STT 200 3pm 1-13-10

Note Title 1/13/2010

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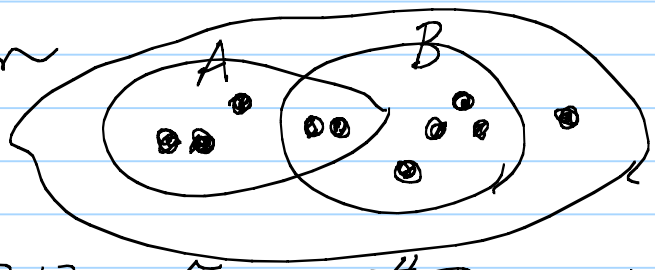
CH 14-17 EXAM 1. PROBABLITY, RANDOM VARIABLES
EXPECTATION
VARIANCE
$\sqrt{\text{Variance}}$ = STD DEVIATION

CH 14 RECALL CLASSICAL PROB MODEL.

Venn



UNIVERSE
(SAMPLE SPACE)

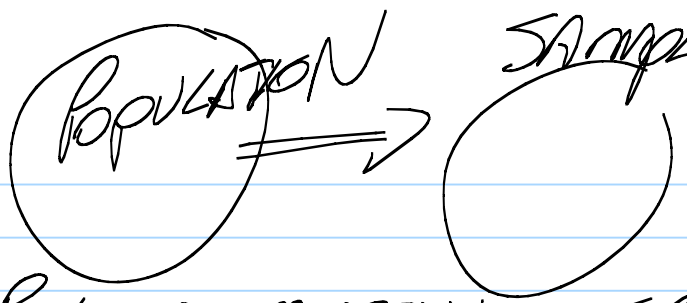
$A \cap B$ and

$A \cup B$ or

$\#A = 3+2 = 5$ $\#B = 2+4 = 6$ $\#A \cap_{\text{and}} B = 2$

$\#A \cup_{\text{or}} B = 3+2+4 = 9$ $\#(A^c \cap_{\text{and}} B^c) = 1 = \#(A \cup_{\text{or}} B)^c$

EXAMPLE OF CLASSICAL SETUP



NEWSPAPER

" POLL FOUND 63%
VOTE DEMOCRAT — POLL HAS MARGIN OF ERROR 3% "

MEANING: AROUND 95% OF SAMPLES (OF n)
WOULD HAVE

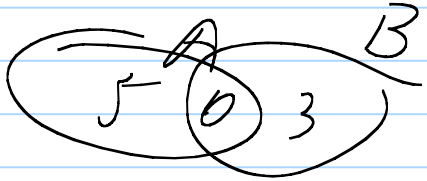
SAMPLE %	±	MARGIN OF ERROR
63%		3%

COVERS THE POPULATION FRACTION FOR DEMS.

IN THIS CASE THE INTERVAL IS 60% TO 66%.

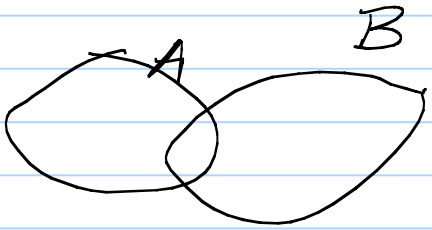
WOW! ONLY USES CLASSICAL MODEL.!

CH. 14 **ADDITION RULE FOR DISJOINT EVENTS**



$\#\, A \cup_{or} B = 5 + 3$

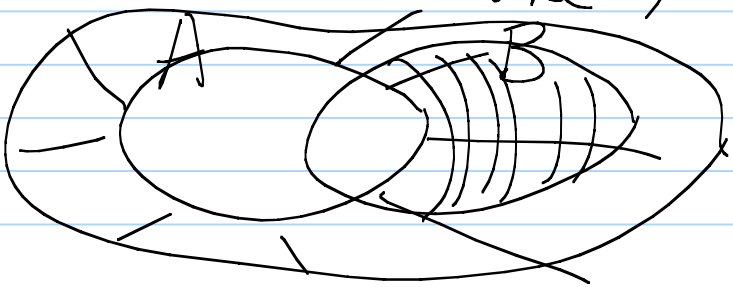
MULT RULE FOR INDEPENDENT EVENTS.



A INDEP OF B IF (DEF) $P(A \cap_{and} B) = P(A)\,P(B)$

IMPLIES A^c INDEP OF B

$$P(A^c \cap_{and} B) = P(B) - P(A \cap_{and} B)$$



$$= P(B) - P(A)\,P(B)$$

$$= P(B)(1 - P(A)) = P(B)\,P(A^c)$$

CH 1.5: GEN'L ADD^N RULE $P(A \underset{\text{or}}{\cup} B) = P(A) + P(B) - P(A \underset{\text{and}}{\cap} B)$

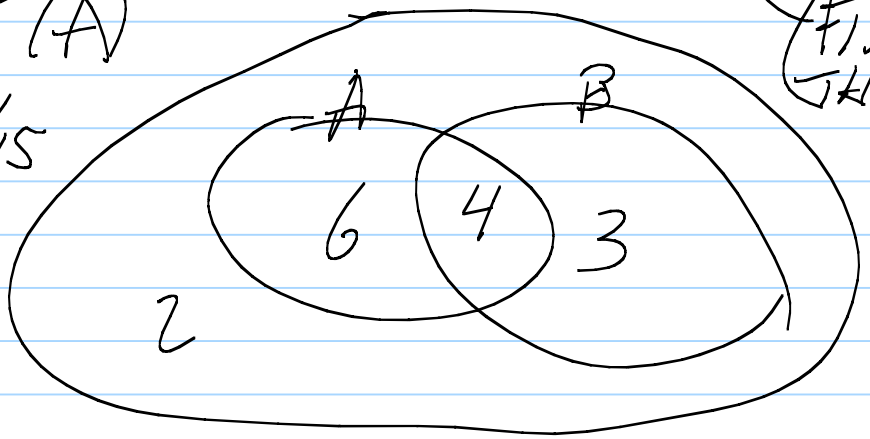
GEN'L MULT^N RULE

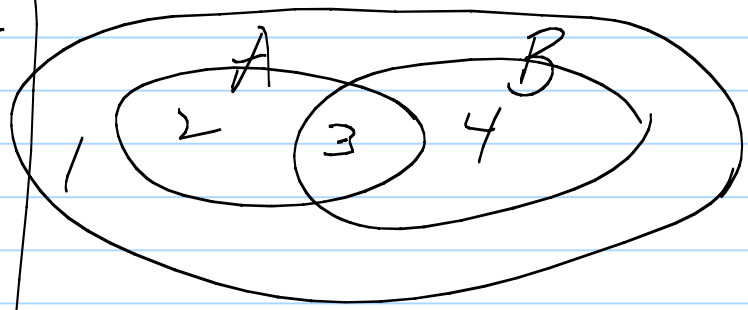
$P(A \underset{\text{and}}{\cap} B) = \dfrac{\#\, A \underset{\text{and}}{\cap} B}{\#\,\text{TOTAL}}$

$= \dfrac{\#A}{\#\,\text{TOTAL}} \cdot \dfrac{\#(A \cap B)}{\#A} \neq \dfrac{4}{10}$ (FIX THIS)

$= P(A)$

10/15





$A \underset{\text{or}}{\cup} B = A \quad B - A \underset{\text{and}}{\cap} B$

2 3 4 2 3 ~~3~~ 4 ~~3~~

WRITE

$P(B \mid A) \overset{\text{DEF}}{=} \dfrac{P(A \underset{\text{and}}{\cap} B)}{P(A)}$

IF

DRAW COLORED BALLS WITHOUT REPLACEMENT.
& WITH EQUAL PROB'Y.

5R 2G 3Y

$P(R1) = 5/10$ $\quad P(R2 \mid R1) = 4/9$ IF

FIRST DRAW IS A RED.

SO $P(R1\ R2) = P(R1)\ P(R2 \mid R1)$ IF

and

$= 5/10\ \ 4/9$

ALSO $P(Y1\ Y2\ Y3\ Y4) = 3/10\ \ 2/9\ \ 1/8\ \ 0/7$

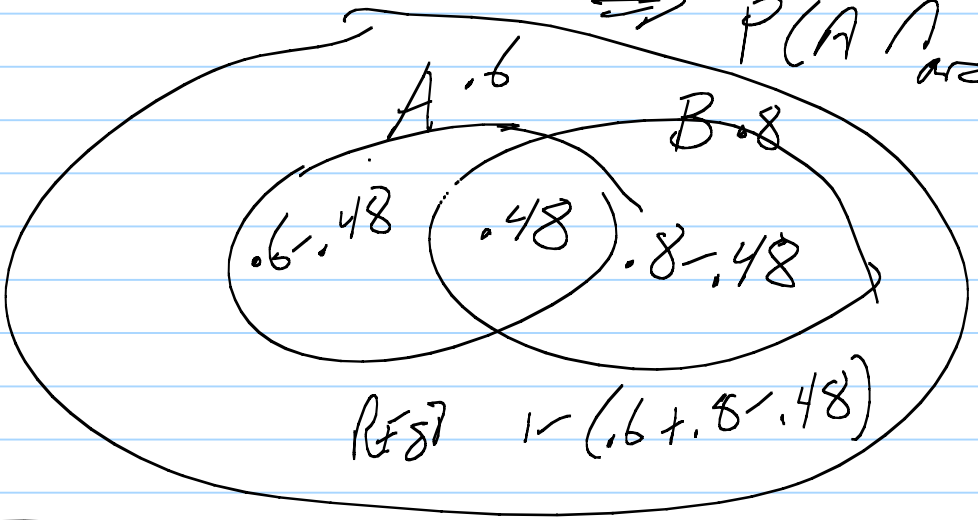
and and and

PER #1 g, h. INDEP EVENTS: A, B.

$P(A) = .6$

$P(B) = .8$

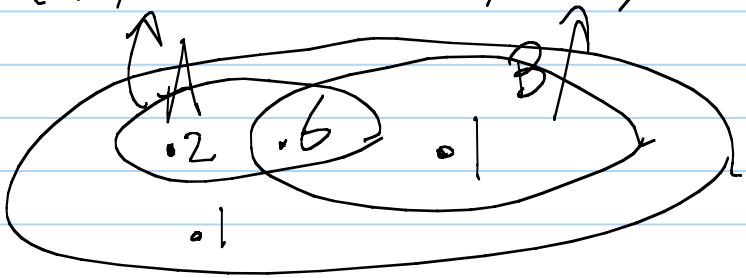
$\Rightarrow P(A \cap_{\text{and}} B) \underset{IND}{=} P(A)\,P(B) = .48$



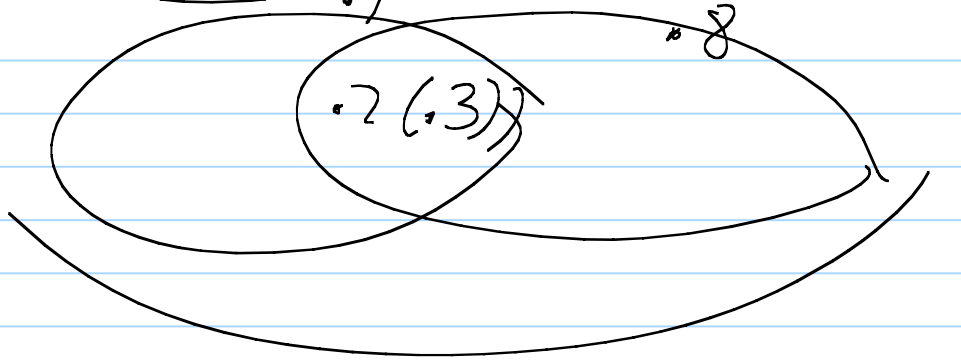
$P(A \underset{\text{or}}{\cup} B) = P(A) + P(B) - P(A \underset{\text{and}}{B})$

$= .6 + .8 - .48$

#2. $P(A) = .8$ $P(B) = .7$ $P(A \cap_{\text{and}} B) = .6$



#3 impossible $P(A) = .7$ $P(B) = .8$ $P(B|A) = .3$



$P(A \cap B) = P(A)P(B|A)$ if and only if

#4.

	AA	Aa	aa	
m	30	20	10	60
f	30	45	15	
	60	65	25	150

marginal

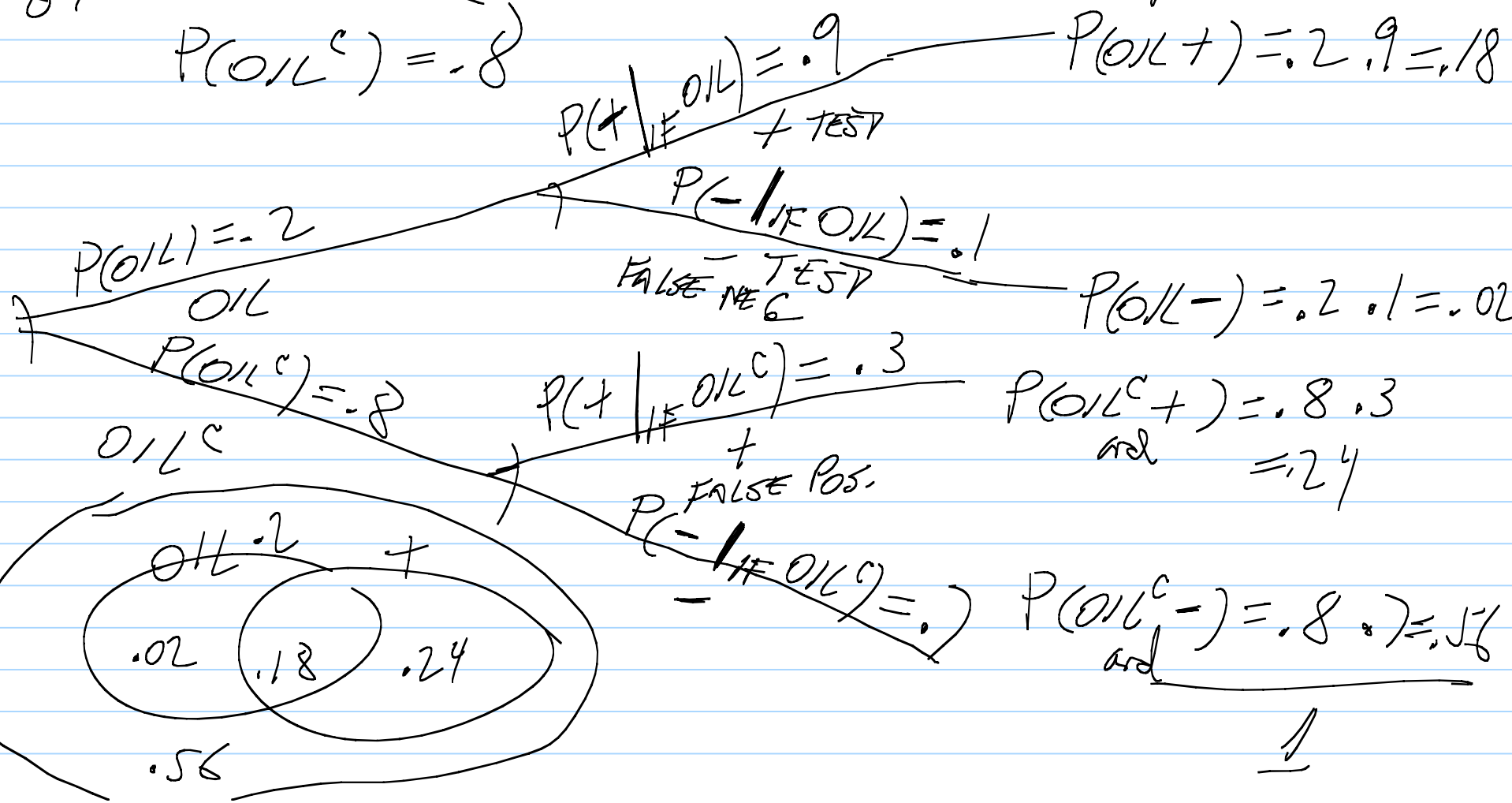
$30/150$ $20/150$ $10/150$ | $60/150$

$30/150$ $45/150$ $15/150$ |

$P(\text{male}) = 30/150 + 20/150 + 10/150$

#6. $P(OIL) = .2$

$P(OIL^c) = .8$



? $P(OIL \mid +_{IF}) = \dfrac{.18}{.18+.24}$

$\dfrac{.3}{.3+.4}$

BEGIN (BEFORE TEST)

$P(OIL) = .2$

BUT FOLLOWING TEST — WHICH HAPPENS TO BE +

$P(OIL \mid +_{IF}) = 3/7$

WRITTEN OUT BAYES' FORMULA.

$$P(B_i \mid A) = \frac{P(A)\,P(B_i \mid_{IF} A)}{\sum_{k=1}^{K} P(A)\,P(B_k \mid A)}$$