

Aritm. jono :

$$a_1, a_1 + d, a_1 + 2d, \dots$$

$$a_n = a_1 + (n-1)d$$

$$d = a_{n+1} - a_n$$

Geom. jono :

$$a_1, a_1 q, a_1 q^2, \dots$$

$$a_n = a_1 q^{n-1}$$

$$q = \frac{a_{n+1}}{a_n}$$

741.



Geom. jono, $q = 0,84$

a_1 = pölyn määrä alussa

$a_n =$ —||— $n:n$ suodattimen jätteen

$$a_n = \cancel{a_1} \cdot 0,84^n = \cancel{a_1} \cdot 0,01 \quad V: 27 \text{ kpl}$$

$$0,84^n = 0,01 \quad || \lg$$

$$n = \frac{\lg 0,01}{\lg 0,84} \approx 26,4$$

Aritm. Summa

- a_n on aritm. jono: $a_n = a_1 + (n-1)d$
- Aritm. Summa: päättävä summa, jossa termit aritm. jonon termejä

$$a_1 + a_2 + \dots + a_n = S_n$$

- toinen merkintätapa: $S_n = \sum_{i=1}^n a_i$

"iso sigma" = summa,
ala-indeksi i kasvaa
yhdeellä

Esim. $a_n = 2n - 3$

a) laske S_{10}

$$a_1 = -1$$

$$a_2 = 1$$

$$a_3 = 3$$

$$\vdots$$

$$a_{10} = 17$$

$$\begin{array}{r} + \\ \hline S_{10} = \dots \end{array}$$

b) laske $\sum_{n=1}^{10} a_n$

$$= -(+1+3+\dots+17)$$

$$= \dots$$

c) laske $\sum_{n=100}^{200} a_n$

$$= a_{100} + a_{101} + \dots + a_{200}$$

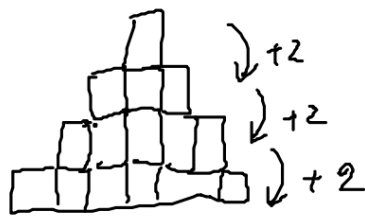
$$= 197 + 199 + \dots + 397$$

• Aritm. summa helposti:

$$S_n = n \cdot \frac{a_1 + a_n}{2}$$

$$a_n = a_1 + (n-1)d$$

Esim. Säilykkeitä 200 kpl.



Montako kerrasta, jääkö tölkköjä
yli? Aritm. jono

$$a_1 = 1$$

$$a_n = a_1 + (n-1)d$$

$$d = 2$$

∴

$$\text{Solve } \left(\sum_{n=1}^x (2n-1) = 200, x \right)$$

$$a_n = 1 + (n-1) \cdot 2 = 2n-1$$

$$S_n = 200 = n \cdot \frac{1 + (2n-1)}{2}$$

$$400 = n(1 + (2n-1))$$

$$400 = n \cdot 2n = 2n^2$$

$$n = \sqrt{200} \approx 14,1$$

$$a_{14} = 2 \cdot 14 - 1 = 27$$

Tüpe 2:

$$1+3+5+7+9+\dots+27=196, \quad \sum_{14} = 14 \cdot \frac{(1+27)}{2} = 196 :$$

14 kenosta

V: 196 tõlkkia 14:ssa kenok-
sessa.

805. b) $\sum_{k=1}^{40} \frac{k}{4} = S_{40}$

$d = a_{n+1} - a_n = \frac{n+1}{4} - \frac{n}{4} = \frac{1}{4} =$
nilai

$a_1 = \frac{1}{4}$

$a_{40} = \frac{40}{4} = 10$

$$S_n = n \frac{a_1 + a_n}{2}$$

$S_{40} = 40 \cdot \frac{(\frac{1}{4} + 10)}{2} = 205$

Tapa 2:

$\frac{1}{4} + \frac{2}{4} + \frac{3}{4} + \dots + \frac{40}{4}$

Esim. $100, 101, \dots, 999$

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kolmella jaoll. $102, 105, \dots, 999$

$$\rightarrow 102 + 105 + \dots + 999$$

$\uparrow$
 a_1

$\uparrow$
 a_n

Soluzioni n: $a_n = a_1 + (n-1)d$

$$a_n = 999 = 102 + (n-1) \cdot 3 = \underline{3n + 99} \quad || -99$$

$$3n = 900 \quad || : 3$$

$$n = 300$$

$$S_{300} = 300 \cdot \frac{(102 + 999)}{2} = 165150$$