

Arithmetic progression

№1. In a theater, the first row contains 50 seats. The second row has 2 additional seats on the sides, the third row — 2 more, and so on. How many seats are there in the third row? In the fifth? In the tenth?

№2. The sequence of numbers in №1 is remarkable because every two consecutive numbers differ by the same amount, usually denoted by the letter d . Such a sequence is called an arithmetic progression, and d is called the common difference of the arithmetic progression. Show that the number at position n (denoted a_n) can be found by the formula:

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

№3. Imagine that the theater hall from №1 is very long. Find the number of seats in the 111th row.

№4. Find the common difference and the 201-st term of the arithmetic progression 2.6, 2.9, 3.2, 3.5, ...

№5. (*Ukraine 2023*) In an arithmetic progression, $a_1 = 4$, $a_2 = -1$. Find the formula to determine the n -th term of this progression.

Hint: Apply formula (1) and simplify the expression.

№6. Determine whether the following numbers are members of the arithmetic progression $\{c_n\}$:

1. 20.4, if $c_1 = 11.4$ and the common difference $d = 0.6$;
2. 38, if $c_1 = 8$ and the common difference $d = 1.4$?

№7. How many positive terms are in the arithmetic progression 5.2, 4.9, 4.6, ...?

№8. (*Ukraine 2024*) In the arithmetic progression $\{a_n\}$, it is known that $a_6 - a_1 = -30$. Find $a_6 - a_4$.

№9. Find the first term of the arithmetic progression $\{b_n\}$ if $b_5 = 11$ and $b_{11} = -7$.

№10. Find the first term and the common difference of the arithmetic progression $\{a_n\}$ if

1. $a_3 + a_7 = 30$ and $a_6 + a_{16} = 60$;
2. $a_4 + a_{10} = 36$ and $a_5 \cdot a_{11} = 340$.

№11. Find the second term of an arithmetic progression if the first and third terms are -6 and 12 , respectively.

№12. Show that the n -th element of an arithmetic progression is the *arithmetic mean* of its neighbors (hence the name):

$$a_n = \frac{a_{n-1} + a_{n+1}}{2}.$$