dist.] L (115)

$= 1 - (1-1/4)(1-1/4) \ldots (1-1/4)$

$= 1 - (1-1/4)^5 = 1 - (0.75)^5 = 0.76$ or 76%

L-116 (death penalty problem)

Probability models for sums & means (R-52)

assume that the wheel is fair

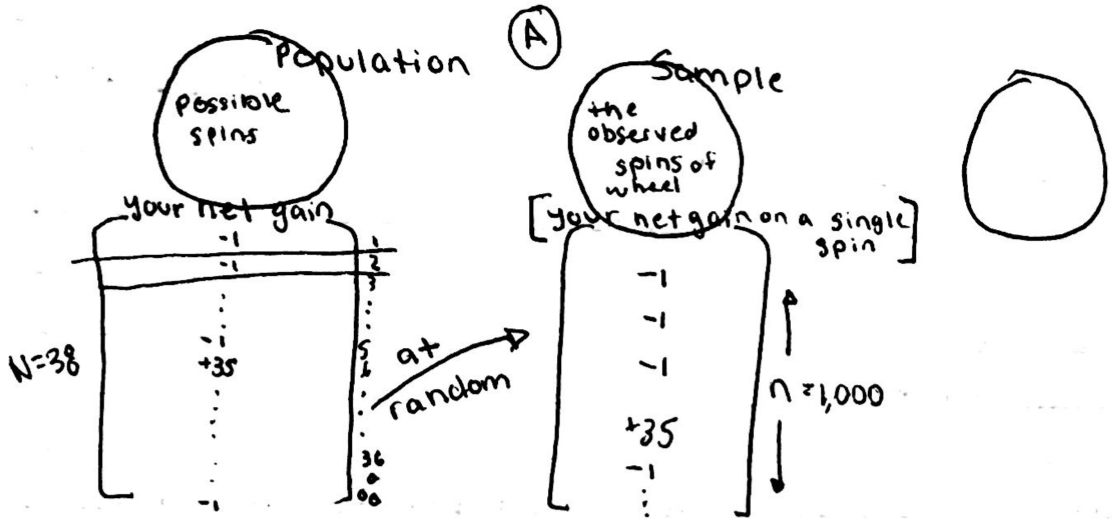
+ equal prob. for all 38 outcomes

+ indep. of all spins

$P(\text{win on a single play of a single \#}) = \frac{1}{38} = 2.5\%$

$P(\text{win on a single play of a split}) = \frac{2}{38} = \frac{1}{19} \approx 5\%$

→



(1 draw from pop. = 1 spin on the roulette wheel)

Single # : 6

		net gain ($)
L	(lost \$1)	-1
L	(lost \$1)	-2
W	(gain \$35)	+33

"mew"

pop. mean $\mu = \dfrac{\overbrace{(-\$1) + (-\$1) + \ldots + (-\$1)}^{37} + (\$35)}{38} = \dfrac{-2}{38} = -0.05$

(pop. mean $\mu = \$-0.05$) → each time I bet \$1 on a single #, I expect on avg. to $\boxed{\text{base a}}$ ~~nickel~~ $\boxed{\text{nickel}}$, give or take

pop SD. $\sigma = \$5.76$ $\quad \sigma = \sqrt{\dfrac{\overbrace{[(-\$1) - (-0.05)]^2 + \ldots + [(+\$35) - (-0.05)]^2}^{37}}{38}}$

sigma, not to be confused w/ capital sigma Σ summation sign

38 → N not $\underline{N-1}$

if a pop. has only 2 kinds of #s in it (larger #) vs (smaller #)

the $\sigma = (\text{larger } \#) - (\text{smaller } \#) \sqrt{(\text{proportion of larger } \#) \cdot (\text{prop. of smaller } \#)}$ →

proportion of larger # $= \frac{1}{38}$

prop. of smaller # $= \frac{37}{38}$

$$\sigma = [(+35)-(-1)]\sqrt{1/38 \cdot 37/38}$$