

**МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ  
РОССИЙСКОЙ ФЕДЕРАЦИИ  
ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ  
ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ  
ВЫСШЕГО ОБРАЗОВАНИЯ  
«СЕВЕРО-КАВКАЗСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ»  
ИНСТИТУТ ЦИФРОВОГО РАЗВИТИЯ**

**Отчет по лабораторной работе №5 по дисциплине:  
основы программной инженерии**

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## ВЫПОЛНЕНИЕ:

### 1. Логические операторы

```
>>> a=10
>>> b=5
>>> a+b>14
True
>>> a<14-b
False
>>> a <= b+5
True
>>> a!=b
True
>>> a == b
False
>>> c = a == b
>>> a, b, c
(10, 5, False)
>>>
```

### 2. Сложные логические операторы

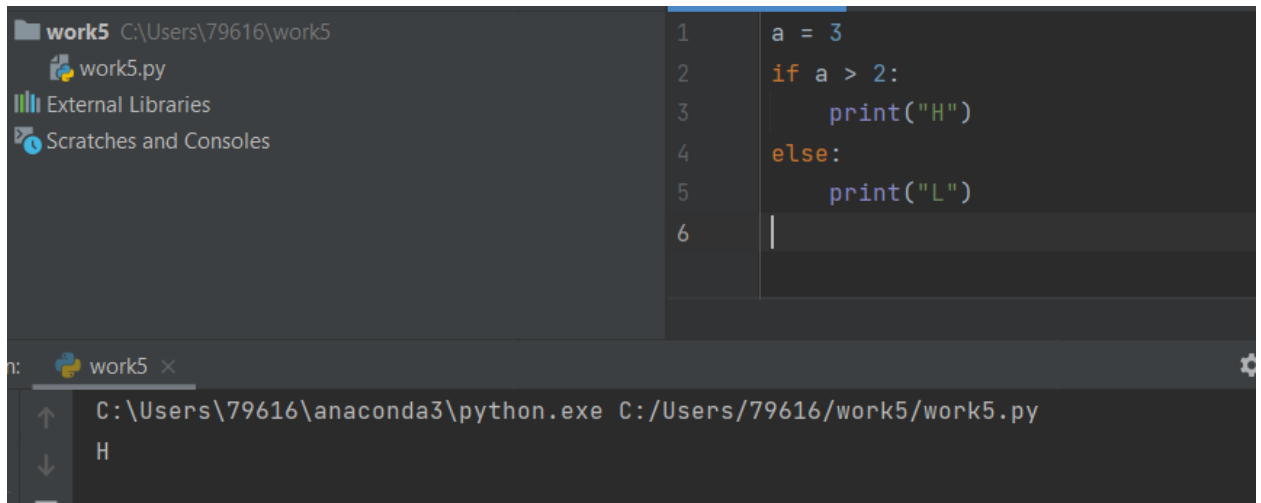
```
>>> x = 8
>>> y = 13
>>> y < 15 and x > 8
False
>>> y < 15 or x > 8
True
>>> not y < 15
False
```

```
>>> a = 5
>>> b = 0
>>> not a
False
>>> not b
True
```

### 3. Конструкция if

```
C:\Users\79616\work5>py work5.py
hello 1
hello 2
hello 3
hello 4
```

### 4. Конструкция if-else

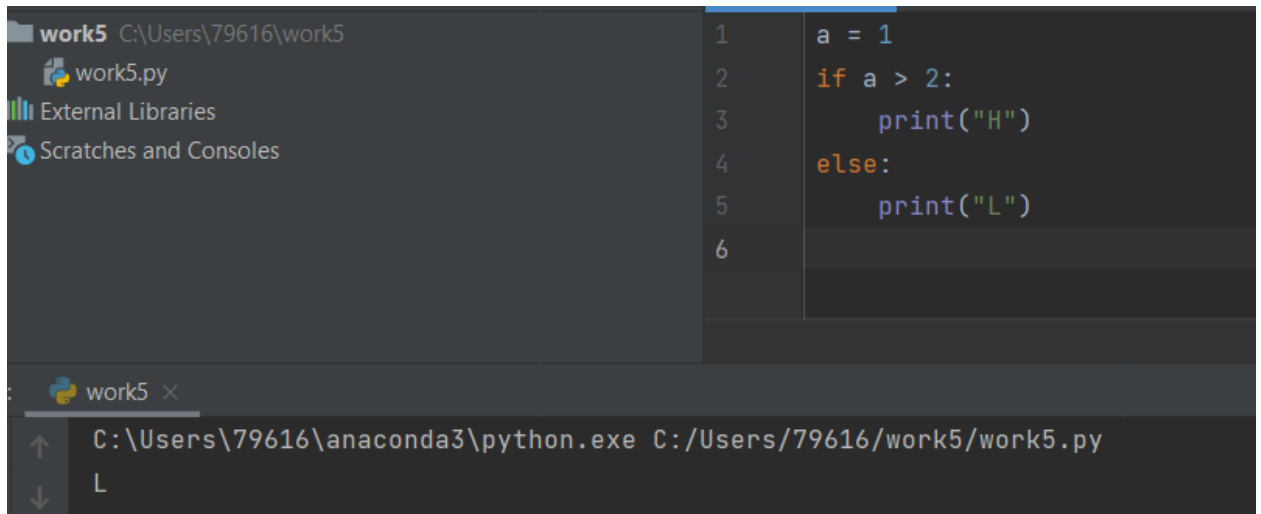


The screenshot shows an IDE with a file named `work5.py` containing the following code:

```
1 a = 3
2 if a > 2:
3     print("H")
4 else:
5     print("L")
6
```

The console output shows the result of running the script:

```
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/work5.py
H
```



The screenshot shows the same IDE with the same code as above, but with `a = 1` instead of `a = 3`:

```
1 a = 1
2 if a > 2:
3     print("H")
4 else:
5     print("L")
6
```

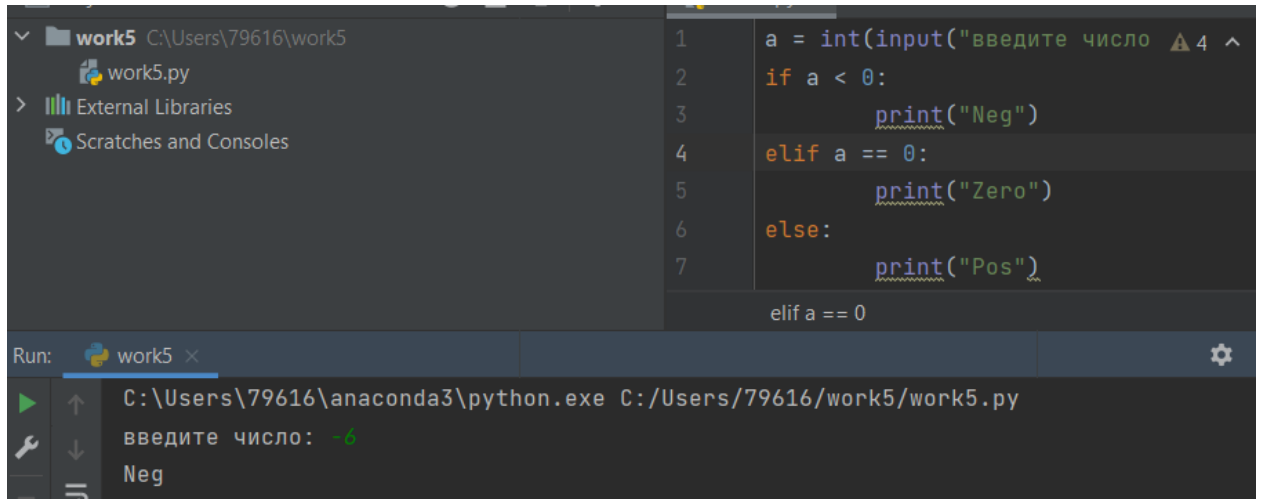
The console output shows the result of running the script:

```
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/work5.py
L
```

### 5. Выполнение тернарной условной операции

```
>>> a = 17
>>> b = True if a > 10 else False
>>> print(b)
True
```

## 6. Конструкция if-elif-else

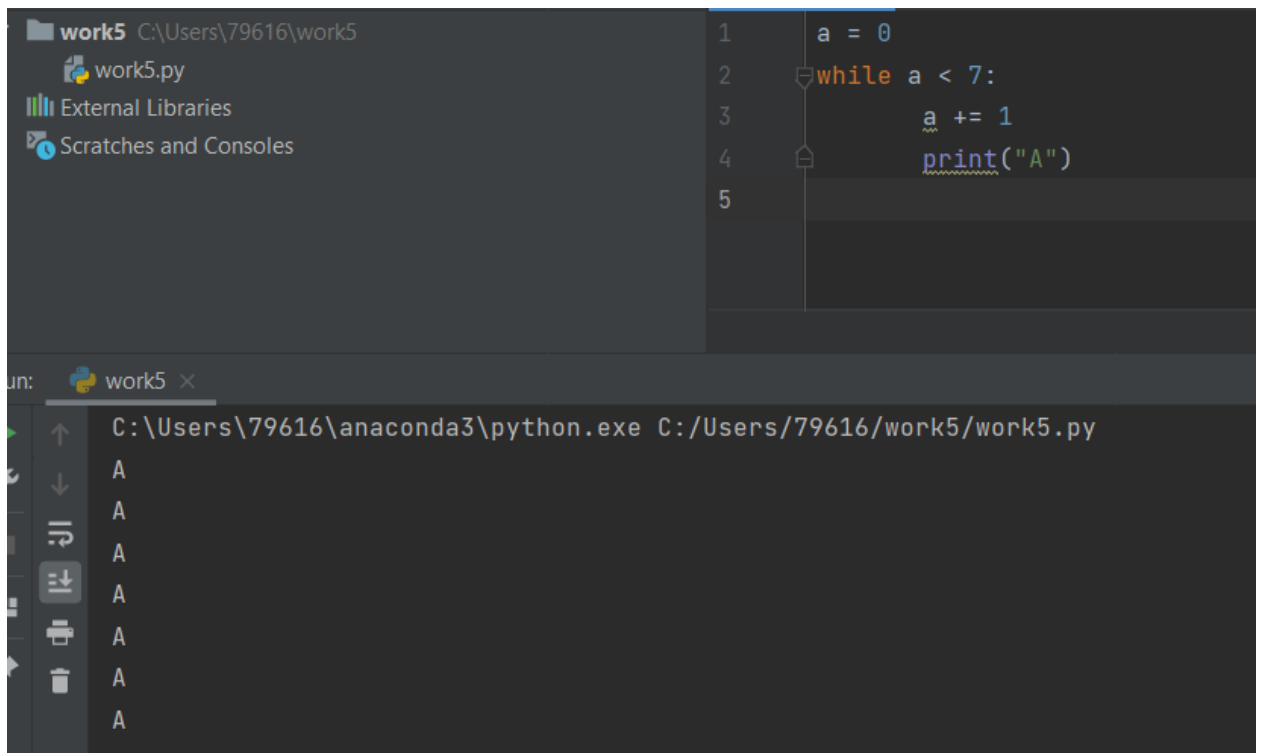


The screenshot shows an IDE with a file named `work5.py` in the `C:\Users\79616\work5` directory. The code in the editor is as follows:

```
1 a = int(input("введите число"))
2 if a < 0:
3     print("Neg")
4 elif a == 0:
5     print("Zero")
6 else:
7     print("Pos")
```

The console output shows the command prompt running the script, the input `-6`, and the output `Neg`.

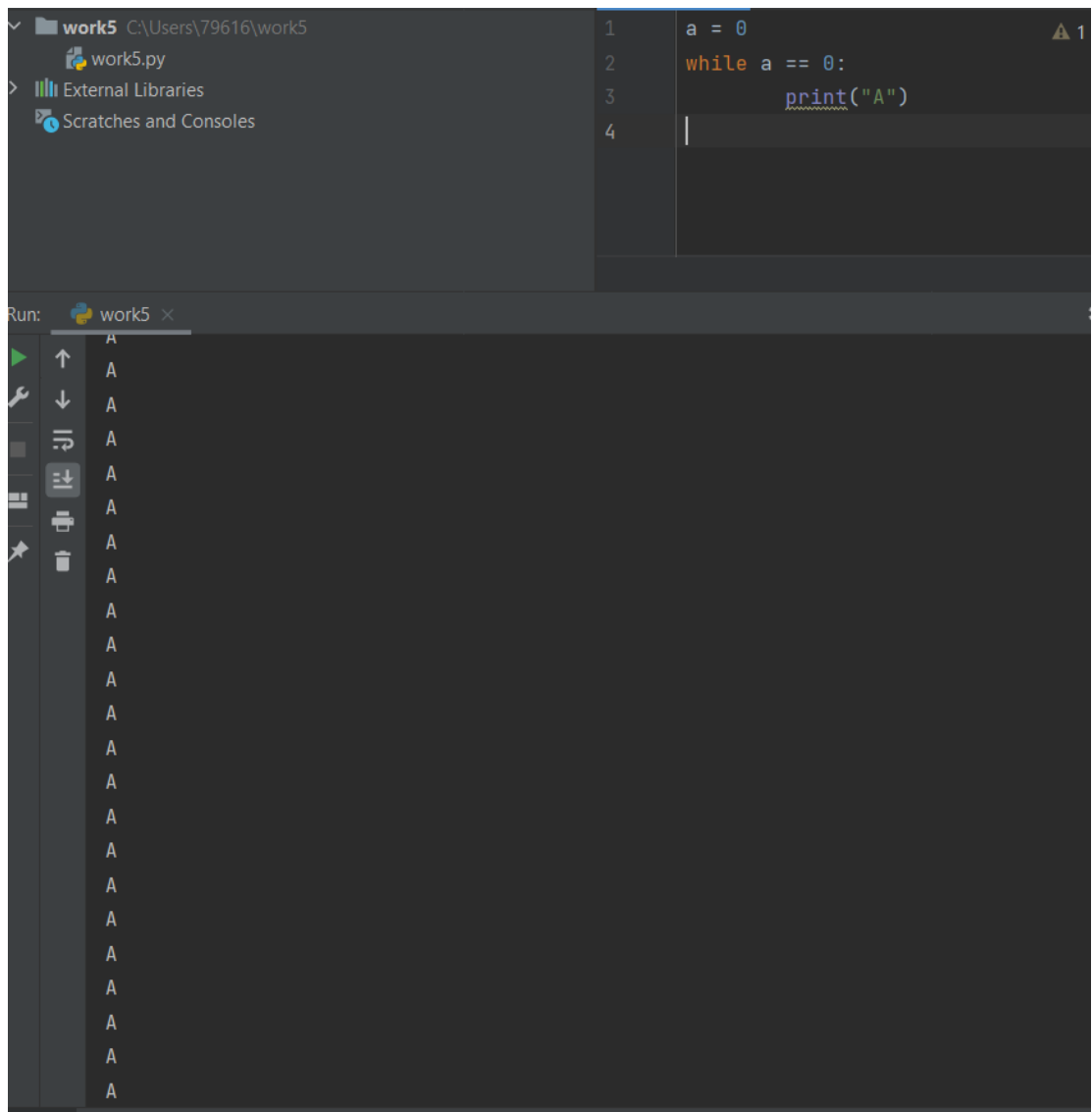
## 7. Оператор цикла while



The screenshot shows an IDE with a file named `work5.py` in the `C:\Users\79616\work5` directory. The code in the editor is as follows:

```
1 a = 0
2 while a < 7:
3     a += 1
4     print("A")
5
```

The console output shows the command prompt running the script, followed by the character `A` being printed seven times, corresponding to the iterations of the `while` loop.



## 8. Оператор цикла for

```
C:\Users\79616\work5>py work5.py
Hello
Hello
Hello
Hello
Hello
```

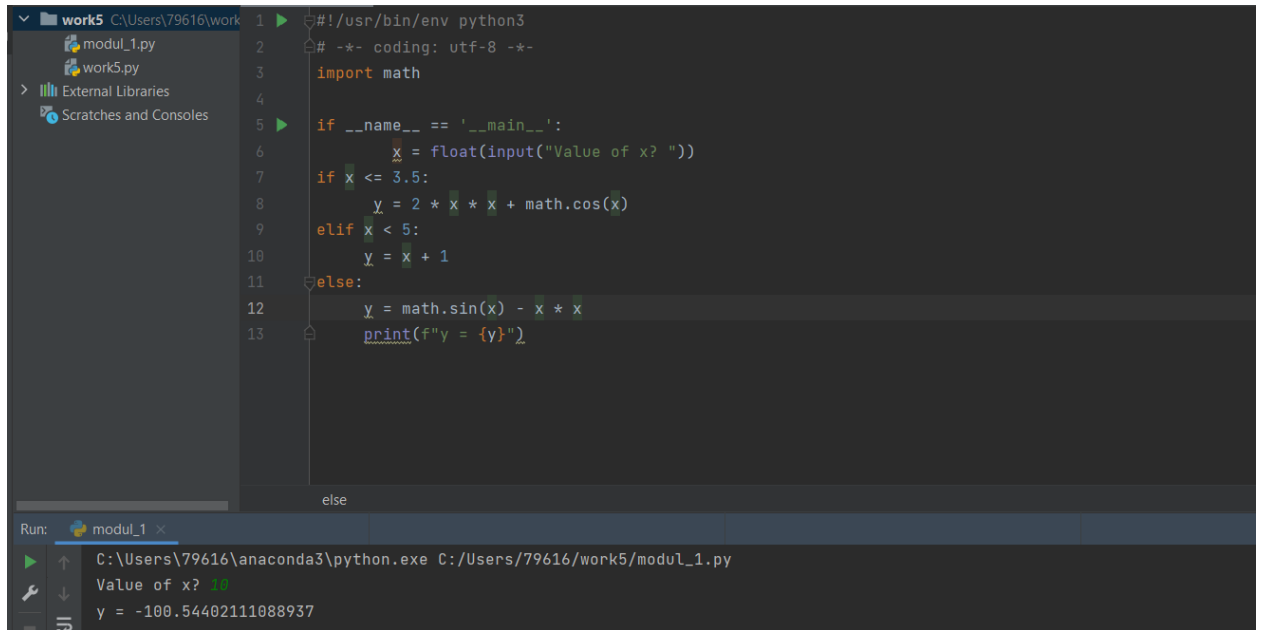
```
C:\Users\79616\work5>py work5.py
1
9
25
49
81
```

```
C:\Users\79616\work5>py work5.py
H
e
l
l
o
,
C
w
o
r
l
d
!
```

## 9. Функция range

```
range(0, 5)
>>> list(range(5))
[0, 1, 2, 3, 4]
>>> list(range(1,5))
[1, 2, 3, 4]
>>> list(range(0, 10, 2))
[0, 2, 4, 6, 8]
>>> list(range(0, 10, 3))
[0, 3, 6, 9]
>>> list(range(10, 0, -1))
[10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
>>> list(range(5, -1, -1))
[5, 4, 3, 2, 1, 0]
>>> list(range(-10, 0, 1))
[-10, -9, -8, -7, -6, -5, -4, -3, -2, -1]
```

## 10. Выполнение примера №1



```
1 #!/usr/bin/env python3
2 # -*- coding: utf-8 -*-
3 import math
4
5 if __name__ == '__main__':
6     x = float(input("Value of x? "))
7     if x <= 3.5:
8         y = 2 * x * x + math.cos(x)
9     elif x < 5:
10        y = x + 1
11    else:
12        y = math.sin(x) - x * x
13    print(f"y = {y}")
```

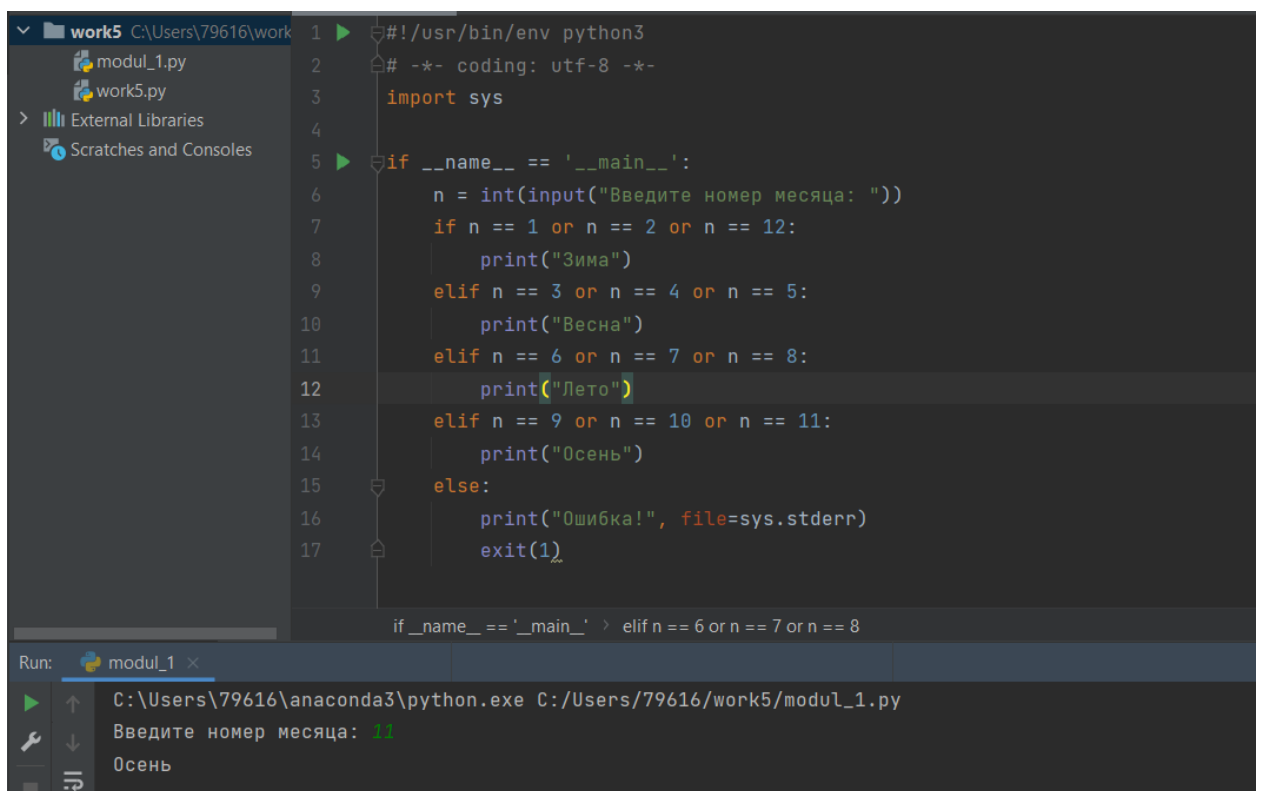
Run: modul\_1 x

C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/modul\_1.py

Value of x? 10

y = -100.54402111088937

## 11. Выполнение примера №2



```
1 #!/usr/bin/env python3
2 # -*- coding: utf-8 -*-
3 import sys
4
5 if __name__ == '__main__':
6     n = int(input("Введите номер месяца: "))
7     if n == 1 or n == 2 or n == 12:
8         print("Зима")
9     elif n == 3 or n == 4 or n == 5:
10        print("Весна")
11    elif n == 6 or n == 7 or n == 8:
12        print("Лето")
13    elif n == 9 or n == 10 or n == 11:
14        print("Осень")
15    else:
16        print("Ошибка!", file=sys.stderr)
17    exit(1)
```

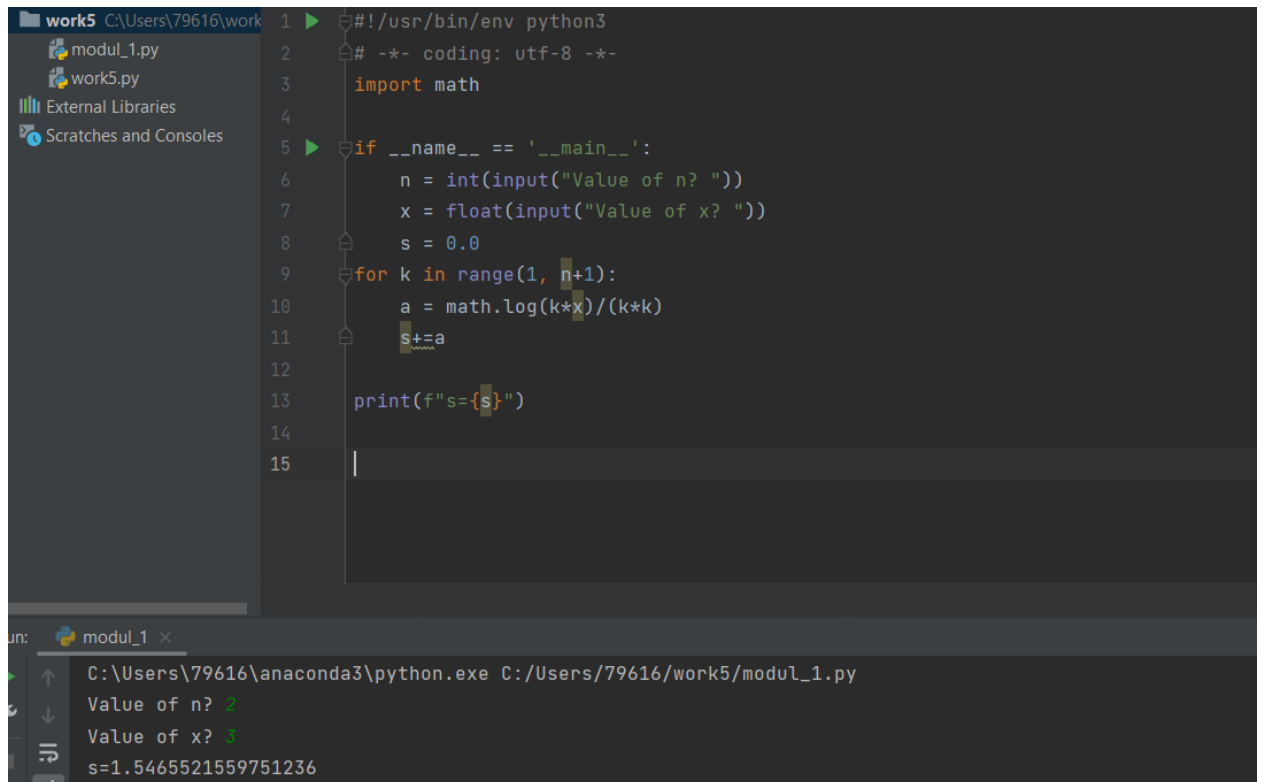
Run: modul\_1 x

C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/modul\_1.py

Введите номер месяца: 11

Осень

## 12. Выполнение примера №3

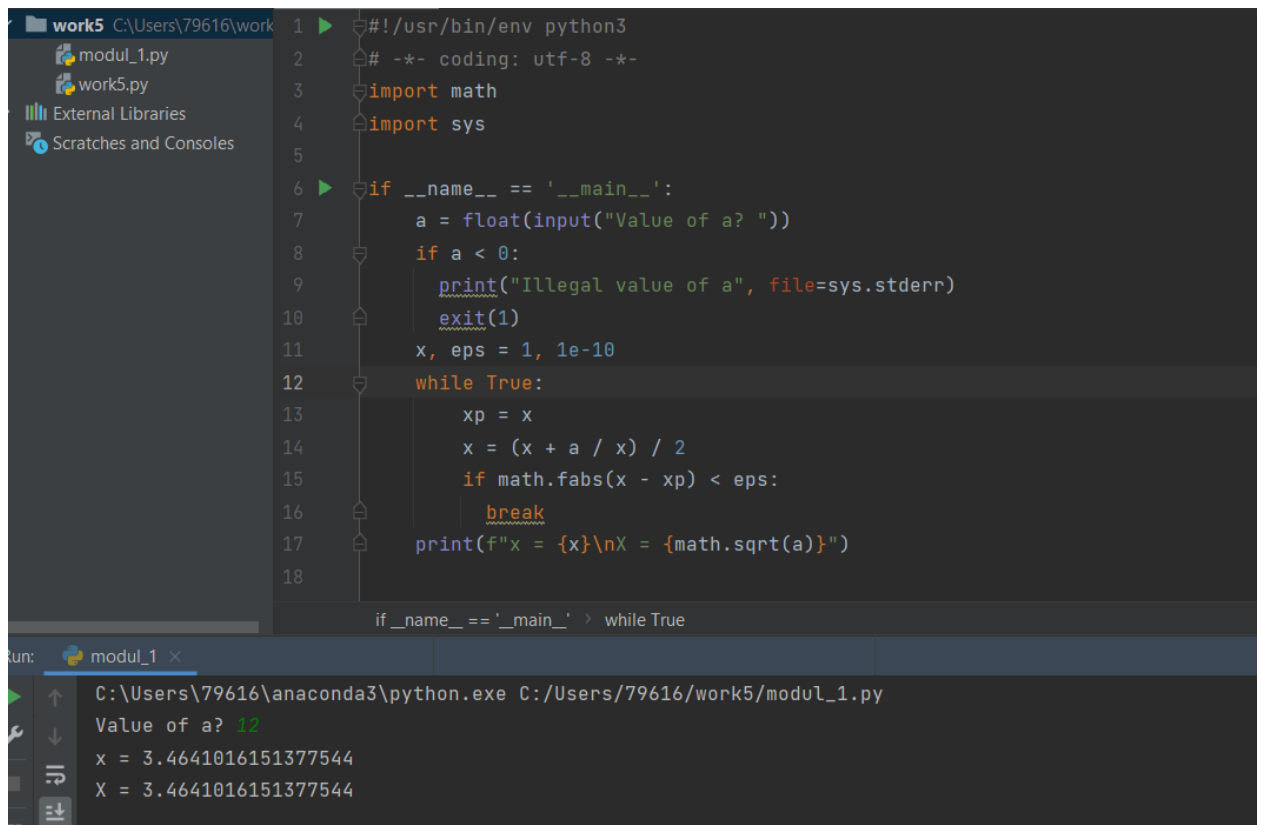


The screenshot shows an IDE with a file explorer on the left containing 'modul\_1.py' and 'work5.py'. The main editor displays a Python script for calculating the harmonic series sum. The script includes a shebang, encoding declaration, math import, and a main function that takes user input for 'n' and 'x', then calculates the sum of  $\log(k \cdot x) / (k \cdot k)$  for  $k$  from 1 to  $n$ . The console at the bottom shows the execution command and the resulting output for  $n=2$  and  $x=3$ .

```
1 #!/usr/bin/env python3
2 # -*- coding: utf-8 -*-
3 import math
4
5 if __name__ == '__main__':
6     n = int(input("Value of n? "))
7     x = float(input("Value of x? "))
8     s = 0.0
9     for k in range(1, n+1):
10         a = math.log(k*x)/(k*k)
11         s+=a
12
13     print(f"s={s}")
14
15
```

Run: modul\_1 x  
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/modul\_1.py  
Value of n? 2  
Value of x? 3  
s=1.5465521559751236

## 13. Выполнение примера №4



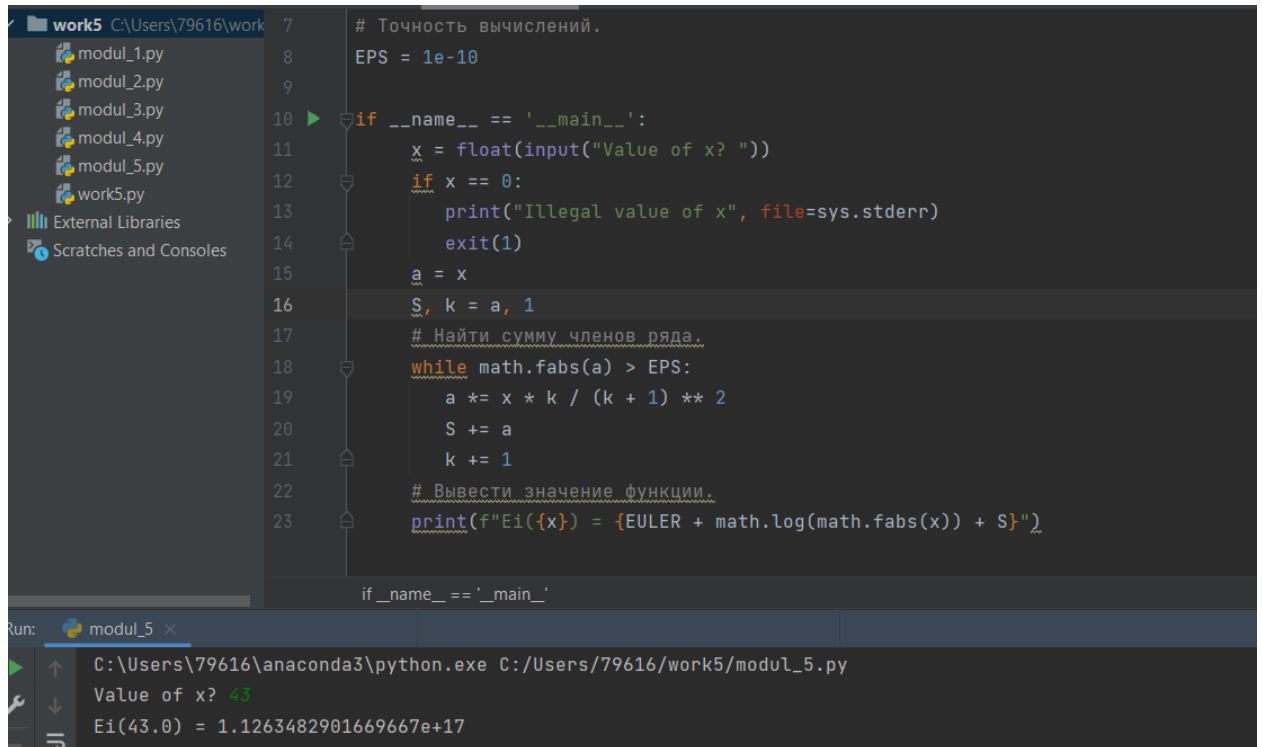
The screenshot shows an IDE with a file explorer on the left containing 'modul\_1.py' and 'work5.py'. The main editor displays a Python script for calculating the square root of a number using the Newton-Raphson method. The script includes a shebang, encoding declaration, math and sys imports, and a main function that takes user input for 'a', checks for non-positive values, and iteratively refines the value of 'x' until the difference is less than a specified epsilon. The console at the bottom shows the execution command and the resulting output for  $a=12$ .

```
1 #!/usr/bin/env python3
2 # -*- coding: utf-8 -*-
3 import math
4 import sys
5
6 if __name__ == '__main__':
7     a = float(input("Value of a? "))
8     if a < 0:
9         print("Illegal value of a", file=sys.stderr)
10        exit(1)
11    x, eps = 1, 1e-10
12    while True:
13        xp = x
14        x = (x + a / x) / 2
15        if math.fabs(x - xp) < eps:
16            break
17    print(f"x = {x}\nX = {math.sqrt(a)}")
18
```

Run: modul\_1 x  
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/modul\_1.py  
Value of a? 12  
x = 3.4641016151377544  
X = 3.4641016151377544



#### 14. Выполнение примера №5



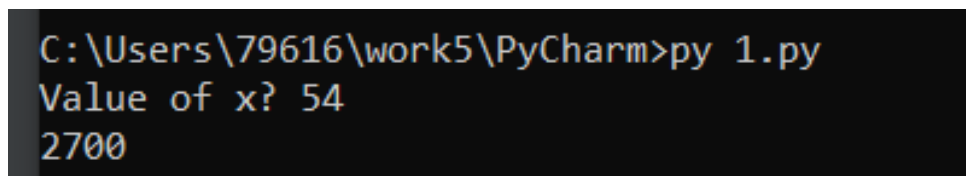
The screenshot shows the PyCharm IDE with a Python script in the editor and its execution output in the Run console. The script calculates the sum of a series for a given value of x.

```
7 # Точность вычислений.  
8 EPS = 1e-10  
9  
10 if __name__ == '__main__':  
11     x = float(input("Value of x? "))  
12     if x == 0:  
13         print("Illegal value of x", file=sys.stderr)  
14         exit(1)  
15     a = x  
16     S, k = a, 1  
17     # Найти сумму членов ряда.  
18     while math.fabs(a) > EPS:  
19         a *= x * k / (k + 1) ** 2  
20         S += a  
21         k += 1  
22     # Вывести значение функции.  
23     print(f"Ei({x}) = {EULER + math.log(math.fabs(x)) + S}")
```

Run: modul\_5 x  
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/modul\_5.py  
Value of x? 43  
Ei(43.0) = 1.1263482901669667e+17

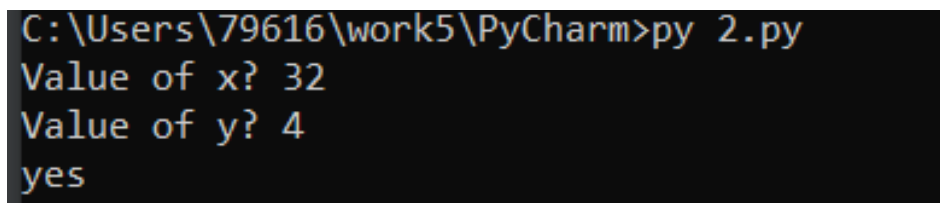
#### ВАРИАНТ 13

#### 15. Выполнение индивидуального задания №1



```
C:\Users\79616\work5\PyCharm>py 1.py  
Value of x? 54  
2700
```

#### 16. Выполнение индивидуального задания №2



```
C:\Users\79616\work5\PyCharm>py 2.py  
Value of x? 32  
Value of y? 4  
yes
```

#### 17. Выполнение индивидуального задания №3

```
C:\Users\79616\work5\PyCharm>py 3.py  
Value of n? 46  
1  
2  
23
```

18. Выполнение задания повышенной сложности (вариант 4)

```
C:\Users\79616\anaconda3\python.exe C:/Users/79616/work5/PyCharm/4.py  
Value of x? 2  
Chi(2.0) = 4.529758512212645
```