

this probability
time: models for runs

read: DD(B) ch. 11
LN pp. 4131 + 136

AMS 7
3 May
17

next
time: for means

I forgot to finish the T-S babies case study: (T-S) ①

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

Looks hard

to do it directly: (1 or more) ←

- 1 or
- 2 or
- 3 or
- 4 or
- 5

so let's compute it indirectly:

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

~~indep~~

$$= 1 - P(\text{not T-S on 1st} \text{ and } \text{not T-S on 2nd} \text{ and } \dots \text{ and } \text{not T-S on 5th})$$

indep

$$= 1 - P(\text{not T-S on 1st}) \cdot P(\text{not T-S on 2nd}) \cdot \dots \cdot P(\text{not T-S on 5th})$$

indep. dist.

$$= 1 - \left(1 - \frac{1}{4}\right) \left(1 - \frac{1}{4}\right) \dots \left(1 - \frac{1}{4}\right)$$

L-115

$$= 1 - \left(1 - \frac{1}{4}\right)^5 = 1 - (0.75)^5 = 0.76 = 76\%$$

prob. models for sums & means

R-5) assume wheel fair
249/ prob.

for all 38 outcomes & indep. of all spins

P(win on a single play of a single #) = $\frac{1}{38}$ ②
= 2.5%

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

1 draw from pop

1 spin of roulette wheel
cumulative net gain

single # : 6

L lost \$1

L lost \$1

W gain \$35

\$1
-1
+35

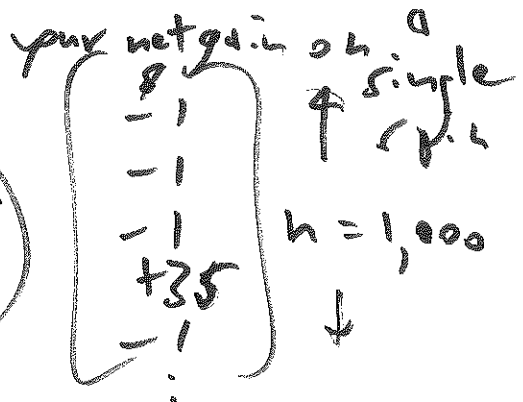
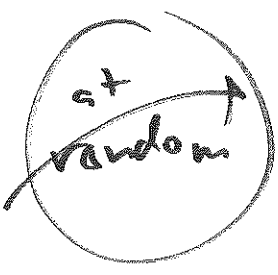
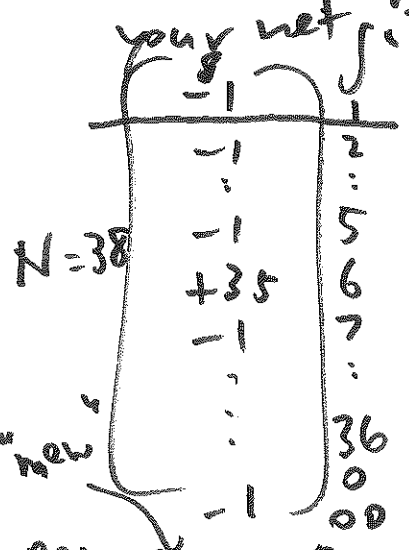
0.526

$$\mu = \frac{(-1) + (-1) + \dots + (-1) + (35)}{38} = \frac{-2}{38} = -0.05$$

population possible spins

A

sample the observed spins



pop. mean $\mu = -0.05$

pop. SD $\sigma = 5.76$

sigma (not to be confused with capital sigma)

Summation

with capital sigma \sum spin

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

then $\sigma = \left[\left(\frac{\text{larger \#}}{\#} \right) - \left(\frac{\text{smaller \#}}{\#} \right) \right] \sqrt{\left(\text{proportion of larger \#} \right) \cdot \left(\text{proportion of smaller \#} \right)}$

(prob. where $\mu = -0.05$) \leftrightarrow each time I
 bet \$1 on a single #, I expect
 on the long to lose a nickel,
 $\mu = -0.05$
 give or take about \$5.76 = σ
 ← 37 →

$\sigma =$
 \uparrow
 19.
 SD.
 not
 sample
 SDs.

$$\frac{[(-1) - (-0.05)]^2 + \dots + [(-1) - (-0.05)]^2 + [(+35) - (-0.05)]^2}{38}$$

not $N-1$

here (smaller #) = -1 (larger #) = +35

prop. of
of layer # $\approx \frac{1}{38}$

prop. $\textcircled{5}$
~~of~~
smaller #

$$\sigma = \left[\begin{matrix} 4 \\ (+35) - (-11) \end{matrix} \right]$$

$$\approx \frac{37}{38}$$

$$\sqrt{\frac{1}{38} \cdot \frac{37}{38}}$$

$$\approx \$5.76$$