3-25-09 bb

TODAY HW 8, MONOPOLY (THINKING ABOUT AVGS), NORMAL, BERNOULLI $X: \begin{matrix} 1 & p \\ 0 & q \end{matrix}$ $EX = 1p + 0q = p$ $\mathrm{Var}X = pq$

BINOMIAL SUM OF n INDEP TRIALS $X_1 + \cdots + X_n$ (BERNOULLIS)

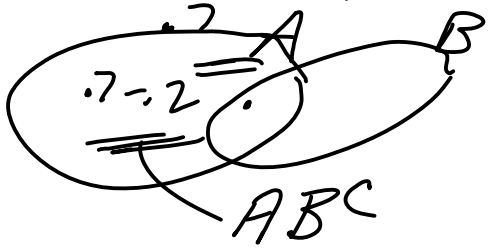
POISSON (THINK OF BINOMIAL WITH $n \sim \infty$, $p \sim 0$).

HW 8

$P(A) = 0.7$, $P(B) = 0.4$ $P(AB) = 0.2$ (EX 1)

1. $P(B^c) = 1 - P(B) = 1 - 0.4$

2. $P(AB^c) = .7 - .2$



3. $P(B|A) = P(AB)/P(A)$
$= .2/.7$

$P(B|A^c) = P(A^cB)/P(A^c)$

CK THIS

$P(A^cB)/P(A^c)$

$\dfrac{P(B) - P(AB)}{P(A^c)}$

$P(OIL) = .2 \quad P(+|OIL) = .9 \quad P(+|OIL^c) = .3$ (EX 2)

4. $P(+) =$ $P(OIL+) + P(OIL^c+) - 0$

TOTAL PROB — MULT

$P(OIL)\,P(+|OIL) + P(OIL^c)\,P(+|OIL^c)$

$.2 \quad .9 \quad + \quad .8 \quad .3$

5. $P(OIL|+) \overset{DEF}{=} \frac{P(OIL+)}{P(+)} = \frac{.2 \cdot .9}{.2 \cdot .9 + .8 \cdot .3}$

(BAYES)

(SEE FORMULA IN TEXT)

"REASONING BACK"

ENTERTAIN ANY $P(B|A)$

TEST 20 DRILL 70 OIL RET 500

6. NET FROM POLICY "TEST, DRILL IF TEST +"

IN CONTINGENCY [OIL] [+] $-20 + -70 + 500$

7. [OIL^c] [+] $-20 + -70 + 0$

DRAW FROM {2 2 2 6} Y r.v. IS RESULT

8. $EY = \frac{2+2+2+6}{4} = \frac{12}{4} = 3$ OR $2\left(\frac{3}{4}\right) + 6\left(\frac{1}{4}\right) = 3$

9. $Var \overset{DEF}{=} \sum (x - EX)^2 p(x)$

$= \frac{(2-3)^2 + (2-3)^2 + (2-3)^2 + (6-3)^2}{4} = \frac{1+1+1+9}{4} = \frac{12}{4} = 3$

(FLUKE)

OR $(2-3)^2\left(\frac{3}{4}\right) + (2-6)^2\left(\frac{1}{4}\right) = 3$

OR $E(X^2) - (EX)^2 = 12 - 3^2 = 3$

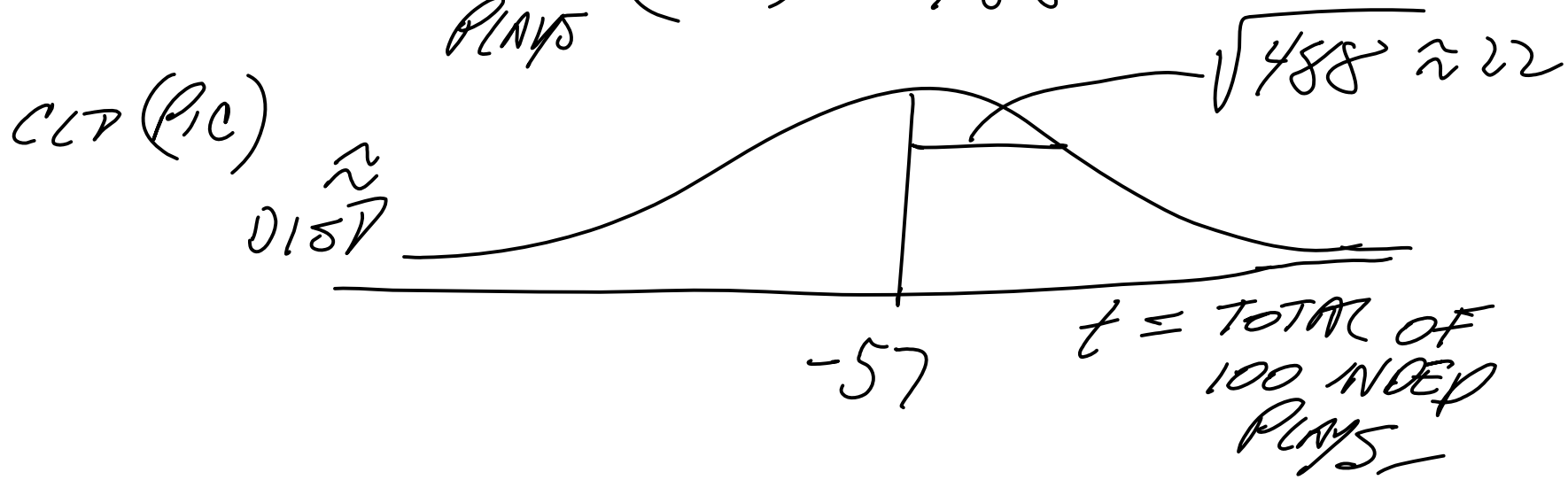
$E(X^2) = \frac{2^2+2^2+2^2+6^2}{4} = \frac{12+36}{4} = \frac{48}{4} = 12$

$E X = -.57, \quad \mathrm{Var}\, X = 4.88$

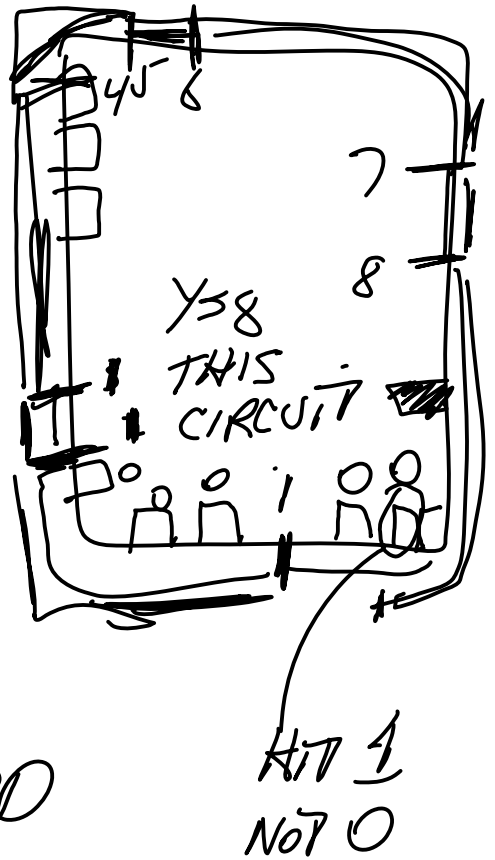
$T = X_1 + \cdots + X_{100}$ (INDEP)

10. $E T = .57(100) = -57$ (PLAYS)

11. $\mathrm{Var}\, T \overset{\text{INDEP PLAYS}}{=} 100(4.88) = 488$



MONOPOLY p = P(GIVEN PROPERTY IS HIT (IN STEADY STATE) ON ONE CIRCUIT)



DEFINE Y = # OF PROPERTIES HIT ON ONE CIRCUIT.

$$= \sum_{i=1}^{N} HIT_i \quad \begin{cases} 1 & \text{HIT PROPERTY } i \\ 0 & \text{NOT} \end{cases}$$

N = # PROPERTIES ON MONOPOLY BOARD

$$E[Y] = N \, E[HIT_1] = N(1 \cdot p + 0(1-p)) = Np$$

$$\boxed{N} = \text{SUM OF GAPS} = \sum Y_{Np} \text{ ON AVG}$$

$$\left(p = \frac{1}{7}\right) \Leftarrow \boxed{N} = 7Np$$

USING RULES OF E (ONLY) + SIMPLE REASONING WE COME UP WITH $p = \frac{1}{4}$

AS P(HIT BOARDWALK (OR ANY OTHER GIVEN PROPERTY ON ONE PASS OF THE BOARD)

PROB MODELS
- NORMAL
- BERNOULLI: 1 p, 0 $q = 1-p$
- BINOMIAL = SUM OF n INDEP BERNOULLI'S
- POISSON

BERNOULLI 1 p, 0 $q = 1-p$ $EX = 1p + 0q = p$

$\text{Var}\, X = E(X^2) - (EX)^2 = p - p^2 = p(1-p) = pq$

$EX = p$ $\text{Var}\, X = pq$