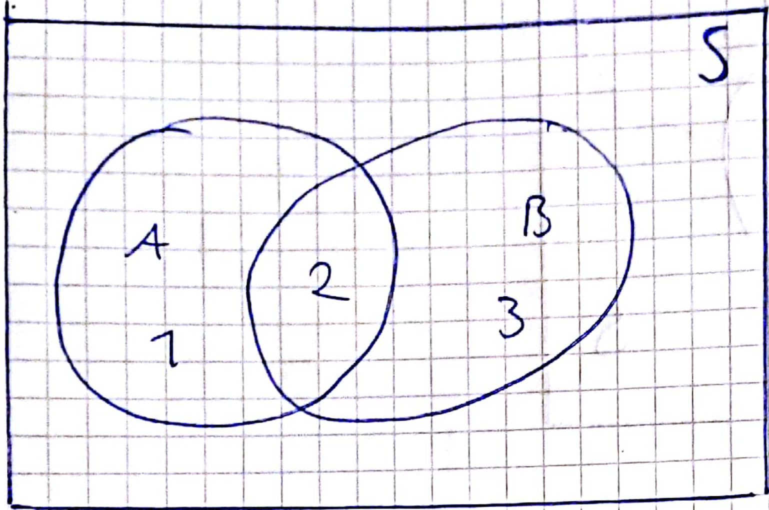
Øving 1 TMA4240 Sander Lindberg

Oppgave 1:

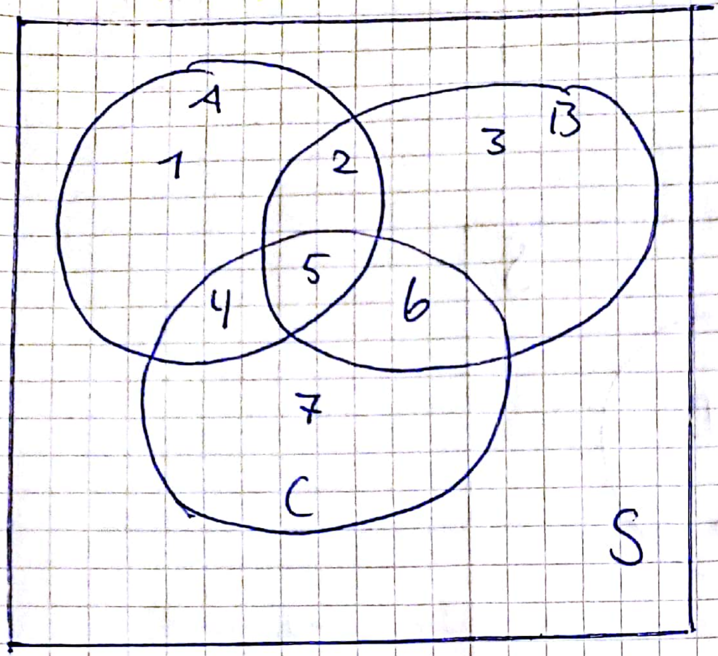


1. $A = 1, 2$
2. $B = 2, 3$
3. $A \cap B = 2$
4. $A' = 3, S$
5. $B' = 1, S$
6. $A \cup B = 2, 1, 3$
7. $(A \cup B)' = \cancel{\ }, \underline{\underline{S}}$
8. $A' \cap B' = (3,S) \cap (1,S) = \underline{\underline{S}}$

   $\underline{\underline{(A \cup B)' = (A' \cap B')}}$

9. $A' \cup B' = (3,S) \cup (1,S) = (1,3,S)$
10. $(A \cap B)' = (2)' = (1,3,S)$

    $\underline{\underline{(A \cap B)' = (A' \cup B')}}$



$A = 1, 2, 4, 5$

$B = 2, 3, 5, 6$

$C = 4, 5, 6, 7$

$A \cap B = 2, 5$

$A \cap C = 4, 5$

$B \cap C = 5, 6$

$A \cup B = 1, 2, 3, 4, 5, 6$

$A \cup C = 1, 2, 4, 5, 6, 7$

$B \cup C = 2, 3, 4, 5, 6, 7$

$A \cup (B \cup C) = (1,2,4,5) \cup (2,3,4,5,6,7) = (1,2,3,4,5,6,7)$

$(A \cup B) \cup C = (1,2,3,4,5,6) \cup (4,5,6,7) = (1,2,3,4,5,6,7)$

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

$A \cap (B \cap C) = (1,2,4,5) \cap (5,6) = 5$

$(A \cap B) \cap C = (2,5) \cap (4,5,6,7) = 5$

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

$A \cup (B \cap C) = (1,2,4,5) \cup (5,6) = (1,2,4,5,6)$

$(A \cup B) \cap (A \cup C) = (1,2,3,4,5,6) \cap (1,2,4,5,6,7) = (1,2,3,4,5,6)$

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

$A \cap (B \cup C) = (1, 2, 4, 5) \cap (2, 3, 4, 5, 6, 7) = (2, 4, 5)$

$(A \cap B) \cup (A \cap C) = (2, 5) \cup (4, 5) = (2, 4, 5)$

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

Oppgave 2

a

Hvor mange enkeltrekker spilles ~~mi~~ i et system med 8 tall?

$\binom{8}{7} = \underline{\underline{8}}$

Enkeltrekker som spilles i et system som inneholder 8 tall er $\underline{\underline{\binom{m}{7}}} = \frac{m!}{7!\,(m-7)!}$

Det koster $\binom{12}{7} \cdot 3 = 2376$ kr å levere et system med 12 tall.

Oppgave 3:

Med 8 kortstokker har vi:

32 ess
32 konger
32 damer
32 knekt
32 tiere.

For en Blackjack må vi ha ess + bildekort/ti eller bildekort/ti + ess:

Dette gir meg $\left(\frac{32}{416} \cdot \frac{128}{415}\right) + \left(\frac{128}{416} \cdot \frac{32}{415}\right) = \cancel{\frac{256}{5395}} \frac{8}{169}$

$= \cancel{0,0474}$

$= \underline{\underline{0,04734}}$

Sannsynligheten for Blackjack gitt at du har fått et ess er $4 \cdot P(\text{konge} \mid \text{ess})$

(ganger med 4, siden sannsynligheten for å få et annet bildekort eller 10 er den samme):

$P(\text{konge} \mid \text{ess}) = \frac{P(\text{konge}) \cdot P(\text{ess})}{P(\text{ess})} = 4 \cdot P(\text{konge}) = 4 \cdot \frac{1}{13} = \underline{\underline{0,3077}}$

$P(A) = P(\text{Blackjack}) = 0{,}06$
$P(B) = P(\text{ess på første}) = 0{,}1$
$P(B|A) = 0{,}4$

$$P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)} \quad \text{(Bruker Bayes setning).}$$

$$= \frac{0{,}4 \cdot 0{,}06}{0{,}1} = \frac{6}{25} = \underline{\underline{0{,}24}}$$

Oppgave 4:

~~Som~~ Hendelsene er avhengige fordi

$P(E_2|E_1) \neq P(E_2)$ og $P(E_1|E_2) \neq P(E_1)$

Hendelsene er ikke disjunkte, da $E_1 \cap E_2 = 0{,}1$ og ikke $= \emptyset$.

$P(E_1 \cup E_2) = \cancel{P(E_1) + P(E_2) - P(E_1 \cap E_2)}$

$\cancel{0{,}01 + 0{,}01 - 0{,}01^2 = 0{,}019}$

$P(E_2|E_1) \cdot P(E_1) = 0{,}1 \cdot 0{,}01 = 0{,}001$

$P(E_1) + P(E_2) - 0{,}001 = \underline{\underline{0{,}019}}$

Sannsynligheten for at minst 2 av 3 funker:

$P(E_1 \cup E_2) \cdot P(T) + (1 - P(T)) \cdot P(E_1 \cap E_2)$

$= 0{,}019 \cdot 0{,}04 + (1 - 0{,}04) \cdot 0{,}1 \cdot 0{,}01 = \underline{\underline{1.72E-3}}$

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Oppgave 5:

$P(J) = 0,80$

$P(\bar{J}) = 0,2$

$P(R|J) = 0,02$

$P(R|\bar{J}) = 0,05$

Bruker lov om total sannsynlighet for å finne $P(R)$:

$P(R) = 0,02 \cdot 0,80 + 0,05 \cdot 0,2 = 0,026$

$$P(\cancel{R}J|R) = \frac{P(J|R) \cdot P(J)}{P(R)} = \frac{0,02 \cdot 0,80}{0,026} = \frac{8}{13} \approx 0,62$$

Resultatet gir ikke ~~et~~ riktig bilde.

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Opgave 6

$P(A \cap B) = P(A|B) \cdot P(B) = 0{,}5 \cdot 0{,}09 = \underline{\underline{0{,}045}}$

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

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

$= (1 - 0{,}09) \cdot 0{,}01 = 9.1E-3$

$P(A) = 9{,}1E-3 + 0{,}045 = \underline{\underline{0{,}0541}}$

$P(B|A) = \dfrac{P(A|B) \cdot P(B)}{P(A)} = \dfrac{0{,}5 \cdot 0{,}09}{0{,}0541} = \underline{\underline{\overset{0{,}83}{\cancel{0{,}0083}}}}$