This time: prob. models for sums
Next time: prob. stat. models for means
Read: DD (B) Ch. 9-11   LN: pp. L-127-156   today: LN pp. L-119

Probability models for Sums

(A) P(coming out ahead on a single play) $= \frac{1}{38} \doteq 2.5\%$
(B) P(coming out ahead on a single play) $= \frac{2}{38} = \frac{1}{19} \doteq 5.0\%$
P(coming out ahead in 1,000 spins with (A)) $= P(S > \$0) = ?$

μ = "mew" pop. mean $\mu = \dfrac{\overbrace{(-\$1)+(-\$1)+(-\$1)}^{37} + (+\$35)}{38} = -\dfrac{\$2}{38} = -0.0526$

σ = "sigma" $\sigma = \sqrt{\dfrac{\overbrace{((-\$1)-(-\$0.05))^2 + \dots + [(-\$1)-(-\$0.05)]^2}^{37} + [(+\$35)-(-0.05)]^2}{38}}$

$\doteq \$5.76$

long-run mean of sum S = expected value of S
$= \text{EV of } S = E(S) = E_{IID}(S)$
expected value of

math fact $\boxed{E_{IID}(S) = n \cdot \mu}$

n IID draws from a pop. with mean μ

$= \left(\begin{matrix}\text{\# of} \\ \text{draws}\end{matrix}\right) \cdot \left(\begin{matrix}\text{pop.} \\ \text{mean}\end{matrix}\right)$

long run SD of S = standard error of S ← our uncertainty about S

= SE(S) = $SE_{IID}(S)$ = ?

involved?	
N	no
μ	no
σ ↑	SE↑
n ↑	SE↑

$$SE = \frac{\sigma\sqrt{n}}{1}$$

S is in \$ σ also in \$

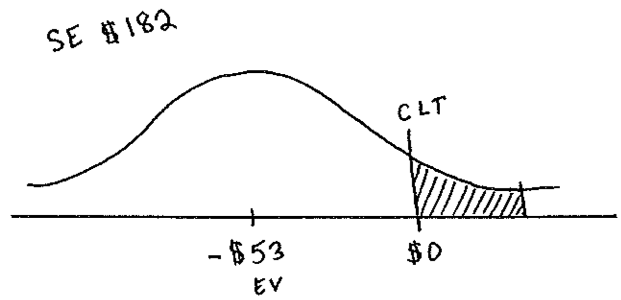
math fact $SE_{IID}(S) = \sigma\sqrt{n}$

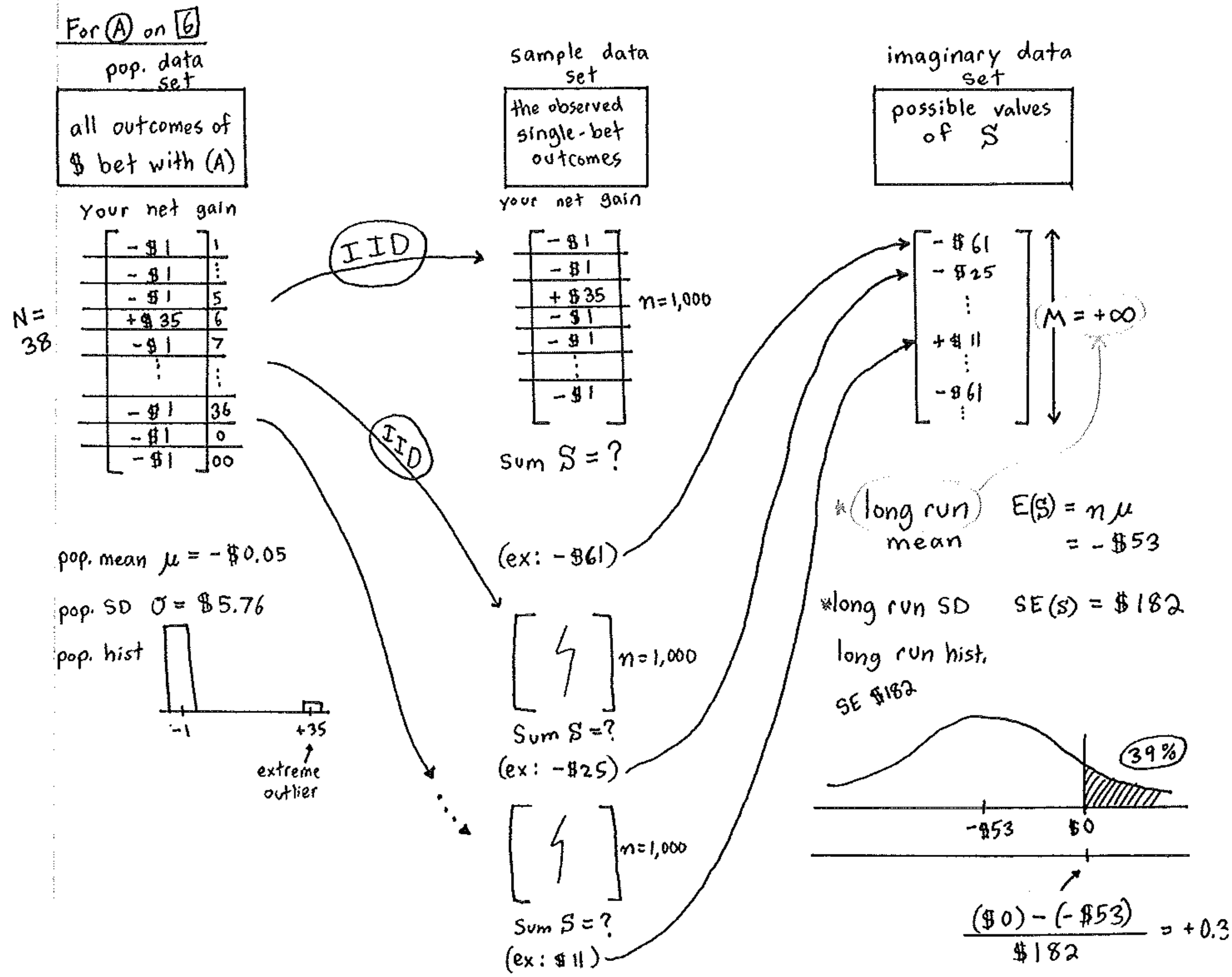
pop SD ↑   ↑ $\sqrt{\# \text{ of draws}}$

signal ⟷ expected value

noise ⟷ standard error

long-run hist. of S





*long run mean: $E(S) = n\mu$

$$= (1000)(\$-0.05)$$
$$= -\$53$$

*long run SD: $SE(S) = \sigma\sqrt{n} = (\$5.76)\sqrt{1000} = \$182$

$(\approx \$6) \quad (\approx 30)$