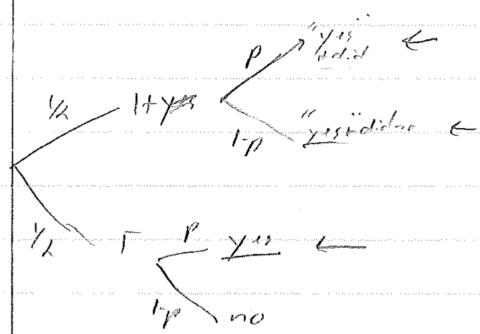
200 ppl Zach Knoech 1/4

100

with p being probability

$$\frac{110}{200} \quad \frac{20}{200} = \frac{20}{110}$$

2-29-30



30 A
31 A
32 A
33 A

$$p(\text{"yes"}) = \tfrac{1}{2}p + \tfrac{1}{2}p + \tfrac{1}{2}(1-p)$$

$$p(x \cap \text{"yes"}) = \tfrac{1}{2}p + \tfrac{1}{2}p$$

$$P(x \mid \text{"yes"}) = \frac{P(x \cap \text{"yes"})}{P(\text{"yes"})} \qquad \frac{p}{p + \frac{1}{2} - \frac{1}{2}p} = \frac{p}{\frac{1}{2}(1+p)} \quad \frac{2p}{1+p}$$

$$\frac{1}{10} \quad \frac{2/10}{11/10} \quad \frac{2}{10} \cdot \frac{10}{11} \quad \frac{20}{110} \quad .18$$

$$P(x \mid \text{"yes"}) = 1 - P(\bar{x} \mid \text{"yes"}) \qquad \cancel{\tfrac{1}{2} + \tfrac{1}{2}}$$

$$\frac{\frac{1}{2}p + \frac{1}{2}p}{\frac{1}{2} + \frac{1}{2}p} = \frac{p}{\frac{1}{2} + \frac{1}{2}p} \quad \boxed{\frac{p}{\frac{1}{2} + \frac{1}{2}p}}$$

$p = .1$ example
200 person sample
100 answer truth
10 people answer truthfully yes
100 answer yes automatically
so $\frac{110}{200}$ say yes

$$p = .1 \quad \frac{.1}{\frac{1}{2} + \frac{1}{20}} = .\overline{18}$$

makes sense. see example

knowing $p = .1$ 10 people from the
100 who auto. said yes ~~say~~ x'ed
so $10 + 10 = 20$ people x'ed

$$\frac{20}{110 \text{ answered yes}} = .\overline{18} = \frac{p}{\frac{1}{2} + \frac{1}{2}p}$$

Zach Knoech 2/4

2-29-31 (1) $P(A_1^c \cap \underbrace{A_2 \cap A_3}_{B}) = P(A_1^c)\underbrace{P(A_2)P(A_3)}_{P(B)}$

$P(A_1^c \cap B) = P(A_1^c)P(B)$

$P(A_1^c|B)\cancel{P(B)} = P(A_1^c)\cancel{P(B)}$

$P(A_1^c|B) = P(A_1^c)$

$1-P(A_1^c|B) = 1-P(A_1^c)$

$P(A_1|B) = P(A_1)$ which is true by the assumption A_1, A_2, A_3 indep

(2) $P(A_1^c \cap A_2) = P(A_1^c)P(A_2)$

$P(A_1^c|A_2)\cancel{P(A_2)} = P(A_1^c)\cancel{P(A_2)}$

$P(A_1^c|A_2) = P(A_1^c)$

$1-P(A_1^c|A_2) = 1-P(A_1^c)$

$P(A_1|A_2) = P(A_1)$ true by assumptions

(3) $P(A_1^c \cap A_3) = P(A_1^c)P(A_3)$

$P(A_1^c|A_3)\cancel{P(A_3)} = P(A_1^c)P(A_3)$

$1-P(A_1^c|A_3) = 1-P(A_1^c)$

$P(A_1|A_3) = P(A_1)$ true by assumptions

(4) $P(A_2 \cap A_3) = P(A_2)P(A_3)$ true by assumptions

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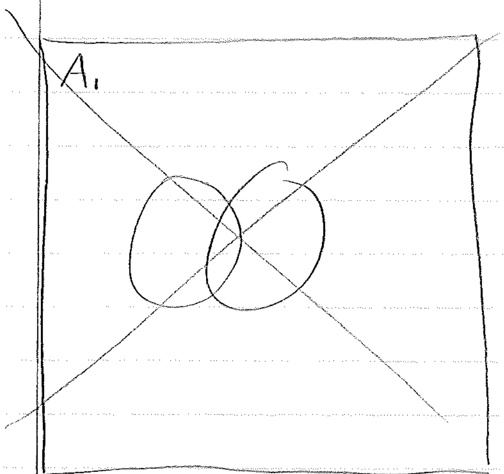
(32)

$P(A_1) = 1$



$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2)P(A_3)$

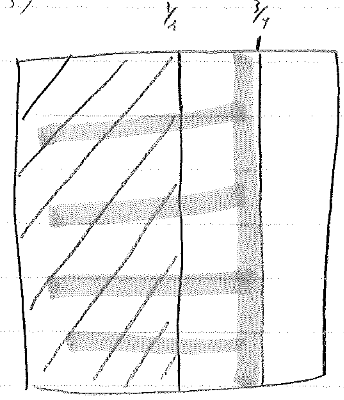
$P(A_1 \cap A_2) = P(A_1)P(A_2)$

$P(A_1 \cap A_3) = P(A_1)P(A_3)$

$P(A_2 \cap A_3) \neq P(A_2)P(A_3)$

if $P(A_1) = 1 \approx A_1 = S$

$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2)P(A_3) \Rightarrow P(A_2 \cap A_3) = P(A_2)P(A_3)$



$A_1 = \emptyset$

$1/2 = A_2 = ///$

$3/4 = A_3 = $ Grn

$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2)P(A_3)$

$\frac{P(A_1 | A_2 \cap A_3)}{P(A_2 \cap A_3)} = P(A_1)P(A_2)P(A_3)$

$P(A_1 | A_2 \cap A_3) = P(A_1)P(A_2)P(A_3)P(A_2 \cap A_3)$

can either be 1 or 0

$\frac{P(A_1)}{P(A_1)} = \frac{P(A_1)P(A_2)P(A_3)P(A_2 \cap A_3)}{P(A_1)}$

$1 = P(A_2)P(A_3)P(A_2 \cap A_3)$ ← cannot happen

$P(A_2) = P(A_3) = P(A_2 \cap A_3) = 1$ ← not indep

$P(A_1) = P(A_1)P(A_2)P(A_3)P(A_2 \cap A_3)$

→ if $P(A_1) = 0 \approx A = \emptyset$

(1) $0 = 0$ ✓

(2) $P(A_1 \cap A_2) = 0 = 0 \cdot P(A_2)$ ✓

(3) $P(A_1 \cap A_3) = 0 = 0 \cdot P(A_3)$ ✓

(4) $P(A_2 \cap A_3) \stackrel{?}{=} P(A_2)P(A_3)$

$\frac{1}{2} \stackrel{?}{=} \frac{1}{2} \cdot \frac{3}{4}$

$\frac{1}{2} \neq \frac{3}{8}$ ✓

$A_1 = \emptyset \quad P(A) = 0$

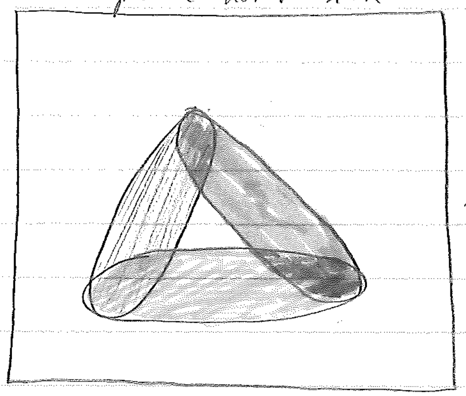
$P(A_2) = \frac{1}{2}$

$P(A_3) = \frac{3}{4}$

Zach Knoech

2-29-(33) (2), (3), (4) true 1 False Assume all intersects in picture are 1/64

picture not to scale



$P(A_1) = P(A_2) = P(A_3) = 1/8$

$\underset{1/64}{P(A_1 \cap A_2)} = P(A_1)P(A_2) = 1/64$

$1/64 = P(A_1 \cap A_3) = P(A_1)P(A_3) = 1/64$

$1/64 = P(A_2 \cap A_3) = P(A_2)P(A_3) = 1/64$

$P(A_1 \cap A_2 \cap A_3) = P(A_1)P(A_2)P(A_3)$

$0 \neq \frac{1}{8^3}$ ✓