STT 200 11-16-09

Note Title 11/16/2009

TODAY: REC. ASSIGNMENT 11-17-09

NOTE: SEVERAL CHANGES TO ASSIGNMENT:

#1. .0002 = P(B)

and |← sum .0002 →|

#36.

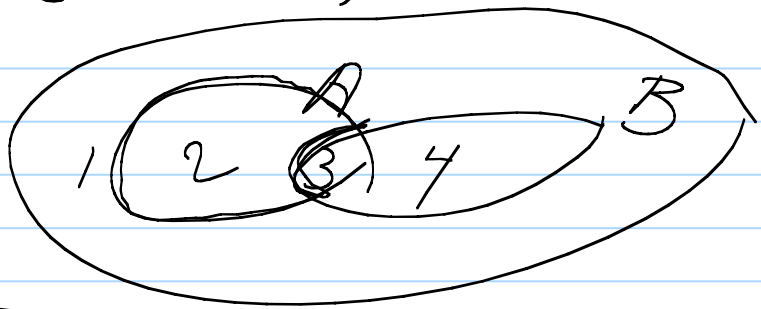
$$P(\bar{R}_1 R_2) = P(\bar{R}_1) P(R_2 | \bar{R}_1)$$

#4c. $P(\text{RAIN SUN} \mid \text{RAIN SAT}) = 0.7$ IF

THESE HAVE BEEN POSTED.

#5. TREE + BAYES' METHOD.

NOTE:



UNKNOWNS

$P(1) = P(A^c \cap B^c)$

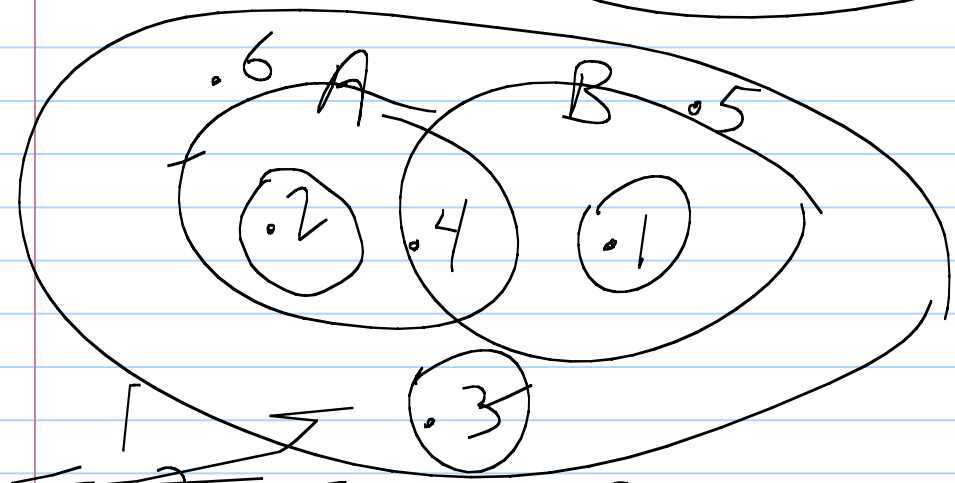
$= P(\bar{A} \cap \bar{B})$

$P(2) = P(A \cap B^c)$

$P(3) = P(A \cap B)$

$P(4) = P(A^c \cap B)$

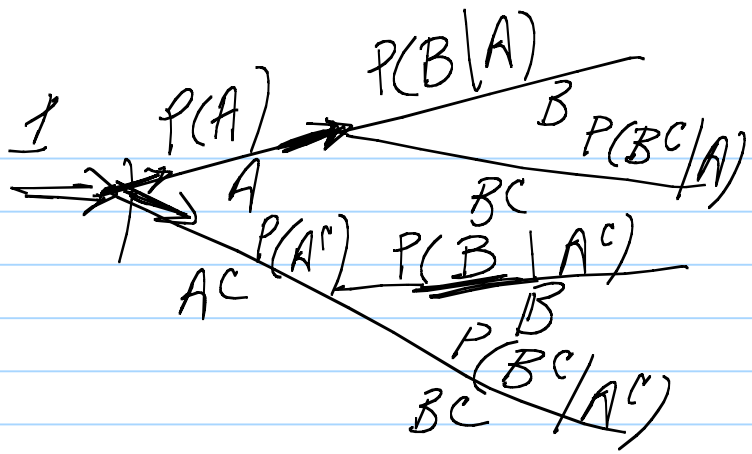
$\Sigma = 1$



$P(A) = .6 \quad P(B) = .5$

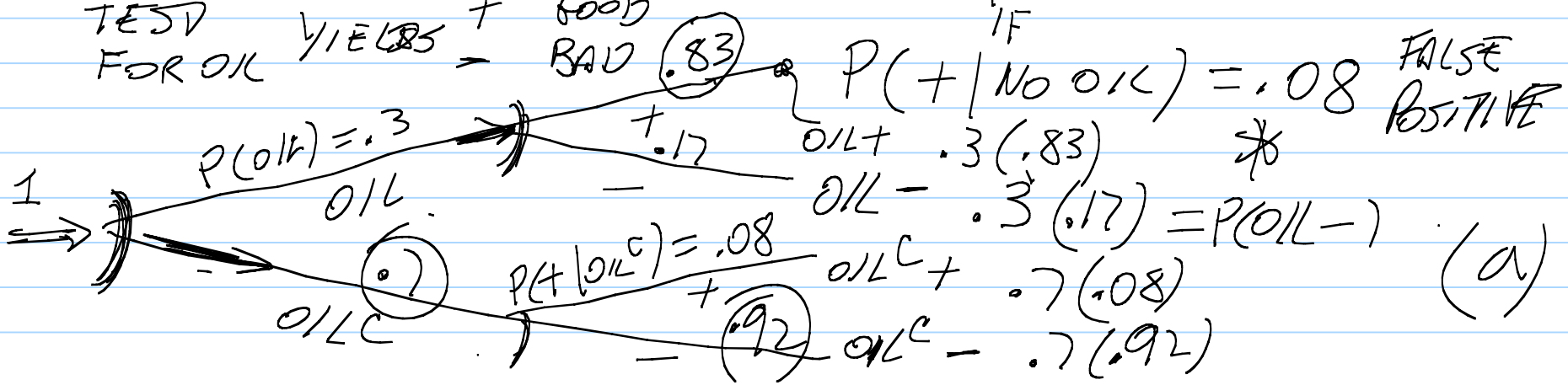
$P(A \cap B) = .4$ (TRY IT)

IRR IS WHEN
$P(A)$ GIVEN
$P(B|A)$, $P(B|A^C)$
IF



OIL EXAMPLE

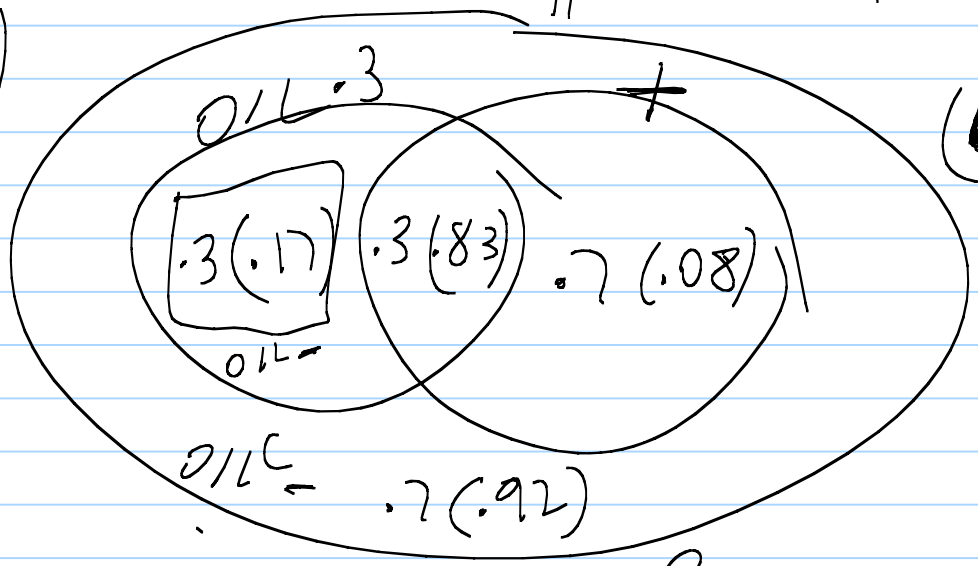
#5. GIVEN $P(OIL) = .3$ ✱, $P(-|OIL) = .17$ ✱ FALSE NEGATIVE
IF



· KEEP IN MIND: TOTAL 1 (VENN PR)

GIVEN $P(OIL)$, $P(+ \mid OIL)$ $P(+ \mid OIL^C)$ (or equivalent)

(b) VENN



(c) $P(+) = P(OIL+) + P(OIL^C+)$

$= .3(.83) + .7(.08)$

(d) IF WANT TO REVISE $P(OIL)$ AFTER HAVING SEEN "+ TEST" BUT WHAT IS IT?

ALWAYS $P(B \mid A) \overset{DEF}{=} P(A \cap B) / P(A)$

SO FOR THIS TREE

$$P(\text{OIL} \mid +) = \frac{P(\text{OIL} +)}{P(+)} \overset{(\text{and})}{=} \frac{.3(.83)}{.3(.83)+.7(.08)} \doteq .8164$$

"GIVEN" IF +

THIS UP FROM $P(\text{OIL}) = .3$ (A-PRIORI)

#5 CONT. $P(\text{OIL} \mid -) \overset{\text{DEF}}{=} \frac{P(\text{OIL} -)}{P(-)} = \frac{.3(.17)}{.3(.17)+.7(.92)}$

$P(\text{OIL})$ TIMES $P(- \mid \text{OIL})$

OIL — OR — OILC

$= .0734$

#4 WEATHER: $P(\text{RAIN SAT}) = .8$, $P(\text{RAIN SUN}) = .6$

(a) DO YOU BELIEVE RAIN SAT & SUN ARE INDEPENDENT EVENTS? ← HERE IN E.L.?

LIKELY NOT INDEP.

A IND OF B

$\equiv P(B|A) = P(B)$

or $\equiv P(A \cap B) = P(A)P(B)$

$\equiv P(B^c|A^c) = P(A^c)$

(b) Suppose "SAT" "SUN" ARE INDEP.

$\Rightarrow P(\text{SAT} \cap \text{SUN}) = P(\text{SAT})P(\text{SUN}) = (.8)(.6) = .48$

and - INDEP CASE

ASK: $P(\text{NO RAIN SAT OR SUN}) = P(SAT^C \cap SUN^C)$

$\overset{INDEP}{=} P(SAT^C)\,P(SUN^C)$

$= (1-.8)(1-.6) = (.2)(.4)$

$P(\checkmark) = P(\text{RAIN ON WEEK END})$

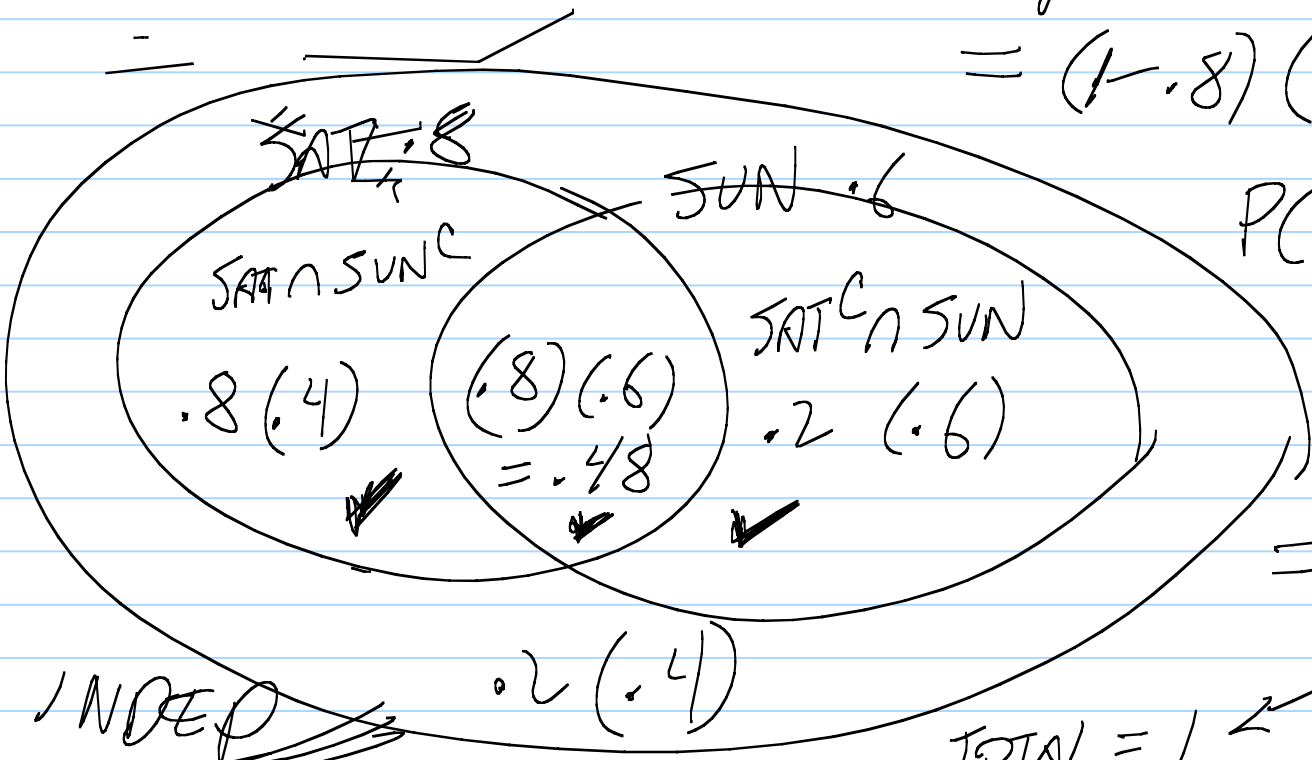
COULD HAVE DONE

$P(\text{NO RAIN SAT OR SUN})$

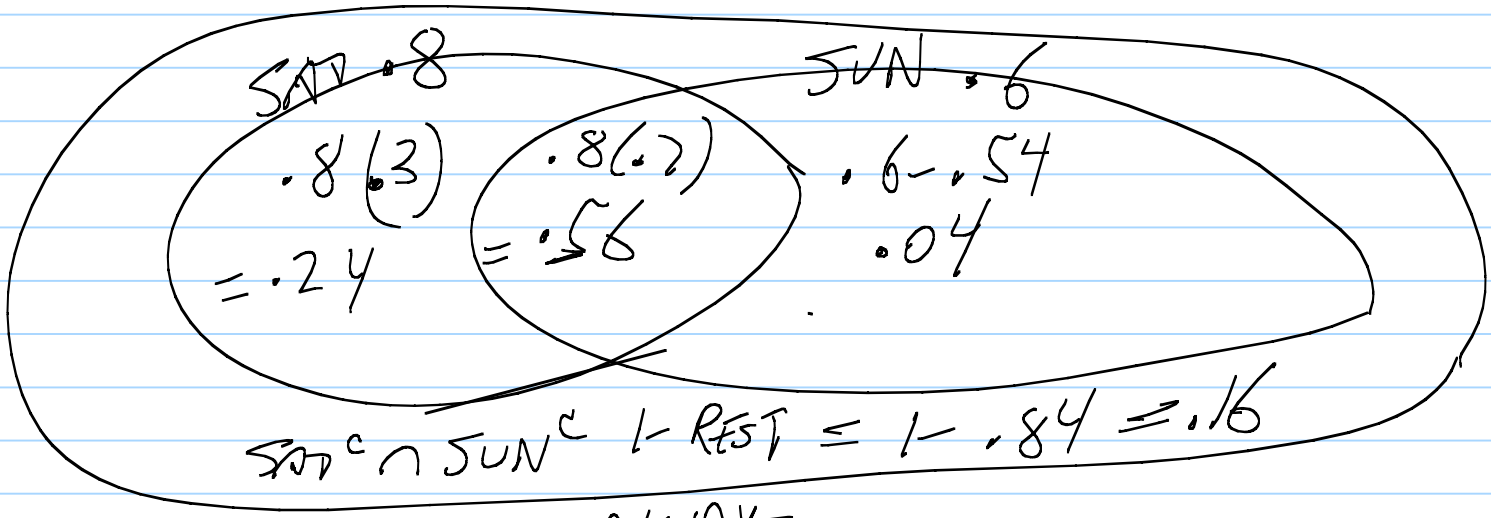
$= 1 - .8(.4) - .48 - .12$

TOTAL = 1 ↗ SAME

OR



4(c). IF RAIN SAT, SUN ARE NOT INDEPENDENT BUT RATHER $P(SUN \mid SAT) = .7$ (CHANGED) THEN NEW VENN



$P(SAT \cap SUN) \overset{\text{ALWAYS}}{=} P(SAT)\, P(SUN \mid_{IF} SAT)$

$= .8(.7) = .56$ $\approx .93$

4(d). $P(SAT \mid_{IF} SUN) =_{DEF} P(SAT \cap SUN)/P(SUN) = .56/.6$

PITFALLS w. NO COND'L PR.

1/4 MM
1/4 MF
1/4 FM
1/4 ~~FF~~

$P(\text{2 males} \mid \text{AT LEAST 1 MALE}) = 1/3$

#3. [3R 4G 5Y] WITHOUT REPL

EQ PROB ON THOSE REMAINING.

(a) $P(R1) = 3/12$

(b) $P(R2 \mid \text{IF } R1) = 2/11$

DRAW FROM [2R 9 OTHER]

TYPO $P(R2 \mid \overline{R1}) = P(R2 \mid R1^C) = \frac{3}{11}$ FROM [3R 8 OTHER]

? ~~ORDER OF~~ $P(R2) = P(R1)$

— DRAW DOES NOT MATTER

DETAILS (RULES)

$P(R2) = P(R1\ R2) + P(R1^C \cdot R2)$ — and, or

$= P(R1)P(R2 \mid R1) + P(R1^C)P(R2 \mid R1^C)$ — IF

$= \frac{3}{12}\frac{2}{11} + \frac{9}{12}\frac{3}{11} = \frac{6+27}{12\ 11}$

$= \frac{33}{12\ 11} = \frac{3}{12}$ SAME AS $P(R1)$!!

[3R 4G 5Y]

#1.

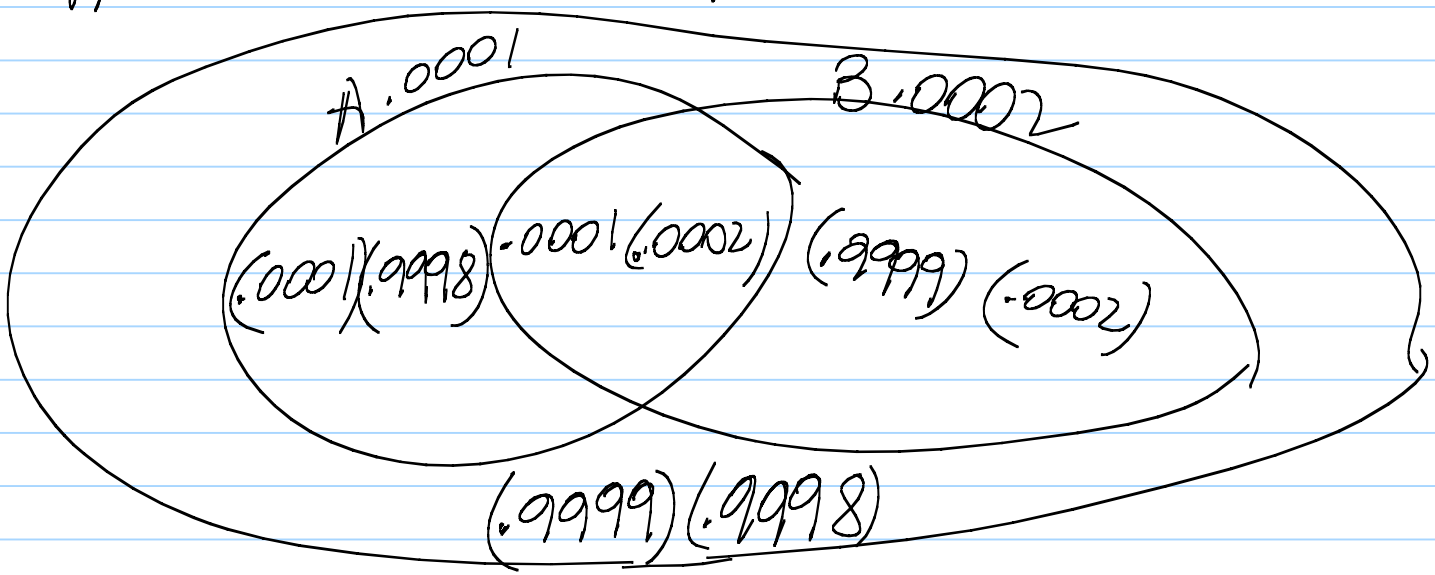
A = LEFT FAILS

P(A) = .0001

B = RIGHT FAILS

P(B) = .0002 (CHANGED!)

SUPPOSE A, B ARE INDEPENDENT.



$$P(\text{AT LEAST ONE DOES NOT FAIL}) = (.9999)(.9998)$$

LEFT DOES NOT FAIL