Лабораторная работа №3
Управляющие конструкции

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НФИбд-01-18

Циклы while и for

```
while <условие>
        <тело цикла>
end
```

```
for <переменная>  in  <диапазон>
        <тело цикла>
end
```

```
i = 1
while i <= length(myfriends)
    friend = myfriends[i]
    println("Hi $friend, it's great to see you!")
    i += 1
end
```

```
Hi Ted, it's great to see you!
Hi Robyn, it's great to see you!
Hi Barney, it's great to see you!
Hi Lily, it's great to see you!
Hi Marshall, it's great to see you!
```

```
for n in 1:2:10
    println(n)
end
```

```
1
3
5
7
9
```

Условные выражения

```
if <условие 1>
        <действие 1>
elseif <условие 2>
        <действие 2>
else
        <действие 3>
end
```

```
n = 15
if (n%3 == 0) && (n%5 == 0)
    println("FizzBuzz")
elseif n%3 == 0
    println("Fizz")
elseif n%5 == 0
    println("Buzz")
else
    println(n)
end
```

```
FizzBuzz
```

Функции

```
function sayhi(name)
    println("Hi $name, it's great to see you!")
end
sayhi("Sergey")
```

```
Hi Sergey, it's great to see you!
```

```
function f(x)
    x^2
end
f(10)
```

```
100
```

```
f(x) = x^2
map(f, [1, 2, 3])
```

```
3-element Vector{Int64}:
 1
 4
 9
```

```
broadcast(f, [1, 2, 3])
```

```
3-element Vector{Int64}:
 1
 4
 9
```

Задания для самостоятельного выполнения

1. Циклы while и for

```
squares = Dict()
for i in 1:100
    squares[i] = i^2
end
squares
```

```
Dict{Any, Any} with 100 entries:
  5  => 25
  56 => 3136
  35 => 1225
  55 => 3025
  60 => 3600
  30 => 900
  32 => 1024
```

```
i = 0
while i < 100
    i+=1
    println(i, "->", i^2)
end
```

```
1->1
2->4
3->9
4->16
5->25
6->36
7->49
```

2. Условный оператор

```
a = 4
if a%2 == 0
    println(a)
else
    println("Nechetnoe")
end
```

```
4
```

```
3
```

3. Функции

```
function add_one(x)
    x+=1
end
add_one(5)
```

```
6
```

4. map/broadcast

```
A = map(+, A_help, A_help1)
```

```
4×4 Matrix{Int64}:
 1  5   9  13
 2  6  10  14
 3  7  11  15
 4  8  12  16
```

5. Матрицы

```
A^2
```

```
3×3 Matrix{Int64}:
  0   0   0
  3   3   9
 -1  -1  -3
```

```
for i in 1:3
    A[3, i] += A[2,i]
end
A
```

```
3×3 Matrix{Int64}:
 1  1  3
 5  2  6
 3  1  3
```

6. Умножение матриц

```
B = ones(15,3)
for i in 1:15
    for j in 1:3
        B[i, j] = 10*(-1)^(j+1)
    end
end
B
```

```
15×3 Matrix{Float64}:
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
 10.0  -10.0  10.0
```

```
C = B' * B
```

```
3×3 Matrix{Float64}:
  1500.0  -1500.0   1500.0
 -1500.0   1500.0  -1500.0
  1500.0  -1500.0   1500.0
```

7. Создание матриц с закономерностями размещения элементов

```
Z4 = copy(Z)
for i in 1:6
    for j in 1:6
        if (i % 2 == 0) && (j % 2 == 0)
            Z4[i, j] = 1
        elseif (i % 2 == 1) && (j % 2 == 1)
            Z4[i, j] = 1
        end
    end
end
Z4
```

```
6×6 Matrix{Float64}:
 1.0  0.0  1.0  0.0  1.0  0.0
 0.0  1.0  0.0  1.0  0.0  1.0
 1.0  0.0  1.0  0.0  1.0  0.0
 0.0  1.0  0.0  1.0  0.0  1.0
 1.0  0.0  1.0  0.0  1.0  0.0
 0.0  1.0  0.0  1.0  0.0  1.0
```

9. Решение СЛУ

```
for i in 1:5
    for j in 1:5
        A[i, j] = 1 + abs(i - j)
    end
end
A
```

```
5×5 Matrix{Int64}:
 1  2  3  4  5
 2  1  2  3  4
 3  2  1  2  3
 4  3  2  1  2
 5  4  3  2  1
```

Зададим вектор решений системы

```
B = [7; -1; -3; 5; 17]
```

```
5-element Vector{Int64}:
  7
 -1
 -3
  5
 17
```

```
X = inv(A) * B
```

```
5-element Vector{Float64}:
 -1.9999999999999996
  3.0
  5.0
  2.0000000000000018
 -4.0
```

10. Поиск подходящих элементов в массиве

```
summ_arr = []
for i in 1:10
    counter = 0
    for j in 1:6
        counter += M[j, i]
    end
    push!(summ_arr, counter)
end
summ_arr
```

```
10-element Vector{Any}:
 23
 47
 27
 30
 45
 44
 43
 27
 43
 39
```

```
for i in 1:9
    for j in i+1:10
        if summ_arr[i] + summ_arr[j] > 75
            println(i, " and ", j)
        end
    end
end
```

```
2 and 4
2 and 5
2 and 6
2 and 7
2 and 9
2 and 10
5 and 6
5 and 7
5 and 9
5 and 10
6 and 7
6 and 9
6 and 10
7 and 9
7 and 10
9 and 10
```

11. Нахождение суммы

$$\sum_{i=1}^{20}\sum_{j=1}^{5}\frac{i^4}{3+j}$$

$$\sum_{i=1}^{20}\sum_{j=1}^{5}\frac{i^4}{3+ij}$$

```
summa = 0
for i in 1:20
    for j in 1:5
        summa += i^4 / (3 + j)
    end
end
summa
```

```
639215.2833333334
```

```
summa_1 = 0
for i in 1:20
    for j in 1:5
        summa_1 += i^4 / (3 + i*j)
    end
end
summa_1
```

```
89912.02146097136
```