

Laboratory work 4. Elements of effective (as much as possible without cycles!) programming with Double and Char objects(for five options)

Option 1

Task 1.

Calculate: having first constructed the base vector, and on its basis the factors p_i that interest us. $p = \left(1 - \frac{1}{2^2}\right) \left(1 - \frac{1}{3^2}\right) \dots \left(1 - \frac{1}{100^2}\right)$

Calculate the arithmetic, geometric, harmonic and quadratic means for the sequence $\{p_i\}$.

Comment. The mean for a given set of numbers is the number between the smallest and largest of them, calculated according to a specific rule. Let's introduce the definitions: arithmetic mean:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i; \quad \text{geometric mean: } g = \sqrt[n]{\prod_{i=1}^n x_i}; \quad \text{harmonic mean: } h = \frac{n}{\sum_{i=1}^n 1/x_i} \text{ and}$$

$$\text{quadratic mean: } s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

Task 2.

Find the sum of the 4th, 16th, 36th, 64th, 100th, 144th, etc. elements of an array consisting of 200 random integers, each of which is in the range from 2 to 22.

Task 3.

Construct an array of 100 random integers, each between 3 and 15. Determine the number of elements in the array to be ten.

Task 4.

Generate an array of 20 random integers ranging from 0 to 10.

- Find the sum of the three maximum elements of the array that are less than the arithmetic mean.
- Replace all even elements of the array with zeros.

Task 5.

Construct an array of 10 random integers ranging from 0 to 50 and find its local minima, that is, those elements of the array that are smaller than their neighboring elements.

Task 6.

Fill array A as follows

1	2	...	5
6	7	...	10
.....		...	...
96	97	...	100

without a cycle.

Task 7.

Fill in array 16×6 data so that the spy determines the checkerboard order, use single numbering.

Task 8.

The array contains 10 letters - S, F, O, I, K, L, O, I, L, N. Display on the screen words formed by letters with follow indices: (3,4,6) (1,5,4,10) (2,3,6,5,1), (1,5,4,6,10) - come up with more words from these letters, preferably five in length, form an array of cells, the elements of which are a separate word and display the contents of the array of cells on the screen.

Task 9.

Extract individual words from the phrase "He is not a man to be trifled with", determine their number and place each word on a separate line in capital letters.

Option 2

Task 1.

Calculate: , having first constructed the base vector, and on its basis the factors p_i that interest us. $p = \left(1 - \frac{1}{3^3}\right) \left(1 - \frac{1}{9^3}\right) \dots \left(1 - \frac{1}{99^3}\right)$

Calculate the arithmetic, geometric, harmonic and quadratic means for the sequence $\{p_i\}$.

Comment. The mean for a given set of numbers is the number between the smallest and largest of them, calculated according to a specific rule. Let's introduce the definitions: arithmetic mean:

$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$; geometric mean: $g = \sqrt[n]{\prod_{i=1}^n x_i}$; harmonic mean: $h = \frac{n}{\sum_{i=1}^n 1/x_i}$ and

quadratic mean: $s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$

Task 2.

Find the sum of the 1st, 25th, 81st, 169th, etc. elements of an array consisting of 300 random integers, each of which is in the range from 1 to 8.

Task 3.

Construct an array of 50 random integers, each ranging from 3 to 15. Determine the number of array elements located in the right half-interval.

Task 4.

Generate an array of 22 random integers ranging from 1 to 10.

a) Find S - the sum of the three minimal elements of the array.

b) Replace elements from a larger S to zero

Task 5.

Construct an array of 10 random integers ranging from 1 to 50 and find its local minima, that is, those elements of the array that are smaller than their neighbors.

Task 6.

Fill array A as follows

1	2	...	4
5	6	...	8
.....		...	...
97	98	...	100

without using loops

Task 7.

Fill in the matrix 12×11 elements so that spy defines a checkerboard pattern, help: use single numbering. Do the same with the transposed matrix.

Task 8.

The array contains 12 letters - S, R, E, N, V, L, O, T, U, N, I, O. Display on the screen words formed by letters with follow indices: (3,5,7,6,9,8,11,12,4) (5,7,6,9,8,3) - come up with more words from these letters, preferably five in length, form an array of cells, the elements of which are a separate word and display the contents of the array of cells.

Task 9. (additional - 1 point) Extract individual words from the proverb "A scholar without work is like a cloud without rain," determine the number of words with repetitions, and place each word on a separate line, excluding repetitions.

Option 3

Task 1.

Calculate: , having first constructed the base vector, and on its basis the factors p_i that interest us. $p = \left(1 + \frac{1}{4^2}\right) \left(1 + \frac{1}{8^2}\right) \dots \left(1 + \frac{1}{80^2}\right)$

Calculate the arithmetic, geometric, harmonic and quadratic means for the sequence $\{p_i\}$.

Comment. The mean for a given set of numbers is the number between the smallest and largest of them, calculated according to a specific rule. Let's introduce the definitions: arithmetic mean:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i; \quad \text{geometric mean: } g = \sqrt[n]{\prod_{i=1}^n x_i}; \quad \text{harmonic mean: } h = \frac{n}{\sum_{i=1}^n 1/x_i} \text{ and}$$

$$\text{quadratic mean: } s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

Task 2.

Find the sum of the 1st, 7th, 13th, 19th, etc. up to the 200th element of an array consisting of 200 integer random numbers, each of which does not exceed 10.

Task 3.

Construct an array of 100 random integers, each ranging from 1 to 11. Determine the number of array elements located in the left half-interval.

Task 4.

Generate an array of 25 random integers ranging from 1 to 15.

- Find the sum of elements that are less than the arithmetic mean of all elements of the array.
- Leave the found elements, replace the rest with zero

Task 5.

Create an array of 22 random integers ranging from 1 to 25 and find its local minima, i.e., those elements of the array that are smaller than their neighbors. In the original array, replace the local min with zero. Show result.

Task 6.

Fill array A as follows

1	2	...	25
26	27	...	50
.....		...	...
76	77	...	100

Avoid using loops.

Task 7.

Fill in the matrices with non-zero elements of order 15×6 and 6×15 so that the spy determines the chess structure, use single numbering.

Task 8.

The array contains 8 letters - S, A, E, L, B, T, U, I. Display on the screen words formed by letters with follow indices: (6,2,5,4,3) (1,7,8,6,3) - come up with more words from these letters, preferably five in length, form an array of cells, the elements of which are a separate word and display the contents of the array of cells.

Task 9. (additional - 1 point) Extract individual words from the proverb " Those who want to know a lot need very little sleep," determine their number and place each word on a separate line in capital letters.

Option 4

Task 1.

Calculate: , having first constructed the base vector, and on its basis the factors p_i that interest us. $p = \left(1 + \frac{1}{5^2}\right) \left(1 + \frac{1}{10^2}\right) \dots \left(1 + \frac{1}{50^2}\right)$

Calculate the arithmetic, geometric, harmonic and quadratic means for the sequence $\{p_i\}$.

Comment. The mean for a given set of numbers is the number between the smallest and largest of them, calculated according to a specific rule. Let's introduce the definitions: arithmetic mean:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i; \quad \text{geometric mean: } g = \sqrt[n]{\prod_{i=1}^n x_i}; \quad \text{harmonic mean: } h = \frac{n}{\sum_{i=1}^n 1/x_i} \text{ and}$$

$$\text{quadratic mean: } s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

Task 2.

Find the sum of the 1st, 8th, 15th, etc. elements of an array consisting of 150 positive random numbers $\in [0,1]$, each of which does not exceed 15.

Task 3.

Construct an array of 100 random integers, each in the range from 5 to 20. Determine the number of array elements located in the central third of the interval that are greater than seven.

Task 4.

Generate an array of 25 random integers ranging from 0 to 10.

a) Find the elements that are less than the arithmetic mean of all elements in the array.

b) Replace the found elements with their squares.

Task 5.

Construct an array of 10 random integers ranging from 0 to 50 and find its local minima, that is, those elements of the array that are smaller than their neighbors.

Task 6.

Fill array A as follows

1	2	...	20
21	22	...	40
.....		...	...
81	82	...	100

Avoid using loops.

Task 7.

Fill in the 6 arrays $\times$ 17 and 17 $\times$ 6 elements so that the spy determines the chess order, use single numbering.

Task 8.

The array contains 12 letters - S, R, E, N, V, L, O, T, U, N, I, O. Display on the screen words formed by letters with follow indices: (3,5,7,6,9,8,11,12,4) (8,9,10,3,1) - come up with more words from these letters, preferably five in length, form an array of cells, the elements of which are a separate word and display the contents of the array of cells.

Task 9. (additional - 1 point)

Extract individual words from the proverb "Live forever, learn forever!", determine their number, and place each word on a separate line in lowercase letters.

Option 5

Task 1.

Calculate: , having first constructed the base vector, and on its basis the factors p_i that interest us. $p = \left(1 + \frac{1}{6^2}\right) \left(1 + \frac{1}{12^2}\right) \dots \left(1 + \frac{1}{60^2}\right)$

Calculate the arithmetic, geometric, harmonic and quadratic means for the sequence $\{p_i\}$.

Comment. The mean for a given set of numbers is the number between the smallest and largest of them, calculated according to a specific rule. Let's introduce the definitions: arithmetic mean:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i; \quad \text{geometric mean: } g = \sqrt[n]{\prod_{i=1}^n x_i}; \quad \text{harmonic mean: } h = \frac{n}{\sum_{i=1}^n 1/x_i} \text{ and}$$

$$\text{quadratic mean: } s = \sqrt{\frac{\sum_{i=1}^n x_i^2}{n}}$$

Task 2.

Find the sum of the 1st, 4th, 7th, etc. elements of an array consisting of 100 random integers, each of which is in the range from 2 to 12.

Task 3.

Construct an array of 100 random integers, each ranging from 1 to 16. Determine the number of array elements located in the first third of the interval.

Task 4.

Generate an array of 50 random integers ranging from 0 to 10.

a) Find the sum of the three maximum elements of the array.

b) Replace all even elements of the array with zeros.

Task 5.

Construct an array of 10 random integers ranging from 0 to 50 and find its local minima, that is, those elements of the array that are smaller than the elements to the right and left of them.

Task 6.

Fill array A as follows, without using a loop:

1	2	...	11
12	13	...	22
.....		...	...
101	102	...	111

Avoid using loops.

Task 7.

Fill in array 9×9 elements so that the spy determines the chess order, use single numbering.

Task 8.

The array contains 11 letters - T, I, C, R, E, O, A, T, N, I, O. Display on the screen words formed by letters with follow indices: (4,5,7,3,8,10,11,9) and (3,4,5,7,8,10,11,9) - come up with more words from these letters, preferably five in length, form an array of cells, the elements of which are a separate word and display the contents of the array of cells.

Task 9. (additional - 1 point) Extract individual words from the proverb "Live forever, study forever, and you will die a fool", determine their number and place each word on a separate line in lowercase letters.