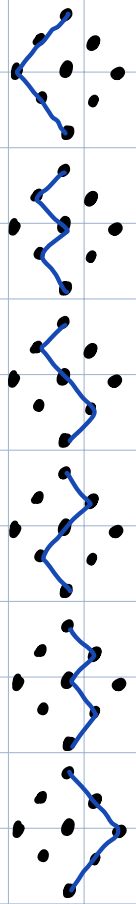
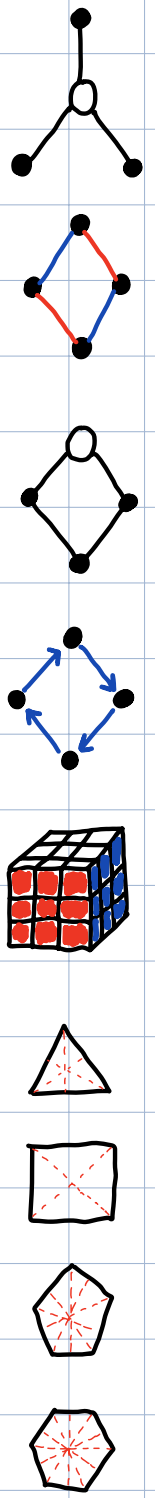


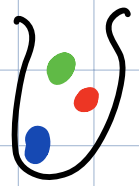
Velkommen! IN1150 uke 10

Kombinatorikk og Abstrakt Algebra





Ordnet/Uordnet, Med/Uten Tilbakelegging





3·3

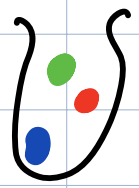
Ordnet
Med tilb.

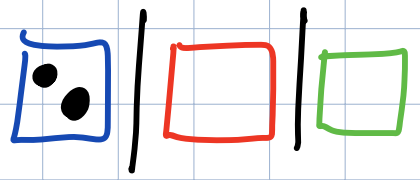


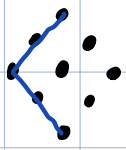
3·2

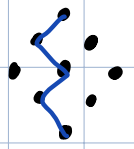
Ordnet
Uten tilb.

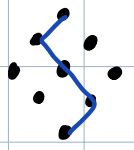


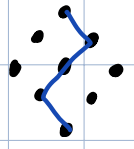


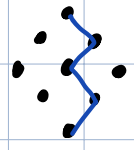


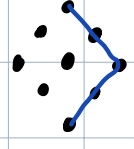




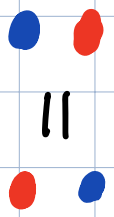










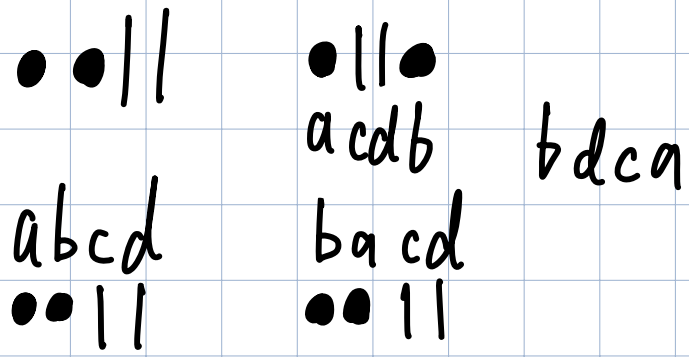


11

$\frac{3 \cdot 2}{2}$

Vordnet
Uten tilbakelegging

S. 219



abcd
••||

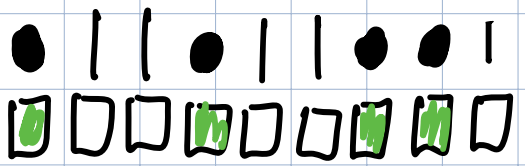
bacd
••||

n = antall kuler
k = hvor mange vi trekker



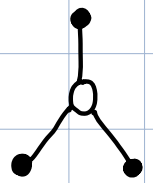
n-1 streker
k kuler

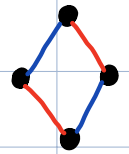
$\binom{(n-1)+k}{k}$

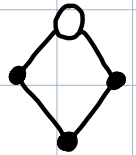


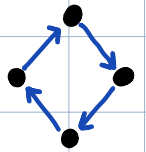
$= \frac{(n-1+k)!}{k!(n-1)!}$

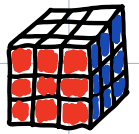
Vordnet
Med tilbakelegging



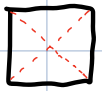


















La oss se på en kjent mengde

$$\mathbb{Z} = \{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots\}$$

Og en operasjon: $+$

$2 + 3 = 5$ $\quad$ $100 + 7 = 107$ $\quad$ Kommutativ

$3 + 2 = 5$ $\quad$ $7 + 100 = 107$ $\quad$ Abelsk gruppe

$5 + 0 = 5$ $\quad$ $0 + 1000 = 1000$

$0 + 7 = 7$ $\quad$ 0 er et identitetselement

$(2+3) + 4 = 9$ $\quad$ Gruppe $\quad$ Assosiativ

$2 + (3+4) = 9$

$(-5) + 5 = 0$ $\quad$ Alle elementer har en

$2 + (-2) = 0$ $\quad$ invers

Et moteksempel:

Er $\langle \mathbb{Z}, - \rangle$ en gruppe?

$5 - 0 = 5$ ← Høyre identitet ✓
$7 - 0 = 7$ Venstre identitet ✗ → $0 - 5 \neq 5$, $0 - 7 \neq 7$

$5 - 5 = 0$
$10 - 10 = 0$
$17 - 17 = 0$

Invers for alle elementer ✓

$(1 - 2) - 3 = (-1) - 3 = -4$
$1 - (2 - 3) = 1 - (-1) = 2$

assosiativ ✗

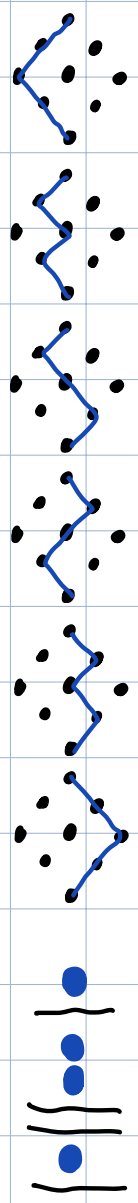


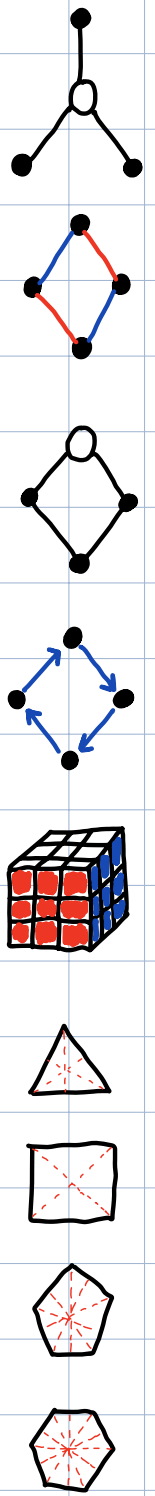
Oppgaveregning! til 13:45

19.1
19.2
19.3

20.1
20.9
20.10 ← Går gjennom

20.12 ← Artig nøtt!







20.10 a) $\langle \mathbb{N}, + \rangle$ ✗ $\quad 5 + ? = 0$

b) $\langle \mathbb{Z}, + \rangle$ ✓

c) $\langle \mathbb{Z}, * \rangle$ ✗ $\quad 5 \cdot 1 = 5 \qquad 5 \cdot ? = 1$

d) $\langle \mathbb{R}, + \rangle$ ✓

e) $\langle \mathbb{R} \setminus \{0\}, \cdot \rangle$ ✓

f) $\langle \mathbb{R} \setminus \{0\}, \div \rangle$ ✗ $\quad 2/(3/4) \neq (2/3)/4$

