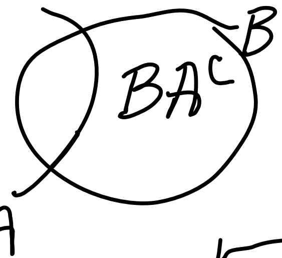
1. P(A) = 0.7, P(B) = 0.4, P(AB) = 0.2.

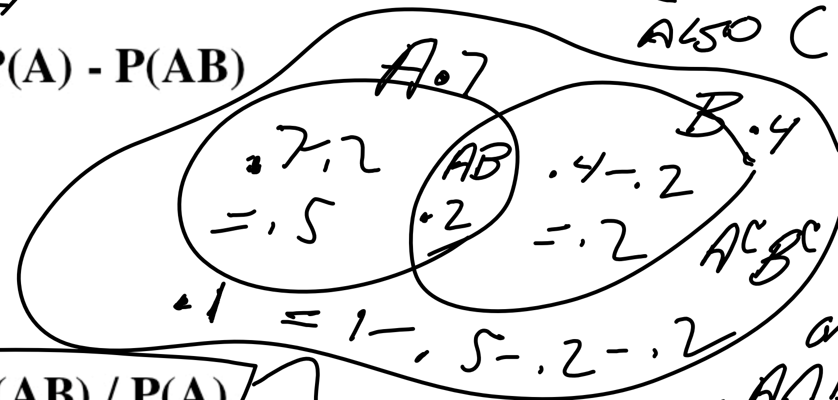
MUST NOT EXCEED P(A), P(B)

$AB = A \cap B \subset A$

ALSO $\subset B$

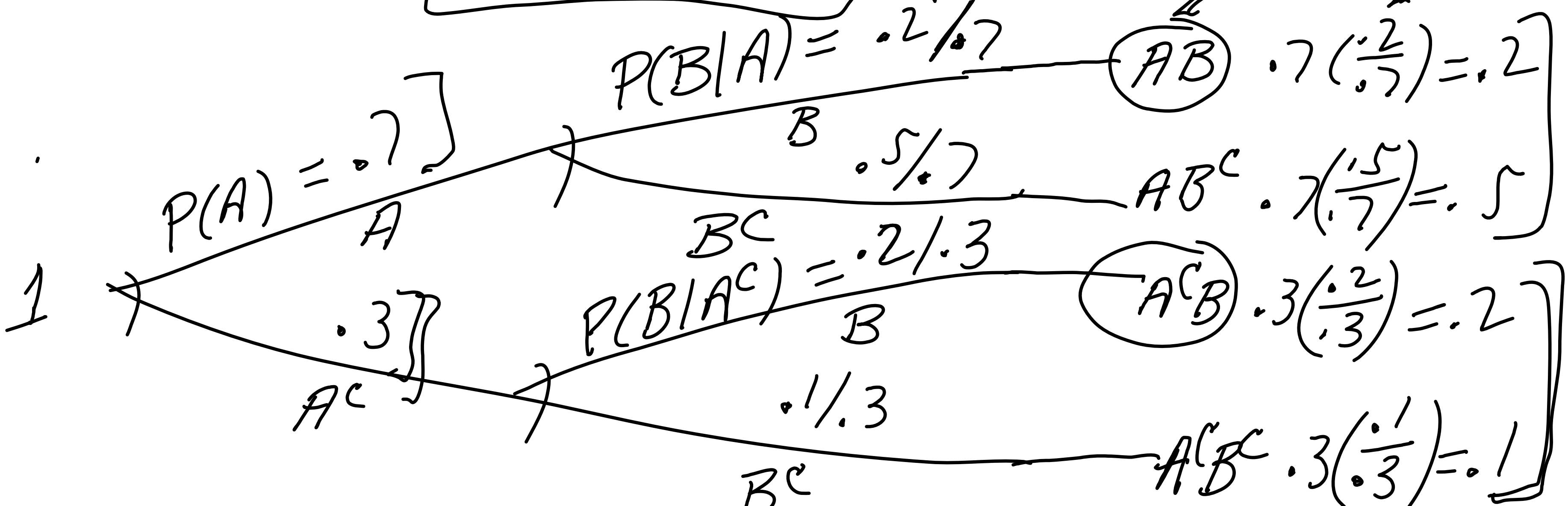
a. Venn diagram. **Hint: P(A B^C) = P(A) - P(AB)**





and $A \cap B$ VENN

b. Tree diagram. **Hint: $\boxed{\text{P(B | A) = P(AB) / P(A).}}$**



$P(B) = P(AB) + P(A^cB) = .2 + .2 = .4$

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) .

$P(B) = P(AB) + P(A^C B)$, $\quad P(A \mid B) = P(AB) / P(B)$

GIVEN ANYWAY

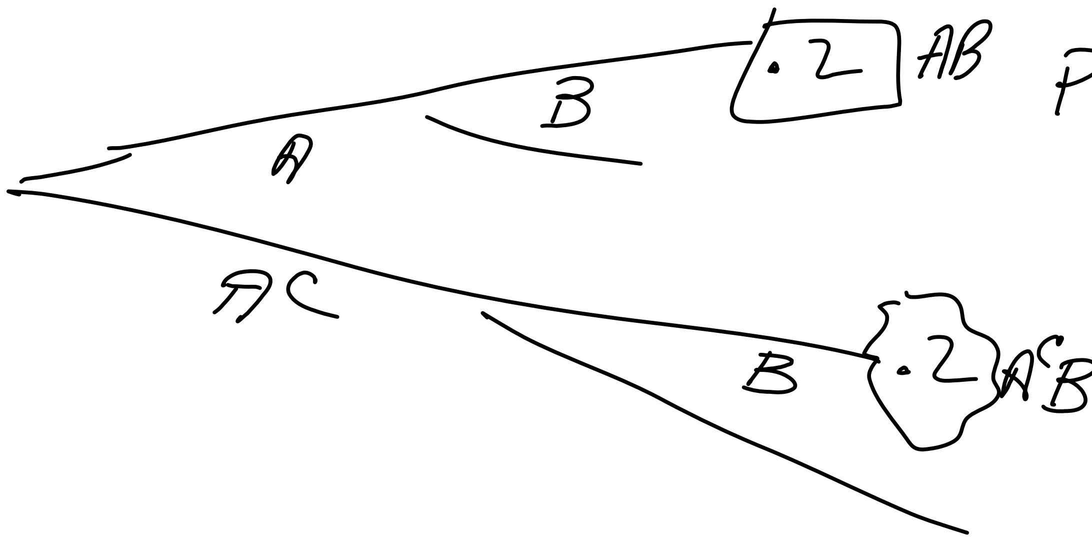
$$P(B) = P(AB) + P(A^C B) = .2 + .2 = .4$$

$$\text{(BAYES)} \quad P(A \mid B) \overset{DEF}{=} P(AB)/P(B) = .2/.4$$ FROM GIVENS

CONDITIONING EVENT –

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

$P(A \mid B) = P(AB) / P(B)$

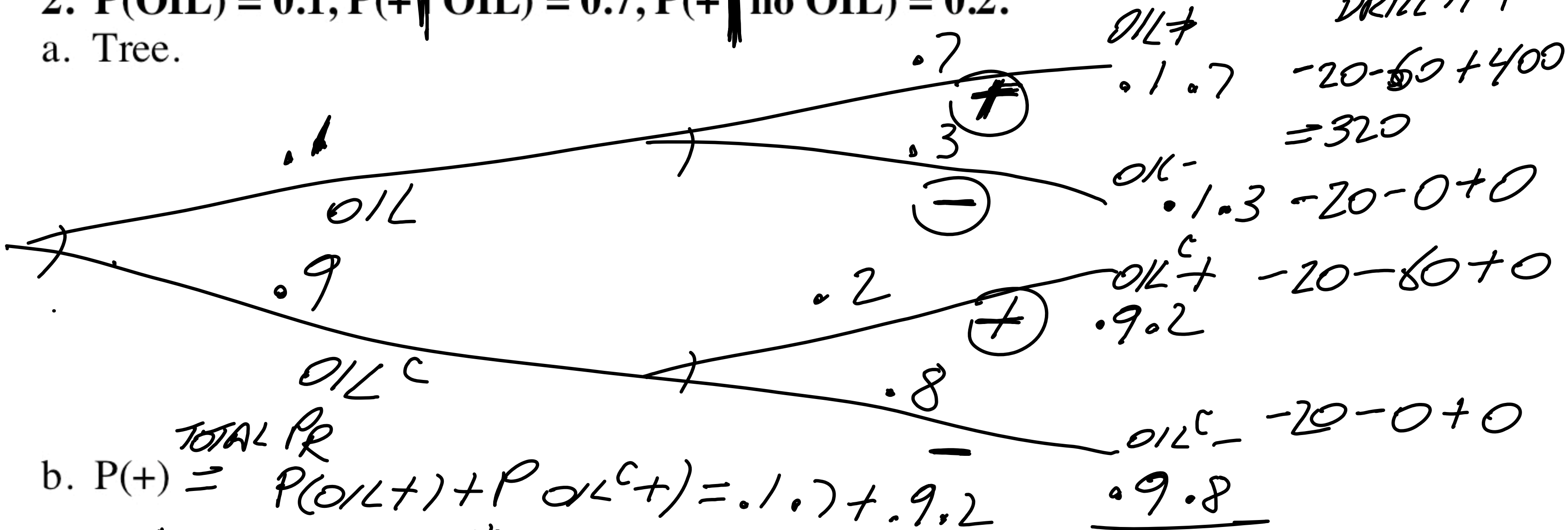


$$P(A \mid B) = \frac{P(AB)}{P(B)} \overset{TREE}{=} \frac{\boxed{.2}}{\boxed{.2} + \boxed{.2}}$$

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

VENN "NET TEST, DRILL IF +"

a. Tree.



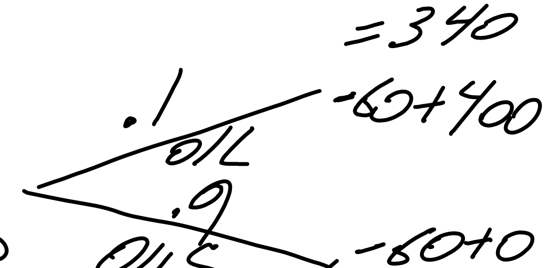
b. P(+) $\overset{\text{TOTAL PR}}{=}$ $P(OIL+) + P(OIL^C+) = .1 \cdot .7 + .9 \cdot .2$

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

c. Costs: test = 20, drill = 60. Gross from oil = 400.

E(NET return from "just drill") = $.1(340) + .9(-60)$

$\sum$ VALUE · PR = $\sum x\,p(x)$ = 34 − 54 = −20



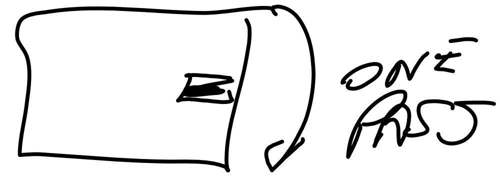
d. E(NET from "test, drill if +") = POLICY II

$.1 \cdot .7(320) + .1 \cdot .3(-20) + .9 \cdot .2(-80) + .9 \cdot .8(-20)$

22.4 etc TOTAL IS E(NET POLICY II)

There was no question 3.

a. What is the approximate probability of landing on Boardwalk (or any other property) in Monopoly?



$p \sim \frac{1}{7}$

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

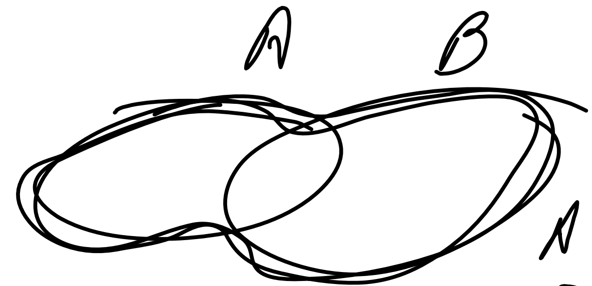
HIT	MISS
200	0
1/7	6/7

$EX = 200/7$

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

$\frac{100}{7} + \frac{150}{7} + \frac{300}{7}$

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



a. $P(A \cup B)$.

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

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

A or B or BOTH

$= A \cup B$

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

$P(B \mid A) = P(AB) / P(A)$. $= .2/.4 = \frac{1}{2}$

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

or $P(B)$ vs $P(B \mid A)$

$.5$ YES $= \frac{1}{2}$

INDEP

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

YES

SO A INDEP B

5. $P(A) = 0.4$, $P(B) = 0.3$, $P(B \mid A) = 0.6$.

a. Give P(AB).
$P(AB) = P(A)\, P(B \mid A)$ always if $P(A) > 0$.

b. Are A, B independent? **Is $P(B) = P(B \mid A)$?**

c. Fill out a complete Venn Diagram.

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

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

SAME — CALC'Y FROM DISTRIBUTION

SEEN FROM EXPERIENCE

b. Var X = **E X² - (E X)²**

$= 18 - 4^2 = \boxed{2}$

sd X = **√Var X** $= \sqrt{2}$

ASIDE: EX^2

$= \frac{2^2+4^2+4^2+6^2}{4}$

$= 2^2(\frac{1}{4}) + 4^2(\frac{1}{2}) + 6^2(\frac{1}{4})$

$= 72/4 = \frac{36}{2} = 18$

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

Var Y = $48/4 - 2^2 = 8$

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

$4EX - EY + 3 = 4(4) - 3 + 3 = 17$

e. If X, Y are INDEPENDENT,
Var(4 X - Y + ~~3~~) = INDEP

$= \text{Var } 4X + \text{Var}(-Y) + \cancel{0}$

$= 16 \text{ Var} X + (-1)^2 \text{ Var } Y$

$= 16 \boxed{2} + 8$

$-\$.60$

$=100^2$

10000

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

a. $E\,T =$ **$E\,X1 + E\,X2 + \ldots\ldots + E\,X10000$ =** $\underbrace{-.6 - .6 - \cdots - .6}_{10000} = -6000 = E\,T$

b. $\mathrm{Var}\,T \overset{\textbf{if independent } r.v.}{=}$ **$\mathrm{Var}\,X1 + \ldots\ldots + \mathrm{Var}\,X10000$** $= \mathrm{Var}\,X_1 + \cdots + \mathrm{Var}\,X_{10000}$

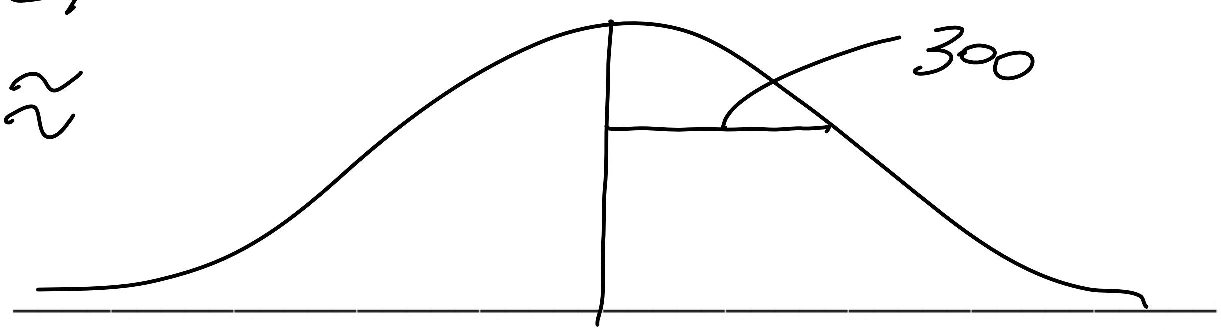
$= 10000(9)$

$\sigma_T = \sqrt{\mathrm{Var}\,T} = \sqrt{10000\ 9} = 100\,(3) = 300 = \sigma_T$

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

CLT

$\approx$



total t of 10000 independent plays

-6000