B_2 = low scores $P(A|B_2) = 0,4$

A = study more than 25h/w

3.100 A = Privately held $P(A) = 0,75$ $P(A|B) = 0,57$
B = Located along coast = 0,35

a) $P(A \cap B)$? when they say "randomly chosen" it indiades that it is intersection, if conditional they say p. of x is y

$\frac{P(A \cap B)}{P(B)} = P(A|B) \Rightarrow \frac{P(A \cap B)}{0,35} = 0,57 \Rightarrow P(A \cap B) = 0,1995$ ✓

b) $P(A \cup B) = P(B) + P(A) - P(A \cap B) = 0,35 + 0,75 - 0,1995 = 0,9005$ ✓

A and B are mutually exclusive,
...tively exha

c) $P(B|A)$?
$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0,1995}{0,75} = 0,266$ ✓

d) Stat. ind. means that
$P(A) \cdot P(B) = P(A \cap B)$
$0,75 \cdot 0,35 = 0,1995$
$0,2625 \neq 0,1995$ Thus, NO. ✓

3.101

Ch 3

101) $P(M) = 0.80$ $\quad P(W) = 0.20$

grad $P(A) = 0.1$ $\quad P(A) = 0.15$

undergrad $P(B) = 0.3$ $\quad P(B) = 0.4$

high school $P(C) = 0.6$ $\quad P(C) = 0.45$

0.9 $\quad$ 0.85

I suggest you use the notations as below. We cannot have $P(A) = 0.1$ and $P(A) = 0.15$ in one problem.

a) $(0.8)(0.6) = \boxed{0.48}$?? gör man så? ✓

b) $(0.8)(0.1) + (0.2)(0.15) = \boxed{0.11}$ ✓

WHAT ?!

c) $P(M|A) = \dfrac{P(M \cap A)}{P(A)}$

$= \dfrac{(0.8)(0.1)}{0.11} = \boxed{0.727}$ ✓

d) Statistically ind. iff: $P(M|A) = P(M)$ ✗

$0.727 \neq 0.8$ $\boxed{\text{No}}$

Statistically independent $\Leftrightarrow P(M \cap A) = P(M)\,P(A)$

e) $P(W|\bar{A}) = \dfrac{P(W \cap \bar{A})}{P(\bar{A})} \rightarrow \dfrac{(0.2)(1-0.15)}{(0.8 \cdot 0.9) + (0.2 \cdot 0.85)} \rightarrow \dfrac{0.17}{0.89} = \boxed{0.191}$

This is absolutely correct. The simplier way is

$P(\bar{A}) = 1 - P(A) = 1 - 0.11 \rightarrow$ from a)

Question:					
$P(M)$	=	0.8	$P(W)$	=	0.2
$P(A \mid M)$	=	0.1	$P(A \mid W)$	=	0.15
$P(B \mid M)$	=	0.3	$P(B \mid W)$	=	0.40
$P(C \mid M)$	=	0.6	$P(C \mid W)$	=	0.45

a. $P(C \cap M) = P(C|M) \times P(M) = 0.6 \times 0.8$

b. $P(B) = P(B|M)\,P(M) + P(B|W)\,P(W)$
$= 0.3 \times 0.8 + 0.4 \times 0.2$

c. $P(M|A) = \dfrac{P(A|M)\,P(M)}{P(A)} = \dfrac{P(A|M)\,P(M)}{P(A|M)\,P(M) + P(A|W)\,P(W)}$

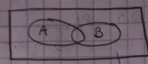
$= \dfrac{0.1 \times 0.8}{0.1 \times 0.8 + 0.15 \times 0.2}$

What you did is absolutely correct! I also think you understand the problem. Just a little advice, I suggest you write the formula before plugging in the numbers. For the assignment(s) it facilitates the coding. For the exam, in case the calculations go wrong, you get points for the understanding :)

3.102 worker

A_1: Women : $P(A_1) = 0{,}3$

A_2: Night sift: $P(A_2) = 0{,}5$



n = all work.

Favor/not favor the plan

B_1 = Favor =

$P(B_1 | A_2) = 0{,}65$ $\quad P(B_1 | A_1) = 0{,}4$ $\quad P(A_1 | A_2) = 0{,}2$

a) $P(A_1 \cap B_1) =$

$= P(B_1 | A_1) P(A_1) = 0{,}4 \cdot 0{,}3 = \underline{0{,}12}$

b) $P(A_1 \cup A_2) = P(A_1) + P(A_2) - \underline{P(A_1 \cap A_2)}$

First we need $\underline{P(A_2 \cap A_1)} \Rightarrow P(A_1 | A_2) P(A_1)$

$= 0{,}2 \cdot 0{,}3 = 0{,}06$

I assume you can interchange them

Can you change within $P(A \cap B)$?

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

$A \cup B = B \cup A$
$P(A \cup B) = P(B \cup A)$

$\underline{P(A_2 \cap A_1) = 0{,}06}$

$P(A_1 \cup A_2) = P(A_1) + P(A_2) - 0{,}06$

$= 0{,}3 + 0{,}5 - 0{,}06$

$= \underline{0{,}74}$

c) IS $P(A_1) \cdot P(A_2) = P(A_2 \cap A_1)$

$0{,}3 \cdot 0{,}5 = 0{,}06$ use from b)

$\underline{0{,}15 \neq 0{,}06}$ TUS, NO its not.

d) $P(A_2 | A_1) = \dfrac{P(A_1 | A_2) \cdot P(A_2)}{P(A_1)} = \dfrac{0{,}2 \cdot 0{,}5}{0{,}3} = \underline{0{,}33}$

e) Male: $\bar{A}_1$ $\quad P(B_1 | \bar{A}_1) = 0{,}5$ $\quad$ Not night shift $= \bar{A}_2 = 0{,}5$

$P(\bar{B}_1 \cap \bar{A}_2) =$ VET EJ!

3.102e → next page

3. 102 e

Question $P(\overline{B_1} \cap \overline{A_2}) = P(\overline{B_1} \mid \overline{A_2})\, P(\overline{A_2})$

$= [1 - P(B_1 \mid \overline{A_2})] \times 0.5$

$$P(B_1 \mid \overline{A_2}) = \frac{P(B_1 \cap \overline{A_2})}{P(\overline{A_2})} = \frac{P(B_1) - P(B_1 \cap A_2)}{P(\overline{A_2})}$$

$$= \frac{P(B_1) - P(B_1 \mid A_2)\, P(A_2)}{P(\overline{A_2})}$$

we know these values

$$P(B_1) = P(B_1 \mid A_1)\, P(A_1) + P(B_1 \mid \overline{A_1})\, P(\overline{A_1})$$

To calculate, just plug in the numbers → $P(B_1)$ → $P(B_1 \mid \overline{A_2})$ ↓ $P(\overline{B_1} \mid \overline{A_2})$

---

3. 103 b

Notation m : number of men chosen
f : number of women chosen

$$P(m > 6) = P(m = 7 \cap f = 5) + P(m = 8 \cap f = 4)$$

$$= \frac{C_7^8 \times C_5^8}{C_{12}^{16}} + \frac{C_8^8 \times C_8^4}{C_{12}^{16}}$$

3.103 a) $\frac{12!}{8!\,(12-8)!} = 495$ ✗ possible   not sure!

$$C^{16}_{12} = \frac{16!}{12!\,(16-12)!}$$

b) A = majority of jury are men, ie >6

P(A)?   previous page

3.104 a) $\frac{12!}{2!\,(12-2)!}$ ...

$$C^{12}_{2} = \frac{12!}{2!\,(12-2)!}$$

3.105 A = increase in sales first three months : $P(A) = 0{,}4$

B = earns a certain amount within three months : $P(B) = \cancel{0{,}70}$ ✗

$\bar{B} = 0{,}3$ ✗ $\bar{B}$ is an event, not probability

P(B | Here I don't even know what to label A & B nor how to write the question with A & B.

$P(A \mid B)$ solution on next page

3.106 A: Go with drug: $P(A) = 0{,}1$ $\bar{A} = 0{,}9$

B: Cured

$P(B \mid A) = 0{,}75$ $P(B \mid \bar{A}) = 0{,}5$

(A)   100 = n = disease

a) $P(A \cap B)$?

$$P(B \mid A) = \frac{P(A \cap B)}{P(A)} \Rightarrow 0{,}75 = \frac{P(A \cap B)}{0{,}1}$$

I assume all were cured? What is P(B)?

$P(A \cap B) = 0{,}75 \cdot 0{,}1 = 0{,}075$

next page

b) $P(A \mid B)$?

$$P(A \mid B) = \frac{P(A \cap B)}{P(B)} \Rightarrow P(A \mid B) = \frac{0{,}075}{P(A \cap B) \cup (\bar{A} \cap B)} \text{ from 3.54}$$

This is **not** a formula

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

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

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

Notation matters!

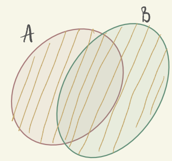
3.106 b) cont.

$P(A \cap B) \cup (\bar{A} \cap B) = 0{,}075 + [P(B \mid \bar{A})\, P(\bar{A})]$

$P(A \cap B) \cup (\bar{A} \cap B) = 0{,}075 + 0{,}5 \cdot 0{,}9 = 0{,}03375$

$\cup$ is plus, not multiply

So, $P(A \mid B) = \frac{0{,}075}{0{,}03375} = 2{,}2$ ... wrong



$A \cup B$ = /// part

$$= \frac{P(A \cap B)}{P(A \cap B) + P(B \mid \bar{A})\, P(\bar{A})} = \frac{0.075}{0.075 + 0.5 \times 0.9} \approx 0.14$$

3.105

$P(A) = 0.4 \qquad P(B|A) = 0.7 \qquad P(B|\bar{A}) = 0.3$

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

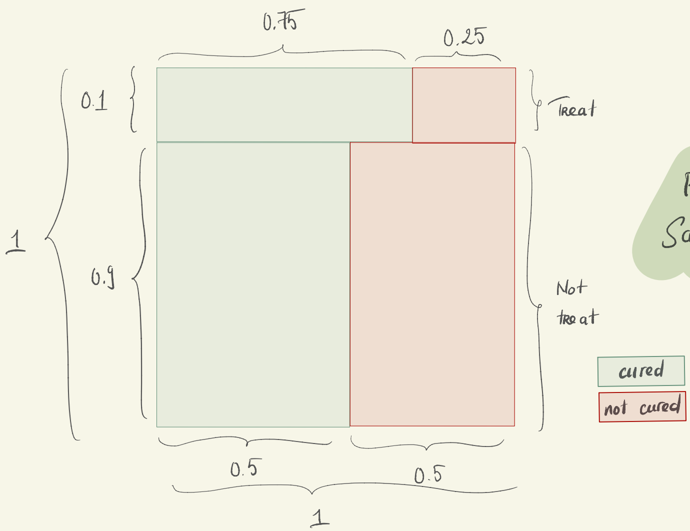
Bayes theorem

Discussion Canvas

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

3.106

Sticky note



P(B) is the green part.
Sadly, not <u>all</u> was cured :(

I eyeball the scale, so not exact.
But you get the point