No.

Date

Assignment 1

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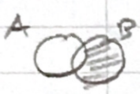
Tutorial Group: 10am Thursday

1. $P(A) = P(B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$

(a) $P(B') = 1 - P(B)$
$= 1 - \frac{3}{4}$
$= \frac{1}{4}$

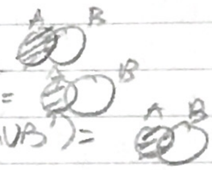
(b) $P(A' \cap B')$
$= P((A \cup B)')$ By De Morgan's Law
$= 1 - P(A \cup B)$
$= 1 - [P(A) + P(B) - P(A \cap B)]$
$= 1 - [\frac{3}{4} + \frac{3}{4} - \frac{1}{2}]$
$= 1 - 1$
$= 0$

(c) $P(B \cap A') = P(B) - P(A \cap B)$
$= \frac{3}{4} - \frac{1}{2}$
$= \frac{3}{4} - \frac{2}{4}$
$= \frac{1}{4}$



(d) $P(A \cup B')$
$= P(A) + P(B')$
$= P(A)$
$= \frac{3}{4}$

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



2) P(wins the first game) = 0.7, P(wins the second game) = 0.6
⇒ Independence = one does not change the probability of occurrence of another

Let A = wins first game, B = wins the second game

(a) P(wins at least one game) $= P(A \cup B)$
$= P(A) + P(B) - P(A \cap B)$
$= P(A) + P(B) - P(A) \cdot P(B)$ By independence of A and B
$= 0.7 + 0.6 - 0.7(0.6)$
$= 0.88$

(b) P(wins exactly one match) $= (P(A) - P(A \cap B)) + (P(B) - P(A \cap B))$
$= (0.7 - 0.7(0.6)) + (0.6 - 0.7(0.6))$
$= 0.28 + 0.18$
$= 0.46$

Great

(c) P(wins neither game) $= 1 - P(A \cup B)$
$= 1 - (P(A) + P(B) - P(A) \cdot P(B))$
$= 1 - 0.88$
$= 0.12$

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3(a) $P(\text{none of them}) = \frac{365}{365} \times \frac{364}{365} \times \frac{363}{365}$

$= \left(\frac{1}{365}\right)^3 \times (365 \times 364 \times 363)$

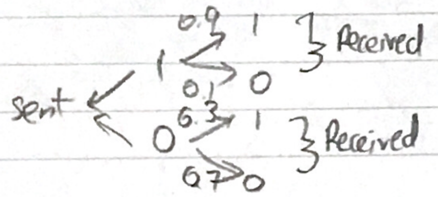
$= 0.9918$

(b) $P(\text{some of them}) = 1 - 0.9918 - \left(\frac{1}{365}\right)^3$

$= 8.20 \times 10^{-3}$

(c) $P(\text{all of them}) = \left(\frac{1}{365}\right)^3$

4)



(a) $P(1 \text{ sent} \mid 1 \text{ was received}) = \frac{P(1 \text{ sent} \cap 1 \text{ received})}{P(1 \text{ received})}$

$= \frac{0.9}{P(1 \text{ sent} \cap 1 \text{ received}) + P(0 \text{ sent} \cap 1 \text{ received})}$

$= \frac{0.9}{(0.9+0.3)}$

$= \frac{0.9}{1.2} = \frac{3}{4}$

(b) $P(0 \text{ sent} \mid 0 \text{ received}) = \frac{P(0 \text{ sent} \cap 0 \text{ received})}{P(0 \text{ received})}$

$= \frac{0.3}{P(1 \text{ sent} \cap 0 \text{ received}) + P(0 \text{ sent} \cap 0 \text{ received})}$

$= \frac{0.3}{(0.1+0.7)}$

$= 0.875$

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5) 0.6 → Wages → Strikes; 0.45 → Without strikes

0.15 → Working Conditions → 0.7 → Without strikes

0.25 → Fringe issues → 0.4 → Without strikes

$P((\text{Wages} \cup \text{Working Conditions} \cup \text{Fringe issues}) \cap \text{without Strikes})$

$= P(\text{Wages} \cap \text{without strikes}) + P(\text{Working Conditions} \cap \text{Without Strikes}) + P(\text{Fringe issues} \cap \text{without strikes})$

$= P(\text{without Strikes} \mid \text{Wages}) \cdot P(\text{Wages}) + P(\text{without strikes} \mid \text{Working Condition}) \cdot P(\text{working Conditions}) +$
$P(\text{without strikes} \mid \text{Fringe issues}) \cdot P(\text{Fringe issues})$

$= 0.45(0.6) + 0.7(0.15) + 0.4(0.25)$

$= \underline{0.475}$ #

6) Age

0.08 → have disease

0.92 → No disease

Diagnose Correct: All → 0.95

wrong → 0.02

Not Diagnose → 0.03

(a)(i) $P(\text{sick} \cap \text{Correctly Diagnose}) = P(\text{sick}) \cdot P(\text{Correctly Diagnose} \mid \text{sick})$
$= 0.08(0.95)$
$= 0.076$

(ii) $P(\text{not sick} \cap \text{Incorrectly Diagnose as having diabetes}) = P(\text{not sick}) \cdot P(\text{Incorrectly Diagnosed} \mid \text{not sick})$
$= 0.92 \cdot (0.02)$
$= 0.0184$

$\therefore P(\text{Diagnosed have diabetes}) = P(\text{Sick} \cap \text{Correctly Diagnose}) + P(\text{not Sick} \cap \text{Incorrectly Diagnose})$
$= 0.076 + 0.0184$
$= \underline{0.094}$

Good

(b) $P(\text{have sick} \cap \text{Correctly Diagnose}) = \underline{0.076}$

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a person over 50 diagnosed by the health service as having diabetes actually h