$$P(\emptyset) = \{\emptyset\}$$

$$P(P(\emptyset)) = \{\emptyset, \{\emptyset\}\}$$

$$P(P(P(\emptyset))) = \{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}, \{\emptyset, \{\emptyset\}\}\}$$

$$P(P(P(P(\emptyset)))) = \{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}, \{\{\{\emptyset\}\}\}, \{\{\emptyset, \{\emptyset\}\}\},$$

$$\{\emptyset, \{\emptyset\}\}, \{\emptyset, \{\{\emptyset\}\}\}, \{\emptyset, \{\emptyset, \{\emptyset\}\}\},$$

$$\{\{\emptyset\}, \{\{\emptyset\}\}\}, \{\{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}, \{\{\{\emptyset\}\}, \{\emptyset, \{\emptyset\}\}\}$$

$$\{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}\}, \{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\},$$

$$\{\emptyset, \{\{\emptyset\}\}, \{\emptyset, \{\emptyset\}\}\}, \{\{\emptyset\}, \{\{\emptyset\}\}, \{\emptyset, \{\emptyset\}\}\},$$

$$\{\emptyset, \{\emptyset\}, \{\{\emptyset\}\}, \{\emptyset, \{\emptyset\}\}\}\}$$

$$V = \{0,1\}$$

$$P(V) = \{\emptyset, \{0\}, \{1\}, \{0,1\}\}$$

$$\begin{aligned}
P(P(V)) = \{ & \emptyset, \{\emptyset\}, \{\{0\}\}, \{\{1\}\}, \{\{0,1\}\}, \\
& \{\emptyset,\{0\}\}, \{\emptyset,\{1\}\}, \{\emptyset,\{0,1\}\}, \\
& \{\{0\},\{1\}\}, \{\{0\},\{0,1\}\}, \{\{1\},\{0,1\}\}, \\
& \{\emptyset,\{0\},\{1\}\}, \{\emptyset,\{0\},\{0,1\}\}, \\
& \{\emptyset,\{1\},\{0,1\}\}, \{\{0\},\{1\},\{0,1\}\}, \\
& \{\emptyset,\{0\},\{1\},\{0,1\}\} \}
\end{aligned}$$

8) a. $(V \cap W) \cap (V \cup W) =$

$((V \cap W) \cap V) \cup ((V \cap W) \cap W) =$ (distributiviteit)

$((W \cap V) \cap V) \cup ((V \cap W) \cap W) =$ (commutativiteit)

$(W \cap (V \cap V)) \cup (V \cap (W \cap W)) =$ (2x associativiteit)

$(W \cap V) \cup (V \cap W) =$ (2x idempotentie)

$(V \cap W) \cup (V \cap W) =$ (commutativiteit)

$V \cap W$ (idempotentie)

b. $((A \cup B^c) \cap C) \cup ((B - A) \cap C) =$

$((A \cup B^c) \cap C) \cup ((B \cap A^c) \cap C) =$ (def −)

$(C \cap (A \cup B^c)) \cup (C \cap (B \cap A^c)) =$ (2x comm)

$C \cap ((A \cup B^c) \cup (B \cap A^c)) =$ (distr)

$C \cap (((A \cup B^c) \cup B) \cap ((A \cup B^c) \cup A^c)) =$ (distr)

$C \cap (((A \cup B^c) \cup B) \cap ((B^c \cup A) \cup A^c)) =$ (comm)

$C \cap ((A \cup (B^c \cup B)) \cap (B^c \cup (A \cup A^c))) =$ (2x ass)

$C \cap ((A \cup U) \cap (B^c \cup U)) =$ (2x compl)

$C \cap (U \cap U) =$ (ident)

$C \cap U =$ (idem)

C (ident)

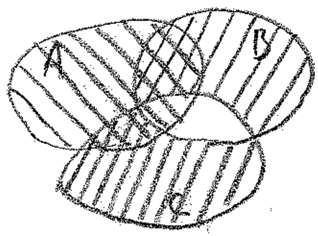
9) a. Nee; tegenvoorbeeld:

$A = \{a, b\}$
$B = \{a\}$
$C = \{b\}$

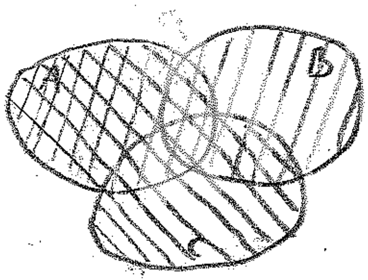
$A \cup B = \{a, b\} = A \cup C$
maar $\{a\} \neq \{b\}$

$A = \{a, b\}$
$B = \{a, c\}$
$C = \{a, d\}$
$A \cap B = \{a\} = A \cap C$
maar $\{a, c\} \neq \{a, d\}$

b.



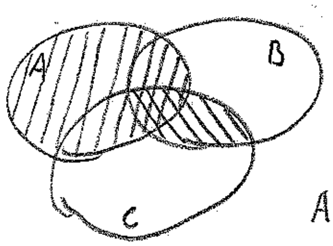
$B \oplus C = ////$
$A = \backslash\backslash\backslash\backslash$
$A \cup (B \oplus C) = //// + \backslash\backslash\backslash\backslash + XXX$



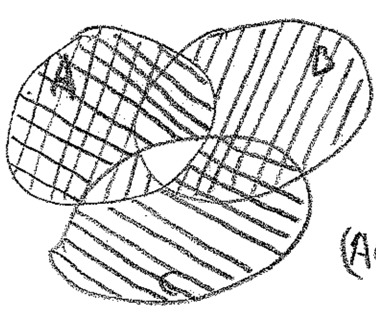
$A \cup B = ////$
$A \cup C = \backslash\backslash\backslash\backslash$
$(A \cup B) \oplus (A \cup C) = //// + \backslash\backslash\backslash\backslash$

dus $A \cup (B \oplus C) \neq (A \cup B) \oplus (A \cup C)$: $\cup$ distribueert niet over $\oplus$

c.



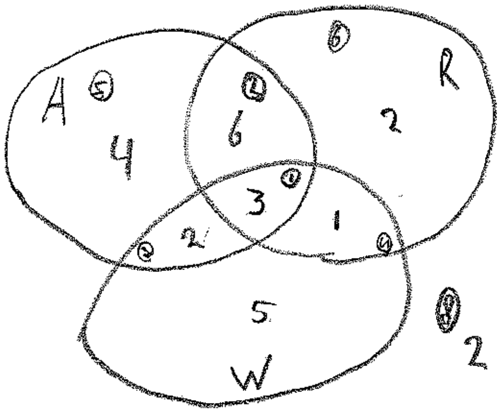
$A = ////$
$B \cap C = \backslash\backslash\backslash\backslash$
$A \oplus (B \cap C) = //// + \backslash\backslash\backslash\backslash$



$A \oplus B = ////$
$A \oplus C = \backslash\backslash\backslash\backslash$
$(A \oplus B) \cap (A \oplus C) = XXX$

dus $A \oplus (B \cap C) \neq (A \oplus B) \cap (A \oplus C)$: $\oplus$ distribueert niet over $\cap$

10)



$n(A) = 15$

$n(R) = 12$

$n(W) = 11$

$n(A \cap R) = 9$

$n(A \cap W) = 5$

$n(R \cap W) = 4$

$n(A \cap R \cap W) = 3$

1 $n(A \cap R \cap W)$ meteen invullen

2 $n(A \cap R) - n(A \cap R \cap W) = 9 - 3 = 6$

3 $n(A \cap W) - n(A \cap R \cap W) = 5 - 3 = 2$

4 $n(R \cap W) - n(A \cap R \cap W) = 4 - 3 = 1$

5 $n(A) - 1 - 2 - 3 = 15 - 3 - 6 - 2 = 4$

6 $n(R) - 1 - 2 - 4 = 12 - 3 - 6 - 1 = 2$

7 $n(W) - 1 - 3 - 4 = 11 - 3 - 2 - 1 = 5$

8 $25 - 1 - 2 - 3 - 4 - 5 - 6 - 7 = 25 - 3 - 6 - 2 - 1 - 4 - 2 - 5 = 2$

a. 5
b. 4
c. 2
d. 1
e. 6
f. $4 + 2 + 5 = 11$
g. $25 - 2 = 23$
h. 2

11) Thm. 1.5: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

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

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

$n(A) + n(B \cup C) - n(A \cap (B \cup C)) =$ (Thm. 1.5)

$n(A) + n(B) + n(C) - n(B \cap C) - n(A \cap (B \cup C)) =$ (Thm. 1.5)

$n(A) + n(B) + n(C) - n(B \cap C) - n((A \cap B) \cup (A \cap C)) =$ (distr)

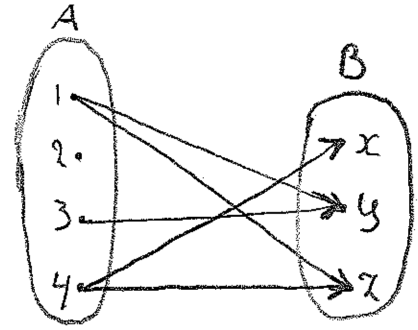
$n(A) + n(B) + n(C) - n(B \cap C) - (n(A \cap B) + n(A \cap C) - n((A \cap B) \cap (A \cap C))) =$ (Thm 1.5

$n(A) + n(B) + n(C) - n(B \cap C) - n(A \cap B) - n(A \cap C) + n(A \cap B \cap C)$ ■

12) a.

$$\begin{array}{c|ccc} & x & y & z \\ \hline 1 & 0 & 1 & 1 \\ 2 & 0 & 0 & 0 \\ 3 & 0 & 1 & 0 \\ 4 & 1 & 0 & 1 \end{array}$$

b.



c. $R^{-1} = \{(y,1), (z,1), (y,3), (x,4), (z,4)\}$

d. $D = \{1,3,4\}$, $R = \{x, y, z\}$

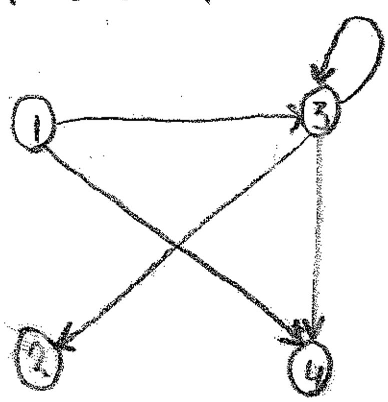
13) a.

$$\begin{array}{c|cccc} & 1 & 2 & 3 & 4 \\ \hline 1 & 0 & 0 & 1 & 1 \\ 2 & 0 & 0 & 0 & 0 \\ 3 & 0 & 1 & 1 & 1 \\ 4 & 0 & 0 & 0 & 0 \end{array}$$

b. $D = \{1,3\}$, $R = \{2,3,4\}$

c. $R^{-1} = \{(3,1), (4,1), (2,3), (3,3), (4,3)\}$

d.



e. $R \circ R = \{(1,2), (1,3), (1,4), (3,2), (3,3), (3,4)\}$

f. $R^{-1} \circ R = \{(2,2), (2,3), (2,4), (3,2), (3,3), (3,4), (4,2), (4,3), (4,4)\}$

$R \circ R^{-1} = \{(1,1), (1,3), (3,1), (3,3)\}$