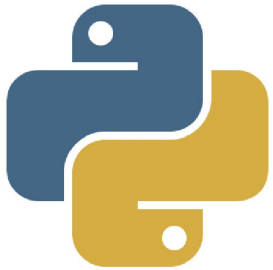
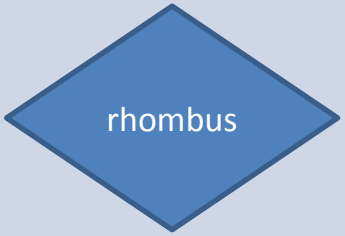
Programming on



python

Block diagram

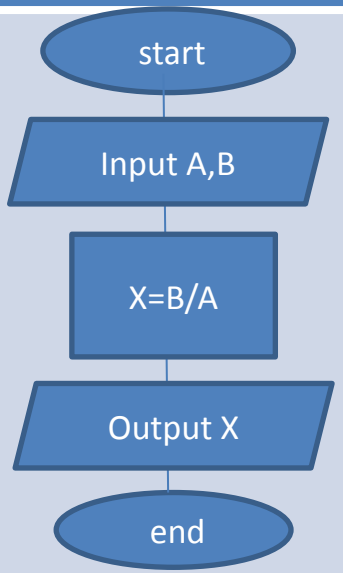
A block diagram is a diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks.[1] They are heavily used in engineering in hardware design, electronic design, software design, and process flow diagrams.

	Start/End	This shape should be used to represent the first and last steps of the process.
	Process.	The figure represents a standard process step. This is one of the most used shapes in any process.
	Solution.	This figure is used at the point where the choice of the next stage depends on the decision made. There may be several options, but most often there are two: "yes" and "no".
	Data.	This shape indicates that data is entering or leaving the process. It is sometimes referred to as the Input/Output pattern.

Example

Solve equation: A*X=B,

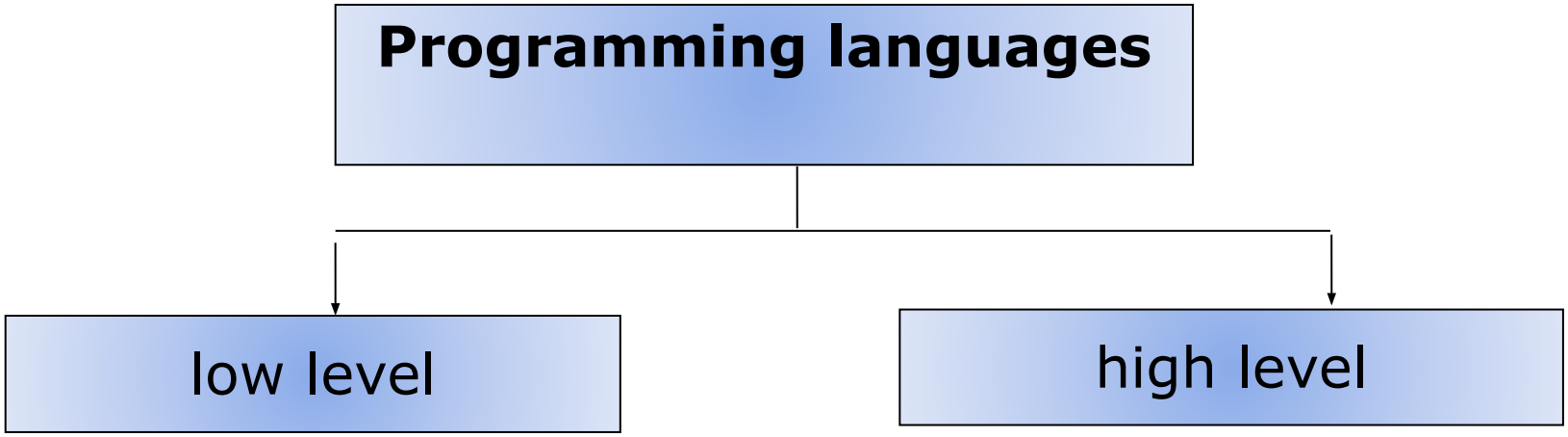
If A,B any known numbers. Find unknown X.

Solution in math:	*Solution in block diagram:*
X=B/A	

Program. Programming language

A program is a set of instructions for a specific performer.

A programming language is a formal language for writing programs (usually for a computer).



Compilers and interpreters

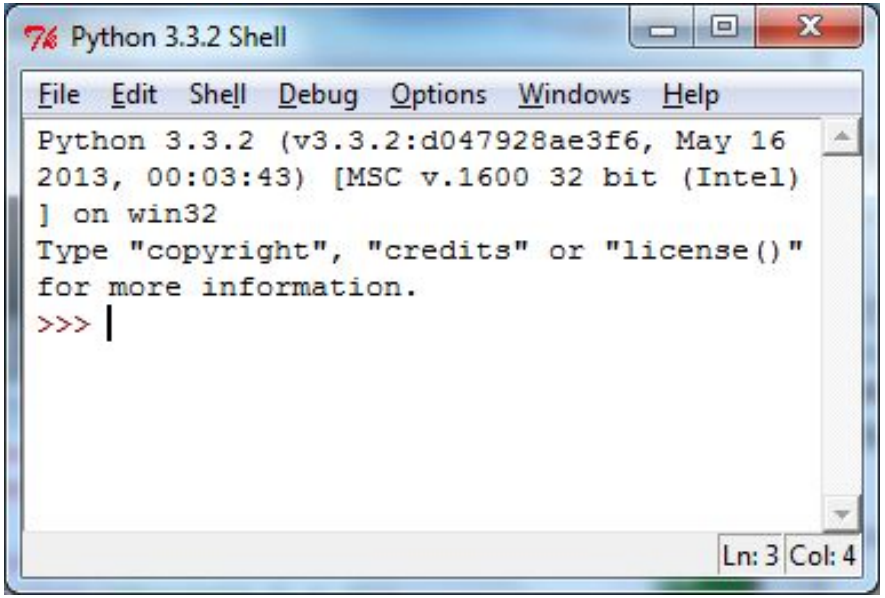
A translator is a special program that converts program code from a particular programming language into machine code.

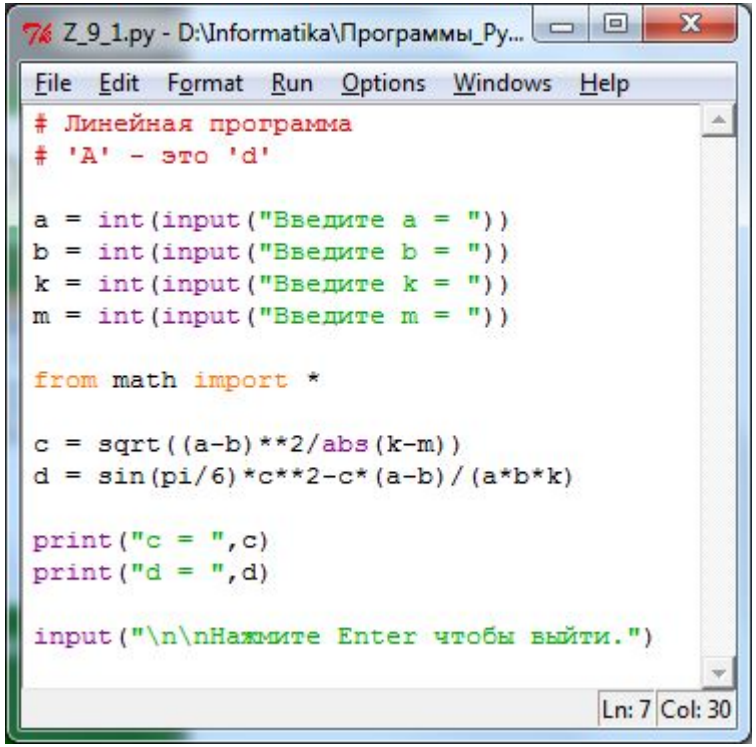
Compiler Immediately translates all program code into machine language.Creates an executable file.

Interpreter
Translates program code line by line.Directly interacts with the operating system.

Features of Python

- Interpreted
- Language Clear
- Syntax complete universal language





Data and their types

- ***integers (integer) - positive and negative integers, as well as 0***
- (**ex: 4, 687, -45, 0**).
- ***floating point numbers - fractional numbers*** (**ex: 1.45, -3.789654, 0.00453**).
  Note: decimal separator is a dot, not a comma.
- ***strings (string) -*** *a set of characters enclosed in quotes*
- *(for example: "ball", "What is your name?", 'dkfjUUv', '6589'). Note: Quotes in Python can be single or double.*

Operations. Operations on different data types

Expression	Execution result
34.907 + 320.65	355.55699999999996
'Hi, ' + 'world :) '	'Hi, world :) '
'Hi, ' * 10	'Hi, Hi, Hi, Hi, Hi, Hi, Hi, Hi, Hi, Hi, '
'Hi, ' + 15	О ш и б к а

Changing Data Types

int() – converts the argument to an integer

str() – converts the argument to a string

float() – … to a floating point number

Expression	Результат выполнения
int ('56')	56
int (4.03)	4
int ("comp 486")	Error
str (56)	'56'
str (4.03)	'4.03'
float (56)	56.0
float ("56")	56.0

Mathematical operators

Operator	Description	example	results
+	Addition	7 + 3	10
-	Subtraction	7 - 3	4
*****	Multiplication	7 * 3	21
/	Division (истинное)	7 / 3	2.3333333333333335
******	Exponentiation	7**3	343
//	Integer division	7 // 3	2
%	Remainder of the division	7 % 3	1

Variables in Python

A variable is a reference to an area of memory where certain data is stored.

An example of working with variables

```
>>> apples = 100
>>> eat_day = 5
>>> day = 7
>>> apples = apples - eat_day * day
>>> apples
65
>>> |
```

Data input and output

implemented using built-in functions

Input : input (arguments)

Output : print (arguments)

Data input

1.

```
>>> input()
1234
'1234'
>>> input()
Hello World!
'Hello World!'
>>>
```

2. Параметр - приглашение

```
>>> input('Введите число:')
Введите число:10
'10'
>>> int(input('Введите число:'))
Введите число:10
10
>>> float(input('Введите число:'))
Введите число:10
10.0
>>>
```

3. Assigning a value to a variable

```
>>> name = input ('Enter your name:')
Enter your name: _____________
>>> name
_____________
>>>
```

output

1. Data type string

```
>>> print("Программа 'Game Over' 2.0")
Программа 'Game Over' 2.0
>>> print("Тоже", "самое", "сообщение")
Тоже самое сообщение
>>> print("Только",
      "чуть-чуть",
      "побольше")
Только чуть-чуть побольше
```

2. Variable output

```
>>> a = 1
>>> b = 2
>>> print(a, '+', b, '=', a + b)
1 + 2 = 3
>>>
```

3. Variable output

sep is the parameter used as separator

```
>>> a=1
>>> b=2
>>> c=a+b
>>> print(a, b, c, sep = ':')
1:2:3
>>>
```

Library math

1. *import math* *# connection of the math library*
math.sin(x) *# function call from one argument*

y = math.sin(x) *# using a function in an expression*

print(math.sin(math.pi/2)) *# outputting a function to the screen*

2. *from math import **

y = sin(x)

print(sin(pi/2))

Library math

Roots, powers, logarithms	
sqrt(x)	Square root. Usage: sqrt(x)
pow(a, b)	Exponentiation, returns a^b. pow(a,b)
exp(x)	Exponent, returns e^x use: exp(x)
log(x)	natural logarithm When called as log(x, b), returns the logarithm to base b.
log10(x)	Decimal logarithm
e	

Library math

Trigonometry	
sin(x)	Sine of an angle specified in radians
cos(x)	Cosine of an angle specified in radians
tan(x)	Tangent of an angle specified in radians
asin(x)	Arcsine, returns value in radians
acos(x)	Arccosine, returns the value in radians
atan(x)	Arctangent, returns the value in radians
atan2(y, x)	Arctangent, returns the value in radians

Library math

(continue:)

Тригонометрия	
hypot(a, b)	The length of the hypotenuse of a right triangle with legs a and b
degrees(x)	Converts an angle given in radians to degrees
radians(x)	Converts an angle specified in degrees to radians
pi	pi constant

Task 1.

Given a, b, k, m.

$$C = \sqrt{\frac{(a-b)^2}{|k-m|}};$$

Define :

$$A = \sin(\pi/6) \cdot C^2 - \frac{C(a-b)}{a \cdot b \cdot k}.$$

Task 1. (Source code)

```
# Линейная программа

a = int(input("Введите a = "))
b = int(input("Введите b = "))
k = int(input("Введите k = "))
m = int(input("Введите m = "))

from math import *

C = sqrt((a-b)**2/abs(k-m))
A = sin(pi/6)*C**2-C*(a-b)/(a*b*k)

print("C = ", C)
print("A = ", A)
```

Задачи

1.) Дана сторона квадрата a. Найти его периметр P = 4·a.

2.) Даны стороны прямоугольника a и b. Найти его площадь S = a·b и периметр P = 2·(a + b).

3.) Дан диаметр окружности d. Найти ее длину L = π·d. В качестве значения π использовать 3.14.

4.) Дана длина ребра куба a. Найти объем куба V = a^3 и площадь его поверхности S = 6·a ^2 .

5.) Даны длины ребер a, b, c прямоугольного параллелепипеда. Найти его объем V = a·b·c и площадь поверхности S = 2·(a·b + b·c + a·c).

6.) Найти длину окружности L и площадь круга S заданного радиуса R: L = 2·π·R, S = π·R ^2 . В качестве значения π использовать 3.14.

7.) Даны два числа a и b. Найти их среднее арифметическое: (a + b)/2.

8.) Даны два неотрицательных числа a и b. Найти их среднее геометрическое, то есть квадратный корень из их произведения: √ a·b.

9.) Даны два ненулевых числа. Найти сумму, разность, произведение и частное их квадратов

10) Дана сторона квадрата a. Найти его площадь S = a^2 .