# Tutorial Test 1 - Tutoriaal Toets 1 (15 minutes)

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|---|---|---|
| **Name and surname / Naam en van** | Memo | **Mark / Punt [10]** |
| **Student number / Studentenommer** | | 10 |

| **Mini formula sheet / Mini-formuleblad** | | |
|---|---|---|
| $\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}(A \cap B)$ | $\mathrm{P}(A \mid B) = \dfrac{\mathrm{P}(A \cap B)}{\mathrm{P}(B)},\ \mathrm{P}(B) > 0$ | $\mathrm{P}(\overline{A}) = 1 - \mathrm{P}(A)$ |
| $\overline{A \cup B} = \overline{A} \cap \overline{B}$<br>$\overline{A \cap B} = \overline{A} \cup \overline{B}$ | $\mathrm{P}(E) = \dfrac{n(E)}{n(S)}$<br>finite, equally likely / eindig, ewe waarskynlik | $n(A \cup B) = n(A) + n(B)$<br>$- n(A \cap B)$ |
| $A \cap B = \varnothing$ | $\mathrm{P}(A) = \lim\limits_{n \to \infty} \dfrac{n_A}{n}$ | $\mathrm{P}(A \cup B) \leq \mathrm{P}(A) + \mathrm{P}(B)$<br>$A \triangle B = (A \cup B) - (A \cap B)$ |

## Question / Vraag 1 [4] 4

A controller records the results of two consecutive component checks. Each check is either a pass ($p$) or a fail ($f$). The possible sequences are:

$$S = \{pp, pf, fp, ff\}.$$

Let $A$ be the event that at least one check fails, and let $B$ be the event that the first check passes.

**a)** List the outcomes in $A$ and $B$. [2]

**b)** Determine $A \cap B$. Are $A$ and $B$ mutually exclusive? Justify your answer using the intersection. [2]

'n Beheerder teken die resultate van twee opeenvolgende komponenttoetse aan. Elke toets is *óf* 'n slaag ($p$) *óf* 'n druip ($f$). Die moontlike rye is:

$$S = \{pp, pf, fp, ff\}.$$

Laat $A$ die gebeurtenis wees dat minstens een toets druip, en laat $B$ die gebeurtenis wees dat die eerste toets slaag.

**a)** Lys die uitkomste in $A$ en $B$. [2] 2

**b)** Bepaal $A \cap B$. Is $A$ en $B$ onderling uitsluitend? Motiveer jou antwoord deur die deursnee te gebruik. [2] 2

a) $A = \{pf, fp, ff\}$ ✓

$B = \{pp, pf\}$ ✓

b) $A \cap B = \{pf\}$ ✓

Not Mutually exclusive, since $A \cap B \neq \emptyset$ ✓ Reason needed.

i.e. they do have an outcome in common.

## Question / Vraag 2 [6] 6

Fifty maintenance reports are reviewed. Of these reports, 30 contain a temperature warning $T$, 22 contain a pressure warning $P$, and 12 contain both warnings. One report is selected at random.

**a)** Calculate $\mathrm{P}(T \cup P)$, the probability that the selected report contains at least one of the two warnings. [2]

**b)** Given that the selected report contains a temperature warning, calculate the probability that it also contains a pressure warning, $\mathrm{P}(P \mid T)$. [2]

**c)** Calculate the probability that the selected report contains neither warning. [2]

Vyftig instandhoudingsverslae word nagegaan. Van hierdie verslae bevat 30 'n temperatuurwaarskuwing $T$, 22 bevat 'n drukwaarskuwing $P$, en 12 bevat albei waarskuwings. Een verslag word ewekansig gekies.

**a)** Bereken $\mathrm{P}(T \cup P)$, die waarskynlikheid dat die gekose verslag minstens een van die twee waarskuwings bevat. [2] 2

**b)** Gegee dat die gekose verslag 'n temperatuurwaarskuwing bevat, bereken die waarskynlikheid dat dit ook 'n drukwaarskuwing bevat, $\mathrm{P}(P \mid T)$. [2] 2

**c)** Bereken die waarskynlikheid dat die gekose verslag geen van die twee waarskuwings bevat nie. [2] 2

a) $P(T \cup P) = P(T) + P(P) - P(T \cap P)$ ✓

$= \frac{30}{50} + \frac{22}{50} - \frac{12}{50}$

$= \frac{40}{50} = 0,8$ ✓

b) $P(P \mid T) = \frac{P(P \cap T)}{P(T)}$ ✓ $= \frac{\frac{12}{50}}{\frac{30}{50}} = \frac{12}{30} = \frac{2}{5} = 0,4$ ✓

c) $P(\bar{T} \cap \bar{P}) = P(\overline{T \cup P})$ De Morgan's Theorem

$= 1 - P(T \cup P)$ ✓

$= 1 - 0,8$

$= 0,2$ ✓ $\left(= \frac{1}{5}\right)$