Logiske metoder
IN1150

OBLIG1

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Oppgave 1 - Mengdelære

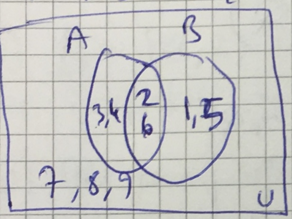
a) $A = \{2,3,4,6\}$

$B = \{1,2,5,6\}$

b) $A \times B = \{\{2,1\},\{2,2\}\{2,5\},\{2,6\},\{3,1\}\{3,2\}\{3,5\},\{3,6\}$
$\{4,1\}\{4,2\}\{4,5\},\{4,6\}\{6,1\}\{6,2\}\{6,5\}\{6,6\}\}$

16 elementer

c) $\overline{A \cup B} = \{7,8,9\}$



$U = \{1,2,3,4,5,6,7,8,9\}$

d) $M \subseteq \{1,2,3,4,5\}$

$|M| = 3$

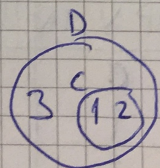
$\{\{2\},\{4\},\{1,2\}\} \subseteq P(M)$

P(M) er potensmengden til M $M = ?$

$M = \{1,2,4\}$ derfor $\Rightarrow P(M) = \{\emptyset,\{1\},\{2\},\{4\}$
$\{1,2\},\{1,4\},\{2,4\}\{1,2,4\}\}$

e) $|P(M)| = 2^3 = 8$

f) $C = \{1,2\}$



$D = \cancel{\{1,2,3\}}$

$D = \{\{1,2\},3\}$

Oppgave 2 – Utsagnslogikk

a)

P	Q	$P \land Q$	$P \to Q$	$\neg\neg P$	$\neg P \lor Q$
1	1	1	1	1	1
1	0	0	0	1	0
0	1	0	1	0	1
0	0	0	1	0	1

$(P \land Q) \models (P \to Q)$

$(P \land Q) \models (\neg\neg P)$

$(P \land Q) \models (\neg P \lor Q)$

b)

P	Q	$P \land Q$	$\neg(P \lor Q)$
1	1	1	0
1	0	0	0
0	1	0	0
0	0	0	1

$(P \land Q) \models \neg\neg(P \lor Q)$

De ikke er uavhengige.

$(P \land Q) \models \neg(P \lor Q)$

$\neg(P \lor Q) \models (P \land Q)$

$\neg(P \lor Q) \models \neg(P \land Q)$

c) Nei valuasjonen som gjør P sann og Q usann gjør $(P \to Q)$ usann og $(\neg P \to \neg Q)$ sann.

d) $(P \land Q) \lor (\neg P \lor \neg Q)$ er en tautologi.

Usann: $(P \land Q)$ usann

$(\neg P \lor \neg Q)$ usann

$\neg P$ usann $\Rightarrow$ P sann

$\neg Q$ usann $\Rightarrow$ Q sann

$(P \land Q)$ sann

Oppgave 3 - Relasjoner og funksjoner

a) $R = \{ \boxed{\langle 1,1\rangle, \langle 2,2\rangle, \langle 3,3\rangle, \langle 4,4\rangle} \}$ → Minste antallet elementer

Svar = 4 $\{\langle 1,2\rangle, \langle 1,3\rangle\ \langle 1,4\rangle\ \langle 2,3\rangle$

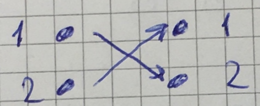
$\langle 2,4\rangle, \langle 3,4\rangle \}$

Minste antallet elementer R er 4.

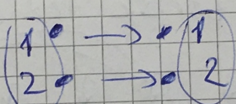
b) $f: \{\langle 1,2\rangle\ \langle 2,1\rangle\}$

fra $\{1,2\} \longrightarrow \{1,2\}$

c) injektiv $f(1) \to 2$ $f(2) \to 1$ [redacted]



Surjektiv

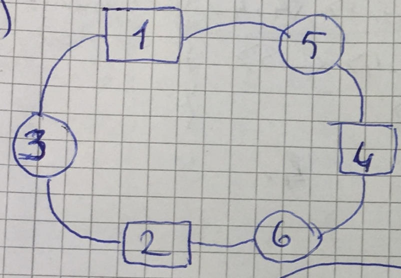


for alle (1,2) finnes i andre siden. (1,2)

Bijektiv fordi den er injektiv og surjektiv

Oppgave 4) Firekanter og sirkler

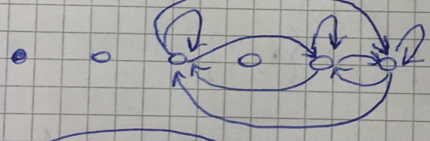
a)



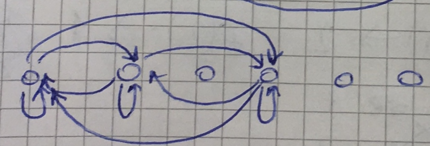
$\boxed{1,2,4}$ (3, 5, 6)

$\langle 3,3\rangle, \langle 3,5\rangle, \langle 3,6\rangle, \langle 5,5\rangle, \langle 5,6\rangle$
$\langle 5,3\rangle, \langle 6,3\rangle, \langle 6,5\rangle, \langle 6,6\rangle$

S =

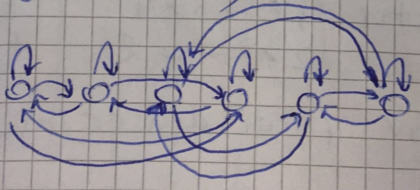


F =



b) Refleksiv, symmetrisk, transitiv

c) $S \cup F$ =



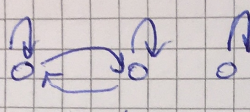
refleksiv ✓
symmetrisk ✓
transitiv ✓

$S \cup F = \{\langle 1,1\rangle, \langle 2,2\rangle, \langle 3,3\rangle \langle 4,4\rangle, \langle 5,5\rangle \langle 6,6\rangle \langle 1,2\rangle \langle 1,4\rangle, \langle 2,4\rangle, \langle 5,6\rangle, \langle 6,5\rangle, \langle 5,3\rangle, \langle 4,2\rangle \langle 4,1\rangle, \langle 2,1\rangle\}$

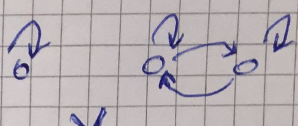
Ja ekvivalensrelasjon fordi det er refleksiv, symmetrisk og transitiv.

4) d

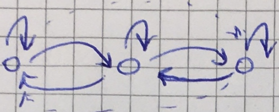
Nei:



X



Y



$X \cup Y$

Refleksiv
relativ
ikke transitiv