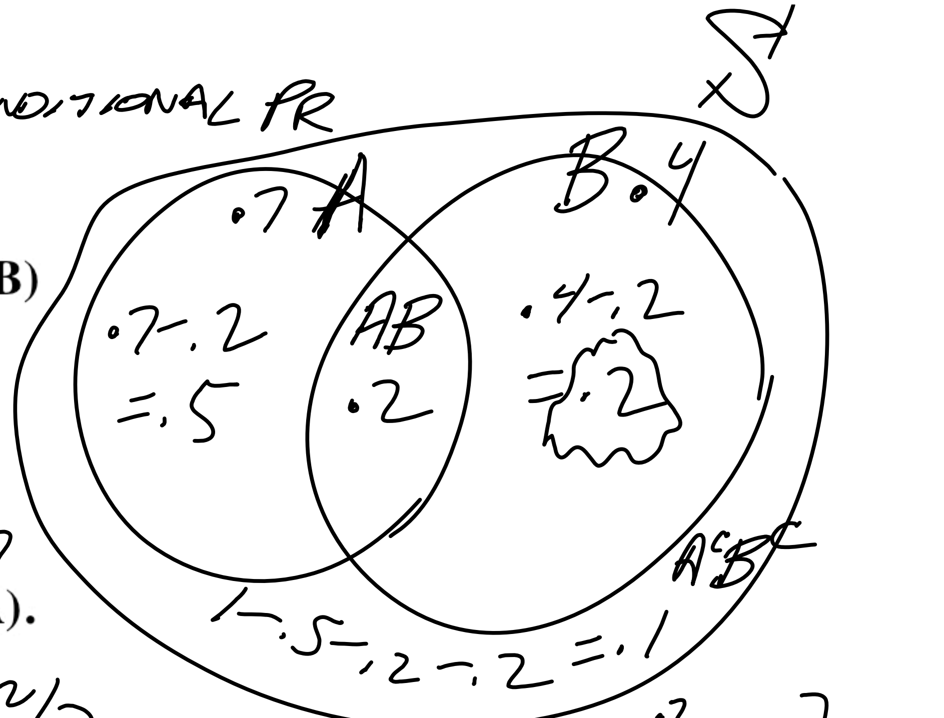
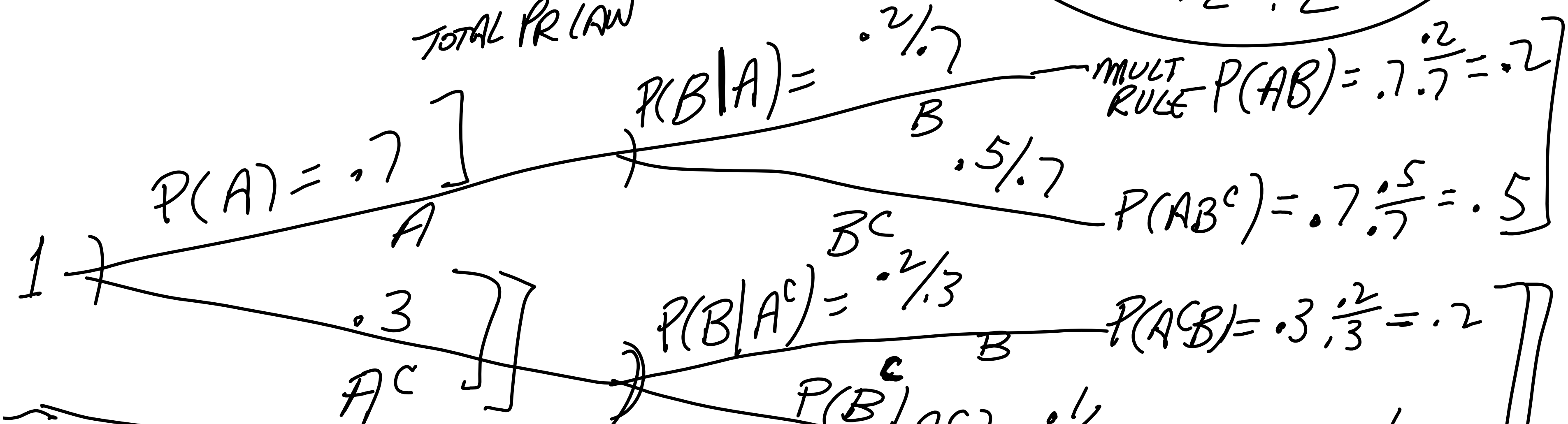
1. P(A) = 0.7, P(B) = 0.4, P(AB) = 0.2.

a. Venn diagram. **Hint: $P(A\,B^C) = P(A) - P(AB)$**

$AB = A \cap B$ "INTERSECTION"



b. Tree diagram. **Hint: $P(B \mid A) = P(AB) / P(A)$.**



$$P(B|A^c) = \frac{P(BA^c)}{P(A^c)} = .2 / (1 - .7)$$

← CONDITIONING EVENT

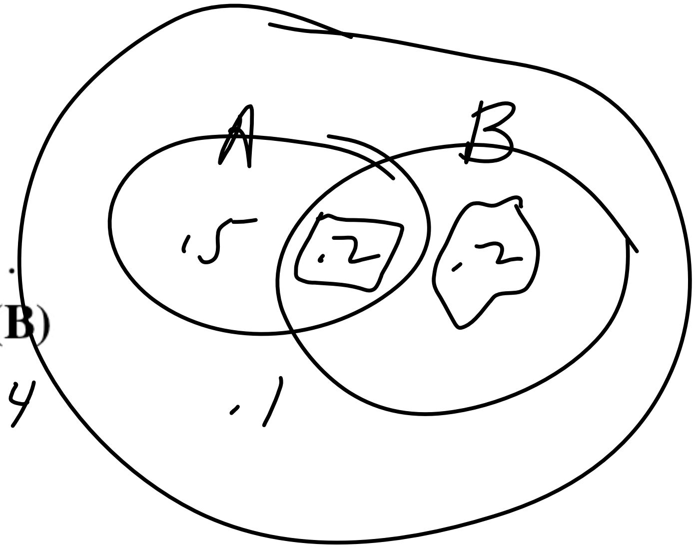
1. P(A) = 0.7, P(B) = 0.4, P(AB) = 0.2.

c. From the Venn Diagram, find P(B) and P(A | B) .

P(B) = P(AB) + P(A^CB), P(A | B) = P(AB) / P(B)

$= \boxed{.2} + .2 = .4$ $.2 / .4 = 1/2$

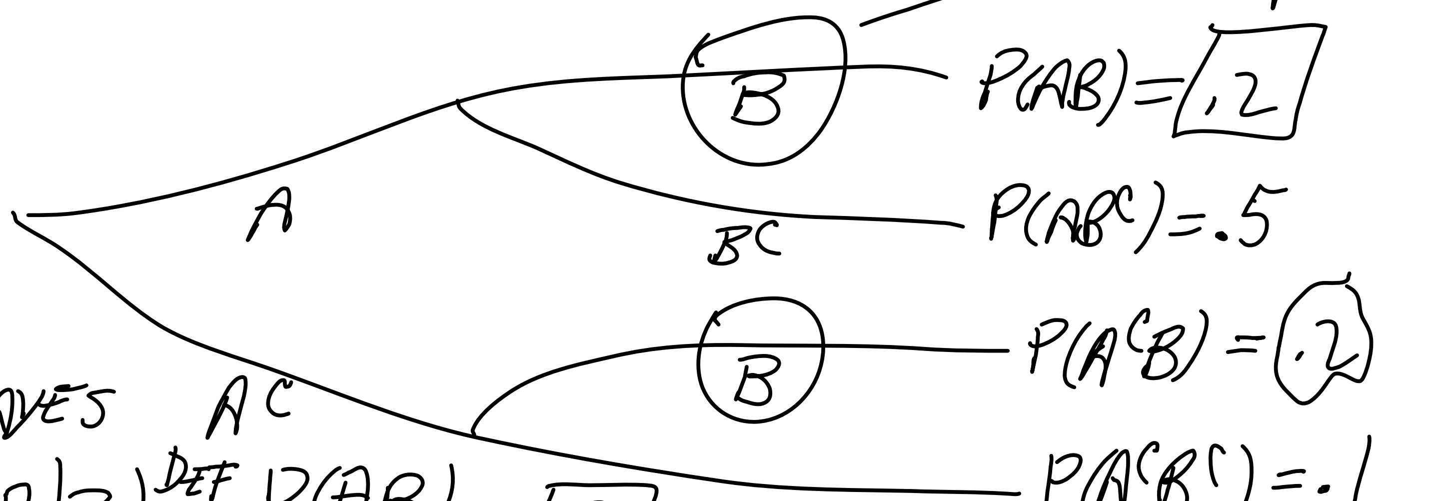
CKS W/ GIVEN



d. From the Tree Diagram determine P(A | B) (Bayes).

P(A | B) = P(AB) / P(B)

P(B) AGG ALL PIECES PASSING THRU B

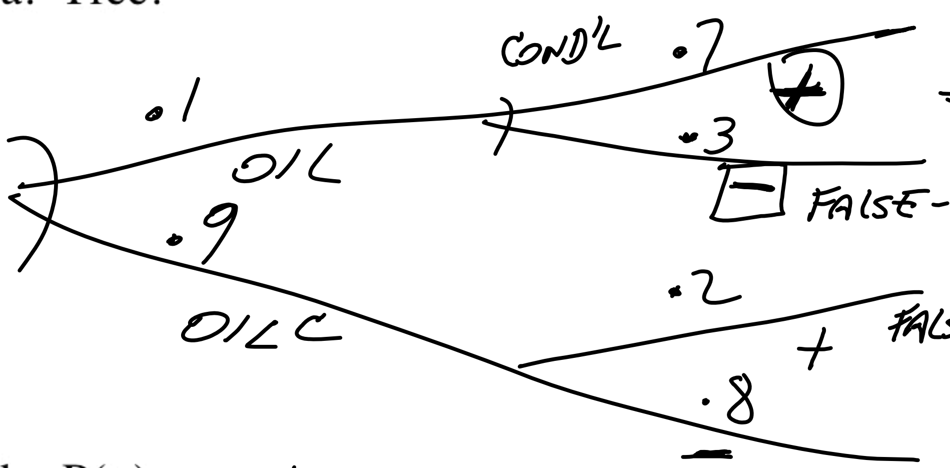


BAYES

$$P(A|B) \overset{DEF}{=} \frac{P(AB)}{P(B)} = \frac{\boxed{.2}}{\boxed{.2} + .2}$$

2. P(OIL) = 0.1, P(+ | OIL) = 0.7, P(+ | no OIL) = 0.2.

a. Tree.



$P(OIL\,+) = .1\ .7$

FALSE+ $P(OIL^c\,+) = .9\ .2$

NET II

$-20 - 60 + 400$
$= 320$

$-20 - \boxed{0} + 0$

$-20 - 60 + 0$

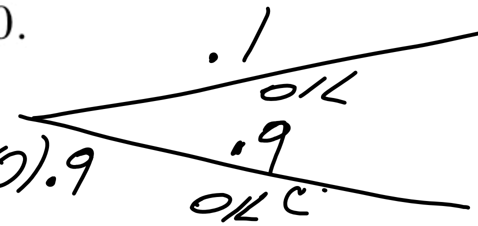
$-20 - 0 + 0$

b. P(+) $= .1\ .7 + .9\ .2$

P(OIL | +). $\overset{DEF}{=}$ (BAYES) $\dfrac{P(OIL+)}{P(+)} = \dfrac{.1\ .7}{.1\ .7 + .9\ .2}$

c. Costs: test = 20, drill = 60. Gross from oil = 400.
E(NET return from "just drill") =

$E(NET\ I) = \sum x\,p(x) = 340(.1) + (-60).9$
$= -20$



NET

$-60 + 400$
$= 340$

$-60 + 0$

d. E(NET from "test, drill if +") =

$E(NET\ II) = \sum x\,p(x) = \overbrace{.1\ .7\ (320)}^{22.4} + .1\ .3\ (-20)$
$+ .9\ .2\ (-80) + .9\ .8\ (-20)$??

+ VALUE PR

There was no question 3.

a. What is the approximate probability of landing on Boardwalk (or any other property) in Monopoly? $\approx \frac{1}{7}$ (SEE WHY LATER)

b. If the rent on that property is \$200 what is the expected return to the owner from one player-circuit of the board?

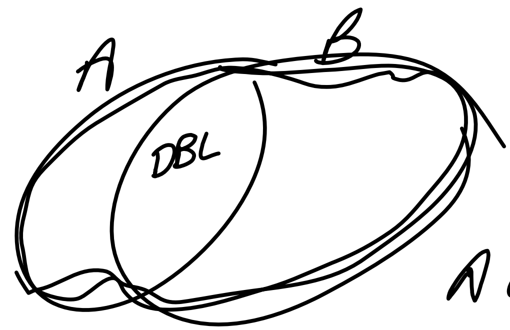
x	200	0
$p(x)$	1/7	6/7

$EX = \frac{200}{7}$

c. If a player owns properties with rents \$100, \$150, \$300 what Is the expected return from three player-circuits of the board?

$100\left(\frac{1}{7}\right) + 150\left(\frac{1}{7}\right) + 300\left(\frac{1}{7}\right)$

4. P(A) = 0.4, P(B) = 0.5, P(AB) = 0.20.



$A \cup B$
UNION
A OR B OR BOTH

a. $P(A \cup B)$.
$P(A \cup B) = P(A) + P(B) - P(AB)$ always.

$= .4 + .5 - .2 = .7$

b. From definition $P(B \mid A)$.
$P(B \mid A) = P(AB) / P(A)$.

$.2 / .4 = 1/2$

c. Are A, B independent of each other? Show reasoning! **Does $P(AB) = P(A)P(B)$?**

OR Ck. IS $P(B \mid A) = P(B)$?

(b) $\frac{1}{2}$ $.5$ GIVEN

YES.

A, B ARE INDEP.

Ck $.2 \stackrel{?}{=} .4 \cdot .5$

YES

$\Longleftrightarrow$ A, B ARE INDEP.

5. P(A) = 0.4, P(B) = 0.3, P(B | A) = 0.6.

a. Give P(AB).
P(AB) = P(A) P(B | A) always if P(A) > 0.

$P(AB) = P(A)\, P(B|A) = .4(.6) = .24$

b. Are A, B independent? **Is P(B) = P(B | A)?**

$.3 \neq .24$ NO – A, B ARE DEPENDENT

c. Fill out a complete Venn Diagram.

6. X = draw from {2 4 4 6}. Y draw from {2 2 2 6}.

DISTRIBUTIONS

OR (DIST) $2(\frac{1}{4})+4(\frac{1}{2})+6(\frac{1}{4})$

a. E X = $2(\frac{1}{4})+4(\frac{1}{4})+4(\frac{1}{4})+6(\frac{1}{4}) = 16/4 = 4$

b. Var X = **E X² - (E X)²**

$E(X^2) = 2^2(\frac{1}{4})+4^2(\frac{1}{2})+6^2(\frac{1}{4})$
$= 1+8+9 = 18$

$\text{Var}X = 18-4^2 = 2$

sd X = $\sqrt{\textbf{Var X}} = \sqrt{2}$

c. E Y = $12/4 = 3$

Var Y = $12-9 = 3$

d. E(4 X - Y + 3) = (addition rule of E)

$4EX - EY + 3 = 4(4) - 3 + 3 = 16$ REGARDLESS OF DEPENDENCE

e. If X, Y are INDEPENDENT,

Var(4 X - Y + ~~3~~) = $\text{Var}\,4X + \text{Var}(-Y) = 16(2) + (-1)^2(3)$
$= 32+3$

sq

7. E X = -\$0.60 and Var X = \$9.
T = X1 + X2 +..... + X10000 (independent plays)

a. E T = **E X1 + E X2 +..... + E X10000 =** $10000(-\$.60) = -6000$

b. Var T $\overset{\text{if independent } r.v.}{=}$ **Var X1 + ... + Var X10000** $\overset{\text{INDEP}}{=} 10000(9)$

$\sigma_T = \sqrt{\text{Var T}} = \sqrt{10000 \; 9} = \sqrt{10000}\,\sqrt{9} = 300$

c. Approximate distribution of T. (CLT "central limit theorem).

CLT

$\approx$