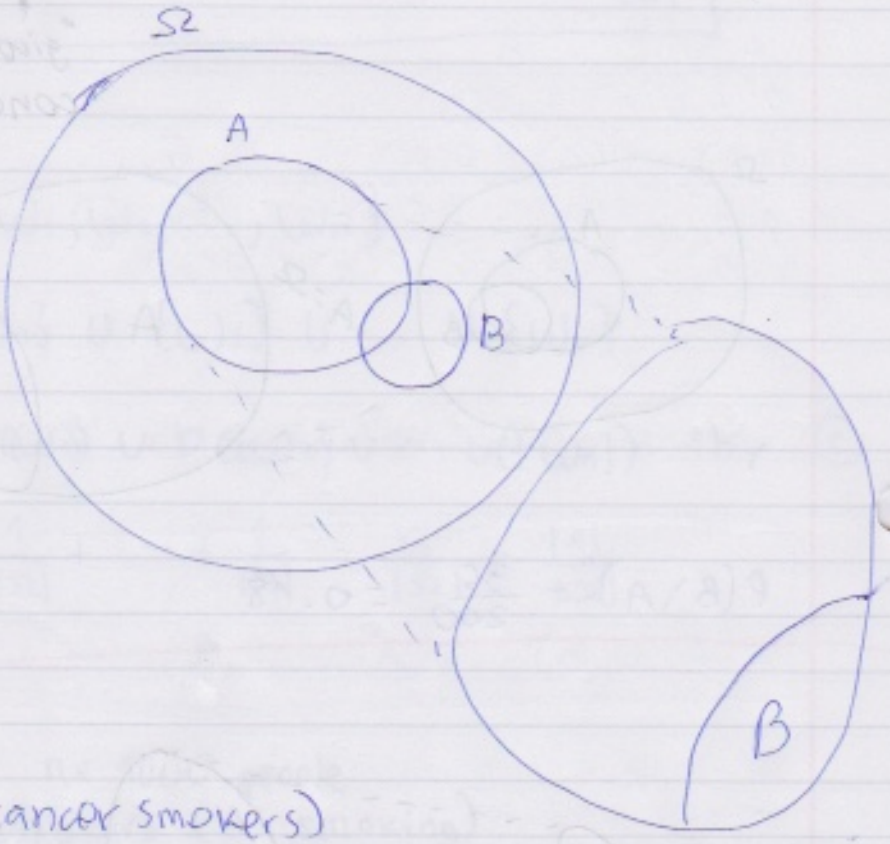
9/25

$P(A) = 0.2$
$P(B) = .06$
$P(AB) = .036$



P(lung cancer smokers)

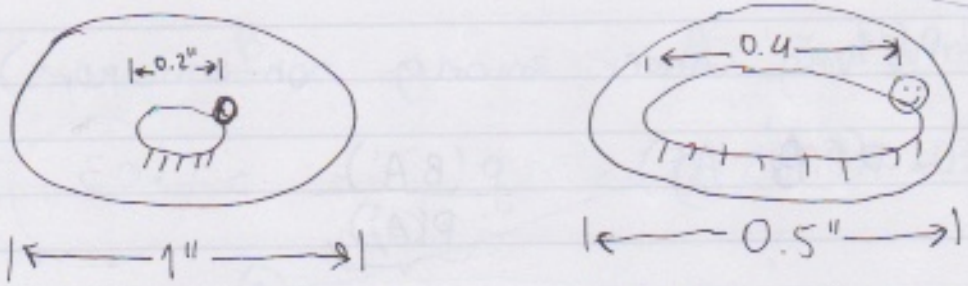
$A = \Omega' = P(B \setminus A) \propto P(AB)$

$AB \propto B \setminus A$

$= \frac{P(\Omega)}{P(A)} P(AB)$

$\Rightarrow P(B \setminus A) = \frac{P(AB)}{P(A)}$

More behind



zoom factor = $\frac{1"}{0.5"} = 2$

$\frac{P(AB)}{P(A)} \Rightarrow \frac{.036}{0.2}$

$= .18$

$\Rightarrow P(AB) = P(A)\,P(B|A)$

$\Rightarrow P(A|B) = \frac{P(B|A)\,P(A)}{P(B)}$

"Bayer Rule" 1763

another problem

P(smoking among those who get l.c) = $P(A|B)$

$\frac{.036}{.06} = .6$

$= \left(\frac{.2}{.06}\right) .18 = .6$

P(lung cancer among non-smokers)

$= P(B \mid A^c) = \frac{P(BA^c)}{P(A^c)} = .03$

$P(A^c) = 1 - P(A)$

$1 - .2 = .8$

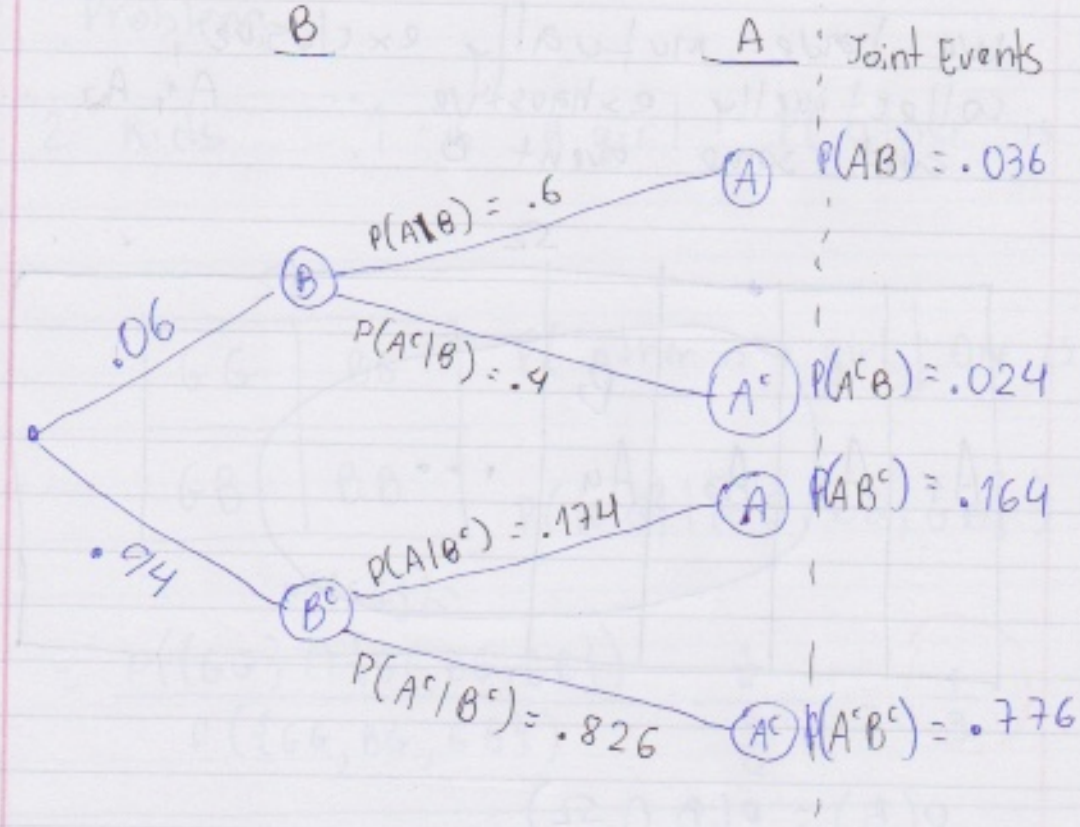
$B = AB \cup A^cB$

$P(B) = P(AB) + P(A^cB)$

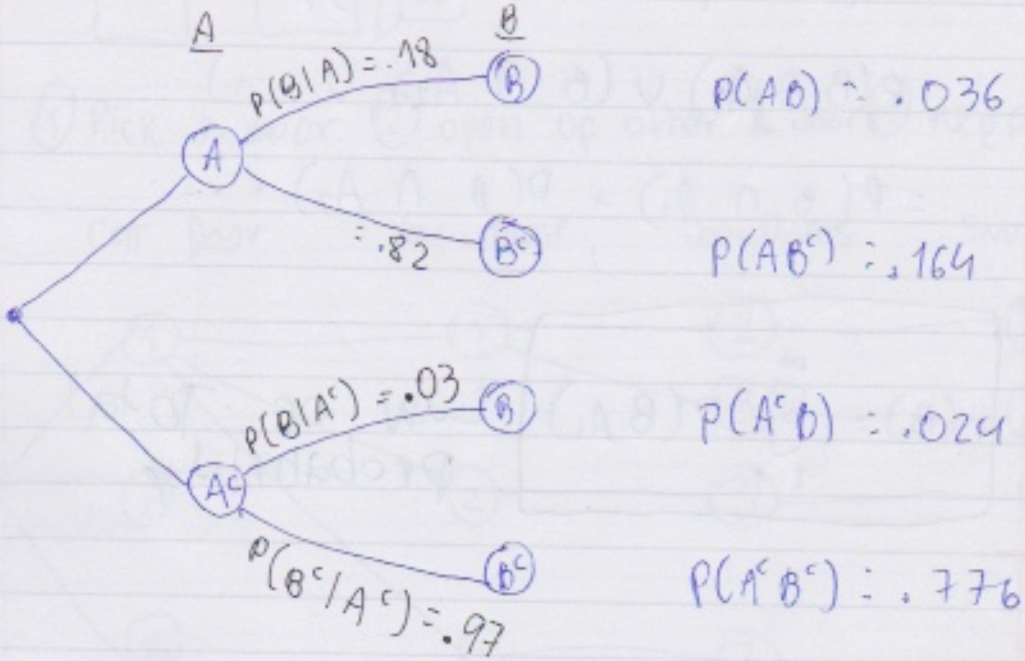
$P(A^cB) = P(B) - P(AB) = .06 - .036 = .027$

$\frac{P(B \mid A)}{P(B \mid A^c)} = \frac{.18}{.03} = 6$ ← Risk Ratio

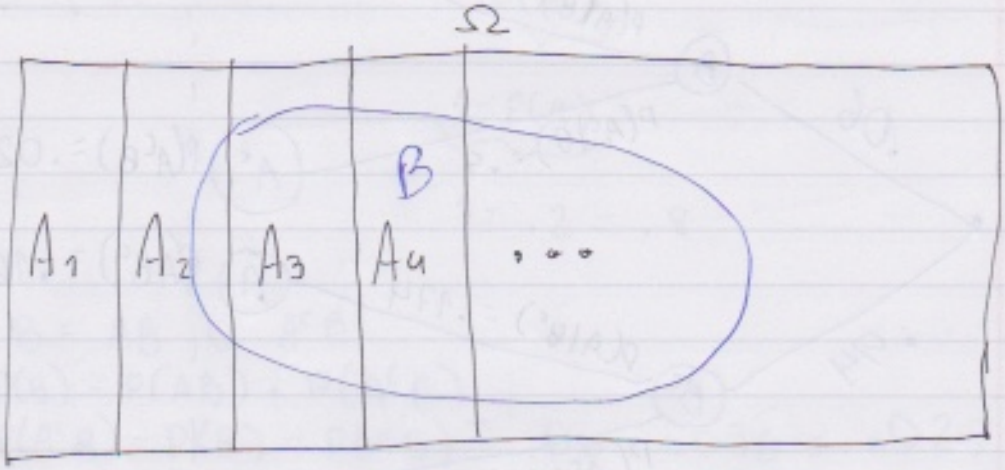
Tree



Tree Inversion



We have mutually exclusive, collectivelly exhaustive ... $A_1, A_2 \ldots$ and some event B



$$P(B) = P(B \cap \Omega)$$

$$= P(B \cap (A_1 \cup A_2 \cup \ldots))$$

$$= P(B \cap A_1) \cup (B \cap A_2) \cup \ldots)$$

$$= P(B \cap A_1) + P(B \cap A_2) + \ldots$$

$$P(B) = \sum_{i=1}^{\infty} P(B A_i)$$

Law of Total Probability

Problem

2 Kids. 1 is a girl P(other is a girl)

Ω

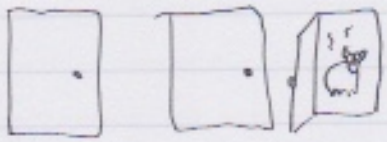
GG	BG
GB	BB

P(other is a girl | One is a girl)

$P(\{GG\} \mid \{GG, BG, GB\})$

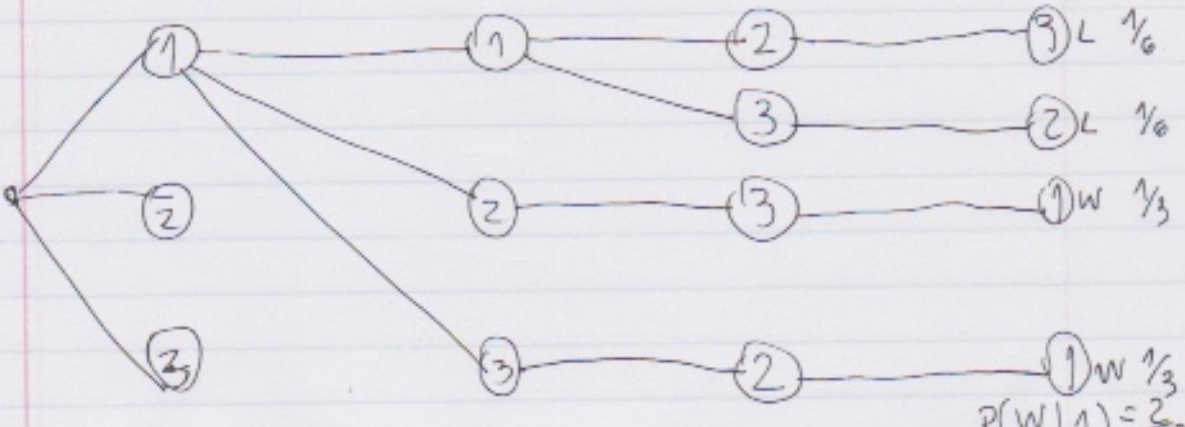
$P(\{GG\}) =$

$$= \frac{P(\{GG\} \cap \{GG, BG, GB\})}{P(\{GG, BG, GB\})} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}$$



(1) Pick a door (2) open of other **1** door (3) kepp or switch

Car Door You choose, Door Opens Switch



P(W|1) = 2/3