

Oblig 1

Oppgave 1.2.1 b)

$$\begin{array}{r} 131 : 19 = 6 + 17 \text{ i rest} \\ -\underline{114} \\ 17 \end{array}$$

$\underline{19 \times 13}$

Oppgave 1.2.4 b)

Er 113 et primtall?

$\cdot 2$ = nei (ikke delbar med 2)

$\cdot 3 \rightarrow 1+1+3=5$ = nei (tversummen ikke er et multiplum av 3)

$\cdot 5$ = nei - slutter ikke på 0 eller 5

$\cdot 10$ = nei - slutter ikke på 0

Tallet 113 må derfor være et primtall

Oppgave 1.2.5 a og b)

$$\begin{array}{r} a) 27 : 11 = 2 + 5 \text{ i rest} \\ -\underline{22} \\ 5 \end{array}$$

Kvotient
Rest

$$\begin{array}{r} b) -122 : 7 = -18 + 4 \text{ i rest} \\ -\underline{(-126)} \\ 4 \end{array}$$

Kvotient
Rest

Oppgave 1.2.6 b)

$$524 = 2 \cdot 262 = 2 \cdot 2 \cdot 131 = 2^2 \cdot 131$$

Oppgave 1.2.9 a og b)

$$a) 70 \equiv 19 \pmod{3}$$

$$\begin{array}{r} 70 : 3 = 23 + 1 \text{ i rest} \\ -\underline{69} \\ 1 \end{array}$$

Utsagnet stemmer

$$b) 455 \equiv -106 \pmod{5}$$

$$\begin{array}{r} 455 : 5 = 91 \\ -\underline{455} \\ 0 \end{array}$$

$$\begin{array}{r} -106 : 5 = 21 + 1 \text{ i rest} \\ -\underline{(-105)} \\ 1 \end{array}$$

Utsagnet stemmer ikke

Oppgave 1.2.10 c)

$$-22 \equiv r \pmod{7}$$

$$-22 : 7 = -4 + 6 \text{ i rest}$$

$$\begin{array}{r} -(-28) \\ 6 \\ 6 : 7 = 0 + 6 \text{ i rest} \end{array}$$

$$\boxed{r = 6}$$

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[Oppgave 1.3.1 c og d]

c) $10111001_2 = 128 + 32 + 16 + 8 + 1 = \underline{185}_{10}$

$$\downarrow \quad \downarrow$$

$$128 + 32 + 16 + 8 + 1$$

d) $1111101000 = 512 + 256 + 128 + 64 + 32 + 8 = \underline{1000}_{10}$

[Oppgave 1.3.2 a og d]

a) $47_{10} : 2 = 23 + 1 \quad \underline{47}_{10} = 10111_2$

$$23 : 2 = 11 + 1$$

$$11 : 2 = 5 + 1$$

$$5 : 2 = 2 + 1$$

$$2 : 2 = 1 + 0$$

$$0 : 2 = 0 + 1$$

b) $1866 : 2 = 933 + 0$

$$933 : 2 = 466 + 1$$

$$466 : 2 = 233 + 0$$

$$233 : 2 = 116 + 1$$

$$116 : 2 = 58 + 0$$

$$58 : 2 = 29 + 0$$

$$29 : 2 = 14 + 1$$

$$14 : 2 = 7 + 0$$

$$7 : 2 = 3 + 1$$

$$3 : 2 = 1 + 1$$

$$1 : 2 = 0 + 1$$

[Oppgave 1.3.3 c og d]

c) $10111001_2 = \underline{271}_8$

$\downarrow \quad \downarrow \quad \downarrow$

$\underline{\underline{2 \ 7 \ 1}}$

$$29 : 2 = 14 + 1$$

$$14 : 2 = 7 + 0$$

$$7 : 2 = 3 + 1$$

$$3 : 2 = 1 + 1$$

$$1 : 2 = 0 + 1$$

d) $1111101000_2 = \underline{1750}_8$

$\downarrow \quad \downarrow \quad \downarrow$

$\underline{\underline{1 \ 7 \ 5 \ 0}}$

$$\underline{1866}_{10} = \underline{11101001010}_2$$

[Oppgave 1.3.4 c]

$$3642_8 = 3 \cdot 8^3 + 6 \cdot 8^2 + 4 \cdot 8^1 + 2 \cdot 8^0$$

$$= 1536 + 384 + 32 + 2$$

$$= \underline{1954}$$

$$\rightarrow \underline{3642_8 = 1954}_{10}$$

[Oppgave 1.3.5 c]

$$274_{10} =$$

$$274 : 8 = 34 + 2$$

$$34 : 8 = 4 + 2 = 422$$

$$4 : 8 = 0 + 4$$

$$\underline{274}_{10} = \underline{422}_8$$

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[Oppgave 1.3.6 eng d]

$$c) \begin{array}{r} 1011100 \\ \hline 2 \quad 8 \\ \downarrow \quad \downarrow \\ 11 \quad 9 \\ \hline 139 \end{array} = B9_{16}$$

$$d) \begin{array}{r} 0111101000_2 \\ \hline 8 \quad 4 \quad 2 \\ \downarrow \quad \downarrow \quad \downarrow \\ 3 \quad 14 \quad 8 \\ \hline 3E8 \end{array} = 3E8_{16}$$

[Oppgave 1.3.7 bog c]

$$b) 3AC_{16} = \underline{\underline{1010101000}}_2$$

↓ ↓ ↓
3 1012
↙ ↘ ↘
001010101100

$$c) EDDF_{16} = \underline{\underline{111011011101110}}_2$$

↓ ↓ ↓
14 13 13 14
↓ ↓ ↓ →
1110 1101 1101 → 1110

[Oppgave 1.3.8 bog e]

$$b) b + e = 1111 + 110001 = \underline{\underline{1000000}}_2$$

↑ ↑ ↑ ↑ ↑ ↑
110001
1000000

$$e) a \cdot d = 101 \cdot 1101 = \underline{\underline{10000001}} \cdot 10 =$$

↑ ↑ ↑ ↑ ↑ ↑
101 101X
1101X
10000001

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[Oppgave 1.4.1]

Permutasjoner av "a,b,c,d"

abcd	bacd	cabd	dabc
abdc	badc	cadb	dcap
acbd	baad	cdab	dcab
acdb	bcda	cdba	dcba
adbc	bdac	ebad	dbc
adcb	bdca	cbda	dbca

$$4! = 24 \text{ permutasjoner}$$

[Oppgave 1.4.2]

Permutasjoner: "1,3,5,7,9"

$$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

↓
20, 60, 120

[Oppgave 1.4.3]

Permutasjoner: "0,2,4,6,8" s. 0.

Tar bort 0, siden vi skal finne permutasjoner hvor de ikke endes med 0.

$$- 4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$$

0 vil alltid være sist.

[Oppgave 1.4.4]

a)	123	213	314	412
	124	214	312	413
	32	231	321	421
	34	234	324	423
	142	243	341	431
	143	241	342	432

$$P(4,3) = \frac{4!}{(4-3)!} = \frac{4!}{1!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{1} = 24$$

$$\text{b)} \begin{array}{c} 123 \\ | \\ 124 \\ + 34 \\ \hline 234 \end{array} \quad \binom{4}{3} = \frac{4!}{(4-3)! \cdot 3!} = \frac{4!}{1! \cdot 3!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{3!} = 4$$

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Oppgave 1.4.5

$$a) P(5,3) = \frac{5!}{(5-3)!} = \frac{5!}{2!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2} = \frac{120}{2} = \underline{\underline{60}}$$

20-60-120

$$b) P(7,1) = \frac{7!}{(7-1)!} = \frac{7!}{6!} = \frac{7 \cdot 6!}{6!} = \underline{\underline{7}}$$

$$c) P(8,6) = \frac{8!}{(8-6)!} = \frac{8!}{2!} = \frac{8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2} = \frac{40320}{2} = \underline{\underline{20160}}$$

Oppgave 1.4.6

$$d) \binom{8}{5} = \frac{8!}{(8-5)! \cdot 5!} = \frac{8!}{3! \cdot 5!} = \frac{8 \cdot 7 \cdot 6 \cdot 5!}{3! \cdot 5!} = \frac{8 \cdot 7 \cdot 6}{3!} = \frac{8 \cdot 7 \cdot 6}{3 \cdot 2 \cdot 1} = \frac{8 \cdot 7 \cdot 6}{6} = \frac{8 \cdot 7 \cdot 6}{6} = \underline{\underline{56}}$$

$$e) \binom{9}{0} = \frac{9!}{(9-0)! \cdot 0!} = \frac{9!}{9! \cdot 1} = \frac{9!}{9!} = \underline{\underline{1}}$$

$$f) \binom{13}{5} = \frac{13!}{(13-5)! \cdot 5!} = \frac{13!}{8! \cdot 5!} = \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9 \cdot 8!}{8! \cdot 5!} = \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9}{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1} = \frac{13 \cdot 12 \cdot 11 \cdot 10 \cdot 9}{120} = \frac{13 \cdot 11 \cdot 9}{120} = \frac{13 \cdot 11 \cdot 9}{120} = \underline{\underline{1287}}$$

Oppgave 1.4.9

$$a) "cd", a, b, ef \rightarrow 5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = \underline{\underline{120}}$$

$$b) P("bca", d, e, f) \rightarrow 4! = 4 \cdot 3 \cdot 2 \cdot 1 = \underline{\underline{24}}$$

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[Oppgave 1.4.13]

$$a) P(50,3) = \frac{50!}{(50-3)!} = \frac{50!}{47!} = \frac{50 \cdot 49 \cdot 48 \cdot 47!}{47!} = 50 \cdot 49 \cdot 48 = \underline{\underline{117600}}$$

$$b) P(49,2) = \frac{49!}{(49-2)!} = \frac{49!}{47!} = \frac{49 \cdot 48 \cdot 47!}{47!} = 49 \cdot 48 = \underline{\underline{2352}}$$

$$c) P(49,2) \cdot 3 = 2352 \cdot 3 = \underline{\underline{7056}}$$

$$d) P(49,3) = \frac{49!}{(49-3)!} = \frac{49!}{46!} = \frac{49 \cdot 48 \cdot 47 \cdot 46!}{46!} = \underline{\underline{110544}}$$

$$e) P(48,1) = \underline{\underline{48}}$$

[Oppgave 1.5.8]

Alfabetet = 29

Kombinasjoner \Rightarrow forbokstavar = 29, såle bokstav = 2^9)

$$29 \cdot 29 = 841 \rightarrow 841 + 1 = \underline{\underline{842}}$$

↑ ↑
841 Antall
 kombinasjoner +1 for å oppnå
 minst 2 like

[Oppgave 1.5.11]

$$12 \cdot 6 \cdot 20 = \underline{\underline{1440}} \rightarrow 1440 + 1 = \underline{\underline{1441}}$$

[Oppgave 1.5.16 a]

$$\begin{aligned} & x^3 y^7 \text{ i } (x+y)^{10} \\ \Rightarrow & \binom{10}{7} \rightarrow \frac{10!}{(10-7)!7!} = \frac{10!}{3!7!} = \frac{10 \cdot 9 \cdot 8 \cdot 7!}{7! \cdot 3 \cdot 2 \cdot 1} = \frac{10 \cdot 9 \cdot 8}{6} = \underline{\underline{120}} \end{aligned}$$

Oblig 1 - Tilleggsoppgaver

Oppgave 1]

$$\text{Menn} \rightarrow C(10,3) = \frac{10!}{(10-3)! \cdot 3!} = \frac{10!}{7! \cdot 3!} = \frac{10 \cdot 9 \cdot 8 \cdot 7!}{7! \cdot 3!} = \frac{10 \cdot 9 \cdot 8}{3 \cdot 2 \cdot 1}$$

$$\text{kvinner} \rightarrow C(7,3) = \frac{7!}{(7-3)! \cdot 3!} = \frac{7!}{4! \cdot 3!} = \frac{7 \cdot 6 \cdot 5 \cdot 4!}{4! \cdot 3!} = \frac{7 \cdot 6 \cdot 5}{6} = 35$$

$$\text{kvinner og menn} \rightarrow 220 \cdot 35 = \underline{\underline{7700}}$$

Oppgave 2]

$$16 \text{ plasser} \rightarrow 16 - 2 = 14 \text{ plasser igjen}$$

2 må være Ø → Hver plass kan enten være Ø eller 1

$$\underline{\underline{2^{14} = 16384}}$$