

esim. $a_1 \quad a_2 \quad a_3 \quad a_4 \quad a_5$
 $2, 5, 8, 11, 14$
 $+3 \quad +3 \quad +3 \quad +3$

on aritmeettinen jono

$$d = a_{n+1} - a_n \quad \text{differentssi}$$

$$a_n = a_1 + (n-1) \cdot d \quad \text{yhteen jäsen}$$

Aritmeettinen summa

esim. $a_1 \quad a_5$
 $S = 2 + 5 + 8 + 11 + 14$
 $S = 14 + 11 + 8 + 5 + 2$

$$2S = 16 + 16 + 16 + 16 + 16$$

$$2S = 5 \cdot 16 \quad \parallel :2$$

$$S = \frac{5 \cdot 16}{2}$$

$$= 40$$

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

$$S_5 = 5 \cdot \frac{2+14}{2} = 5 \cdot \frac{16}{2} = 5 \cdot 8 = 40$$

S. 110

11.3

aritmeettinen jono

$a_1 \quad a_2 \quad a_3 \quad a_{60}$
 $48, 21, -6, \dots, -1545$

$$d = 21 - 48 = -27$$

$$a_{60} = 48 + (60-1) \cdot (-27)$$

$$48 + 59 \cdot (-27) = -1545$$

Summa

$$S_{60}?$$

$$48 + 21 + (-6) + \dots + (-1545)$$

$$S_{60} = 60 \cdot \frac{48 + (-1545)}{2} = \frac{60 \cdot (-1497)}{2} = -44910$$

11.10

$a_1 \quad a_n \quad n?$
 $41 + 38 + 35 + \dots + (-226)$

$$d = 38 - 41 = -3$$

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

$$41 + (n-1) \cdot (-3) = -226 \quad \parallel -41$$

$$(n-1) \cdot (-3) = -226 - 41$$

$$\frac{-3(n-1)}{-3} = \frac{-267}{-3} \quad \parallel :(-3)$$

$$S = n \cdot \frac{41 + (-226)}{2}$$

Laske aritmeettinen summa

$$S_{90} = 90 \cdot \frac{41 + (-226)}{2}$$

$$90 \cdot \frac{(41 - 226)}{2} = -8325$$

$$\frac{-3(n-1)}{-3} = \frac{-267}{-3} \quad || : (-3)$$

$$n-1 = 89 \quad || +1$$

$$n = 90$$

11.15

Laske aritmeettinen summa S_{24}

$$a_n = \frac{3}{4}n - \frac{1}{6}$$

$$a_1 = \frac{3}{4} \cdot 1 - \frac{1}{6} = \frac{3}{4} - \frac{1}{6} = \frac{9}{12} - \frac{2}{12} = \frac{7}{12}$$

$$a_{24} = \frac{3}{4} \cdot 24 - \frac{1}{6} = \frac{72}{4} - \frac{1}{6} = \frac{216}{12} - \frac{2}{12} = \frac{214}{12}$$

$$S_2 = 24 \cdot \frac{\frac{7}{12} + \frac{214}{12}}{2} = 24 \cdot \frac{\frac{221}{12}}{2} = 24 \cdot \frac{221}{12 \cdot 2} = \frac{24 \cdot 221}{24} = 221$$

s. 119

12.8

$$\begin{array}{ccc} \underline{2017} & 2018 & \underline{2019} \\ 8894 \text{ kpl} & & 10198 \text{ kpl} \\ a_1 & & a_3 \end{array}$$

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

$$a_3 :$$

$$8894 + (3-1) \cdot d = 10198$$

$$2d = 10198 - 8894$$

$$2d = 1304 \quad || : 2$$

$$d = \underline{652}$$

$$8894 + (n-1) \cdot 652 > 15000$$

$$652(n-1) > 15000 - 8894$$

$$652(n-1) > 6106 \quad || : 652$$

$$n-1 > 9,36... \quad || +1$$

$$n > 10,36...$$

12.12

Kotitehtävä

V: 11 vuoden kuluttua,
2028