STT 200 3pm 1-25-10

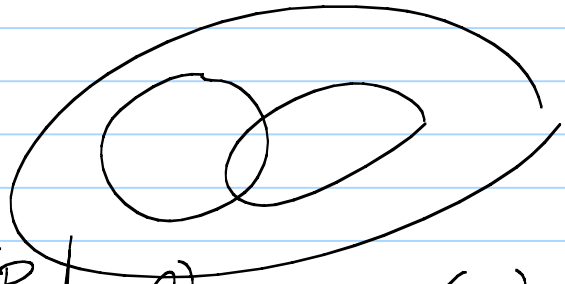
Note Title 1/25/2010

QUESTION: TOSS A COIN UNTIL THE PATTERN IS SEEN. ON AVERAGE, DO YOU WAIT THROUGH MORE TOSSES TO GET HTH OR HTT (OR IS THE WAIT THE SAME)?

1-5 $P(A) = .7$, $P(B) = .4$

1. $P(B \mid \text{IF } A) = .2$

THEN $P(A \text{ and } B) \overset{\text{ALWAYS}}{=} P(A)\,P(B \mid \text{IF } A) = .7(.2)$ (C)

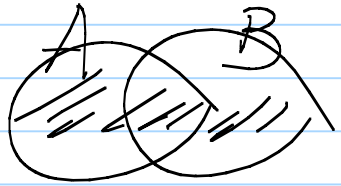


2. A, B INDEPENDENT $\Rightarrow P(B \mid_{\text{IF}} A) = .4$ (d)

(IN THIS CASE, $P(A \cap_{\text{and}} B) = .2$) (.4)

3. IF $P(A \cap_{\text{and}} B) = .2$ THEN $\cap_{\text{and}}$

$P(A \cup_{\text{or}} B) \underset{\text{RULE}}{=} P(A) + P(B) - P(A \text{ and } B)$

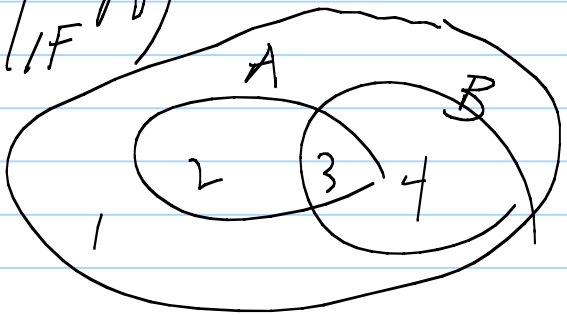


$= .7 + .4 - .2 = .9$ (e)

4. $P(A \cap_{\text{and}} B) = .3 \Rightarrow P(B \mid_{\text{IF}} A) \underset{\text{DEFINITION}}{=} P(A \text{ and } B)/P(A)$

$= .3/.7 = .43$ (a)

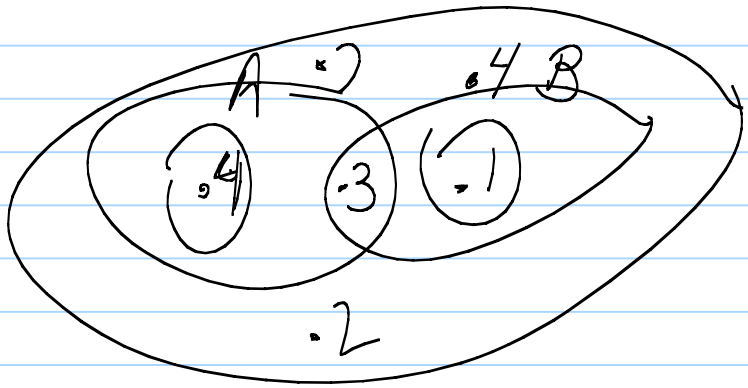
#3 / #2+3#



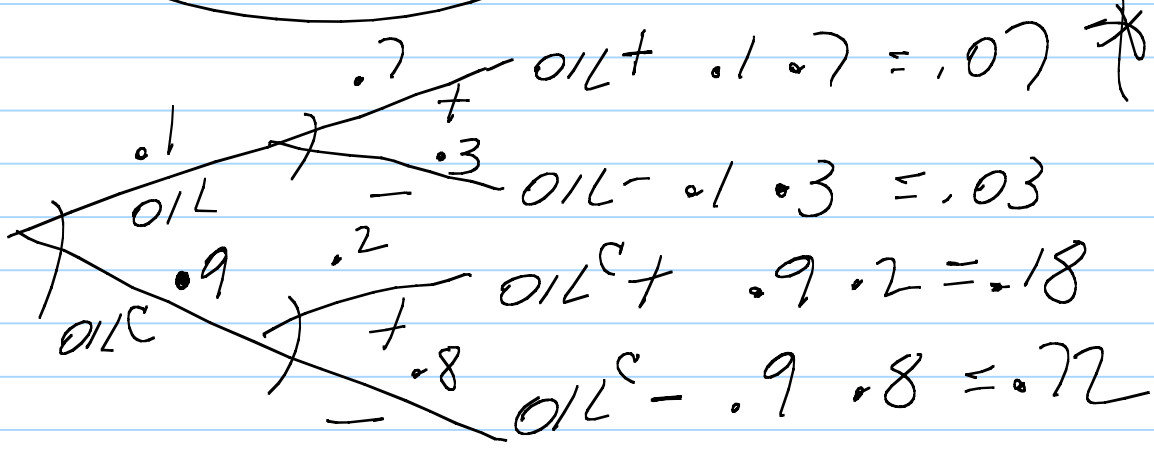
↑ CONDITIONING EVENT

5. $P(A \cap \text{and } B) = .3 \Rightarrow$? $P(A \cap \text{and } B^c) = .4$

see #1!



6-10



6. $P(+ \mid \text{IF OIL})$ GIVEN AS .7 (a)

7. $P(\text{OIL} +) \underset{\text{AND}}{=} P(\text{OIL}) P(+ \mid \text{OIL}) = .1 \cdot .7 = .07$ (d) MULT RULE

8. $P(+) \underset{\text{TOTAL PROBABILITY}}{=} P(\text{OIL} +) + P(\text{OIL}^c +) - 0$

$= P(\text{OIL}) P(+ \mid \text{OIL}) + P(\text{OIL}^c) P(+ \mid \text{OIL}^c)$

$= .1 \cdot .7 + .9 \cdot .2 = .25$ (c)

9. $P(\text{OIL} \mid \text{IF} +) \overset{\text{DEFINITION}}{=} \dfrac{P(\text{OIL} +)}{P(+)} = \dfrac{.1 \cdot .7}{.25} = \dfrac{.07}{.25} = .28$ (b)

(BACKWARD?)

10. COSTS TEST 50 GROSS 1200
DRILL 100

POLICY: "TEST BUT DRILL ONLY IF TEST IS +"

NET IF O/L — $-50 - 200 + 1200 = -50$.

TEST NEG — YOU DID NOT DRILL

11-13.

x	$p(x)$	$x\,p(x)$	$x^2 p(x)$
0	.5	0	$0^2 \cdot .5$
1	.4	.4	$1^2 \cdot .4$
4	.1	.4	$4^2 \cdot .1$
		$.8 = EX$	$2 = EX^2$

SO VARIANCE IS (SHORT FORM) $= EX^2 - (EX)^2$

$= 2 - (.8)^2 = 1.36$

$\text{Var}X = \sum_x (x - EX)^2 p(x)$

↑ VARIANCE OF X

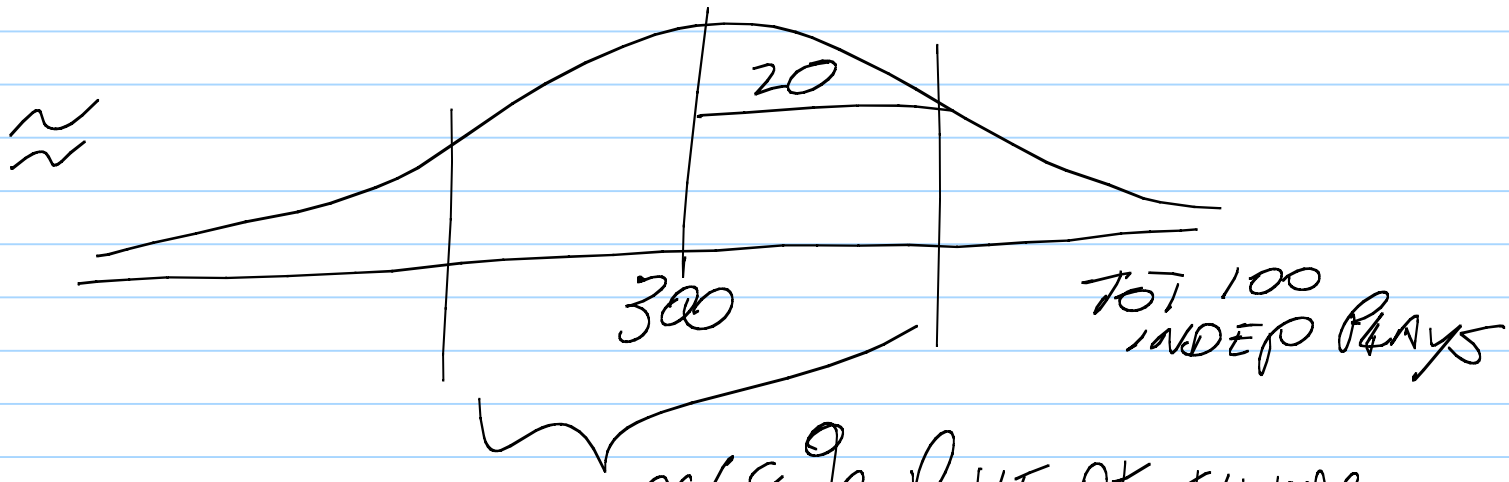
RECALL THAT STANDARD DEVIATION OF $X = \sqrt{\text{Var}X} = \sqrt{1.36}$

14-16. $EY = 3$ $\text{Var}\,Y = 4$ so $SD\,X = \sqrt{4} = 2$

TOTAL OF 100 INDEP PLAYS

$E(\text{TOT}) = 100\,EY = 300$ $\quad$ $\$\,\text{TOT} = 300.$

$\text{Var}(\text{TOT}) = 100\,\text{Var}\,Y = 400$ $\quad$ $SD\,\text{TOT} = \sqrt{400} = 20$



$\approx 68\%$ RULE OF THUMB.