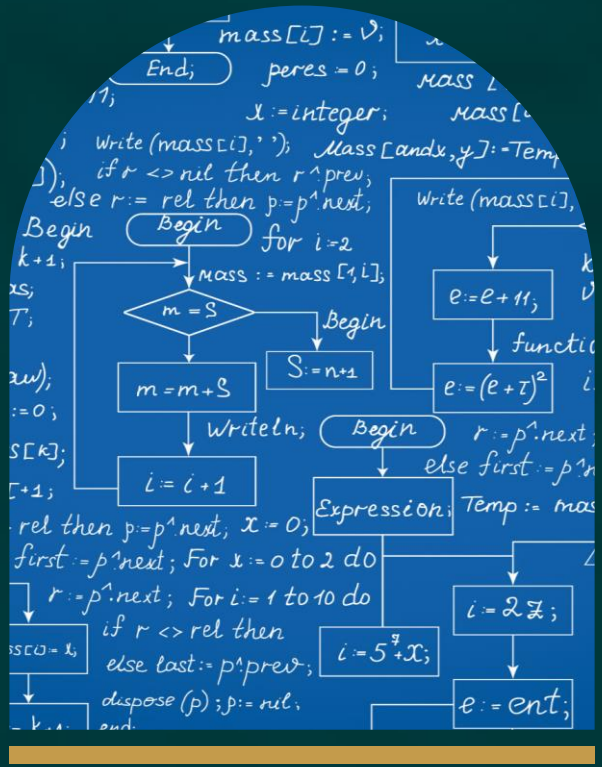
Algorithms

By Niloufar Kashefi



What is an algorithm?

An algorithm is a procedure used for solving a problem or performing a computation. Algorithms act as an exact list of instructions that conduct specified actions step by step.

Algorithms are widely used throughout all areas of IT. In mathematics, computer programming and computer science, an algorithm usually refers to a small procedure that solves a recurrent problem. Algorithms are also used as specifications for performing data processing and play a major role in automated systems.

Features of an algorithm

Each algorithm must have the following characteristics:

Well-defined inputs	The expected inputs of an algorithm must be well-defined to ensure its correctness, predictability, and repeatability. Well-defined inputs ensure that the algorithm's behavior is deterministic, which means, that the same input will always produce the same output. An algorithm has zero or more inputs that are supplied from the outside environment
Well-defined outputs	The algorithm must have one or more outputs / produces the intended and accurate result for a given set of inputs
Unambiguity	Each of its steps should be clear in all aspects and must lead to only one meaning. It has to consider all possible situations / include full details of the problem solving
Finiteness	An algorithm must always terminate after a finite number of steps
Language independence	it must be just plain instructions that can be implemented in any language
Feasibility	All instructions of an algorithm must be executable.

Example of Algorithms

Ex. 1: Turn on the light

Ans.:

1. Move to the light switch
2. Move your hand to the light switch
3. Turn on the light switch
4. End

Ex. 2: Phone call to mother

Ans.:

1. Pick up the phone
2. Select the dialing method
    - 2.a: By her saved number
    - 2.b: By inserting her phone number manually
    - 2.c: On favorite number
    - 2.d: On recent call
    - 2.e: Using call tab in massages
3: Talk
4: End

Ex. 3: Do Shoulder Presses (3×12)

Ans.:

1. Select Weight / Bar
2. If select bar:
    - 2.a: Adjust the bar
    - 2.b: Stand up behind the bar

   else:
    - 2.a: Select the weight
    - 2.b: Stand up behind the weight
3. Do shoulder press until 12
4. Relax 30 second
5. Number of sets + 1
6. If it was your third set:
    - 6.a: End

   else:
    - 6.a: Go to step 3

Ex. 4: Calculate the circumference and area of a rectangle

Ans.:

1. Input the (L) and (W) of the rectangle
2. Calculate the circumference using:

$$circumference = 2 \times (L + W)$$

3. Calculate the area using:

$$area = (L \times W)$$

3. Output the values of circumference and area
4. End

Inputs:
- length (L): Length of the rectangle
- width (W): Width of the rectangle

Outputs:
- circumference: The perimeter of the rectangle
- area: The area of the rectangle

Ex. 5: Check if a number A is divisible by another number B

Ans.:

1. Input (A) and (B)
2. If the reminder of A divided by B is zero
   - 2.a: Yes, A is divisible by B

   Else:
   - 2.a: No
4. End

Inputs:
- Number 1: A
- Number 2: B

Outputs:
- Print yes or no

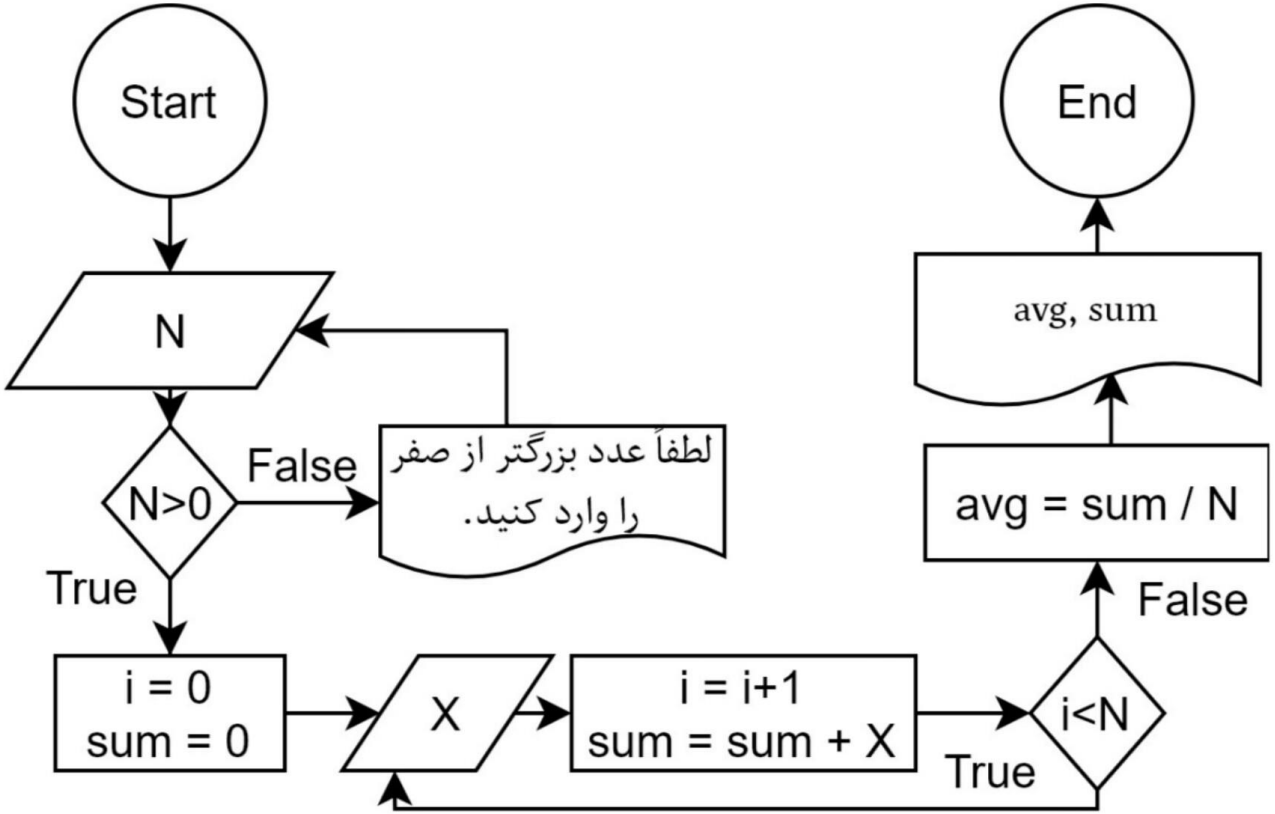
Ex. 6: Factorial of A

Ans.:

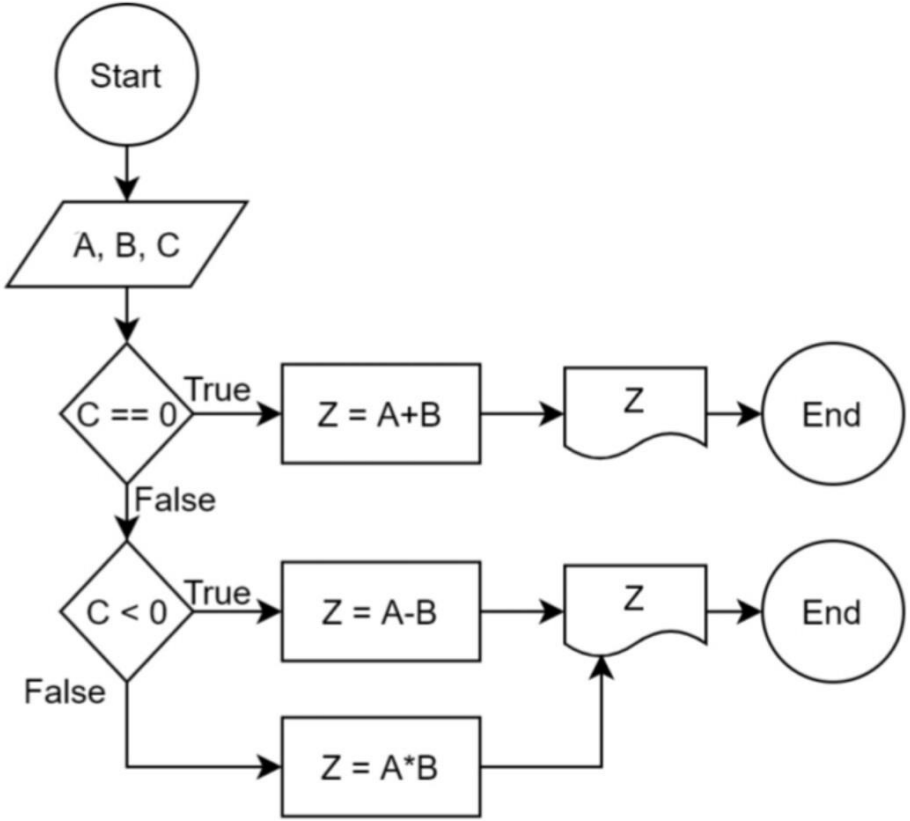
1. Input (A)
   2. Fact = 1 , i=1
   2. If A>=1
      2.a. If A=1
         2.a.a: Print Factorial A is 1
      Else:
         2.a.a: Fact=Fact × i
         2.a.b: i=i+1
         2.a.c: If i=A:
            2.a.c.a: End
         Else:
            2.a.c.a: Go to 2.a.a
   Else:
      2.a: Please Enter a positive number
   3. End

Inputs:
•Number A

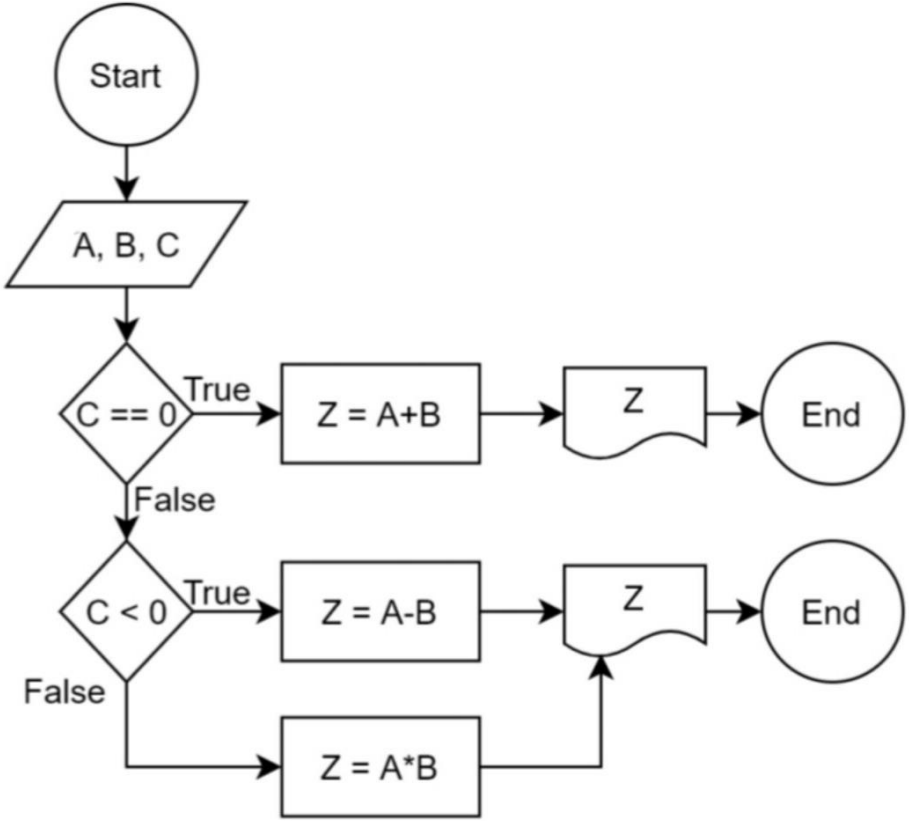
Outputs:
•Factorial Number A



فلوچارت برای میانگین اعداد.



فلوچارت عملیات مربوط به علامت های متغیرهای ورودی.



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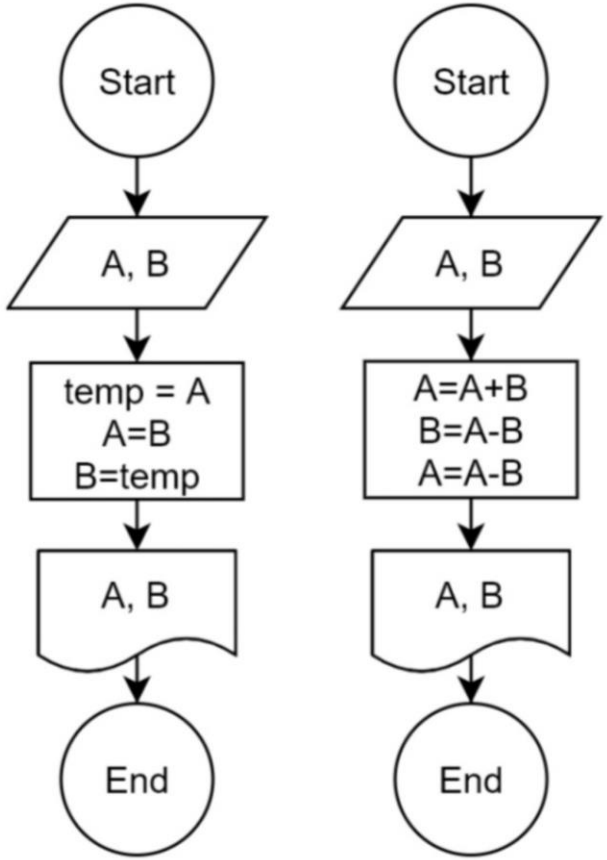

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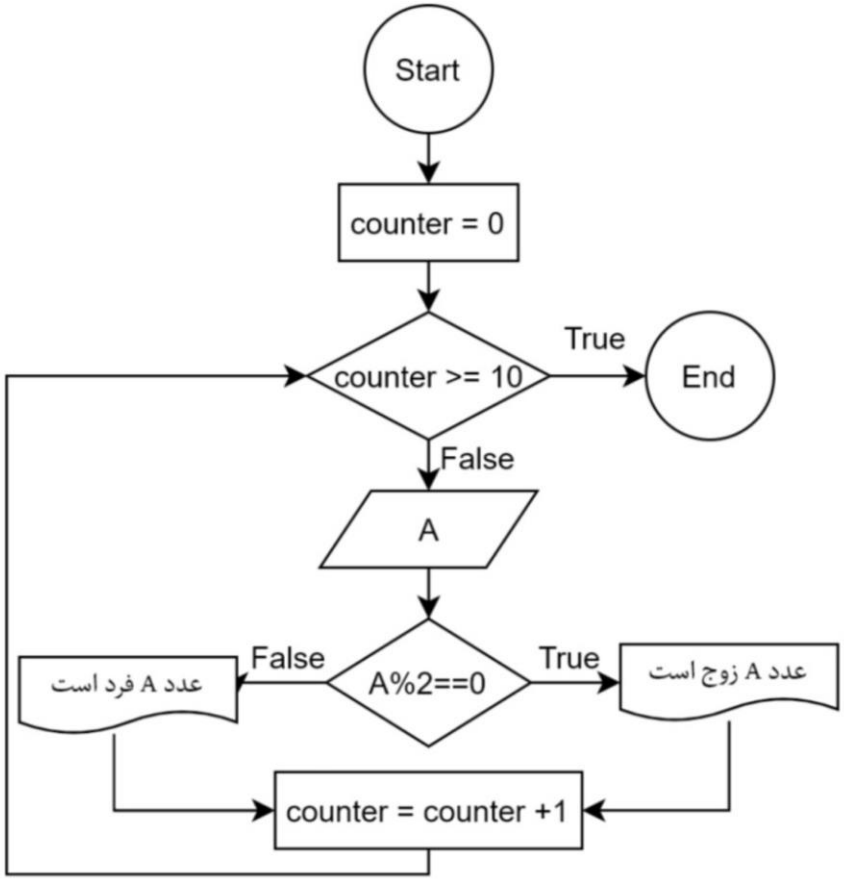
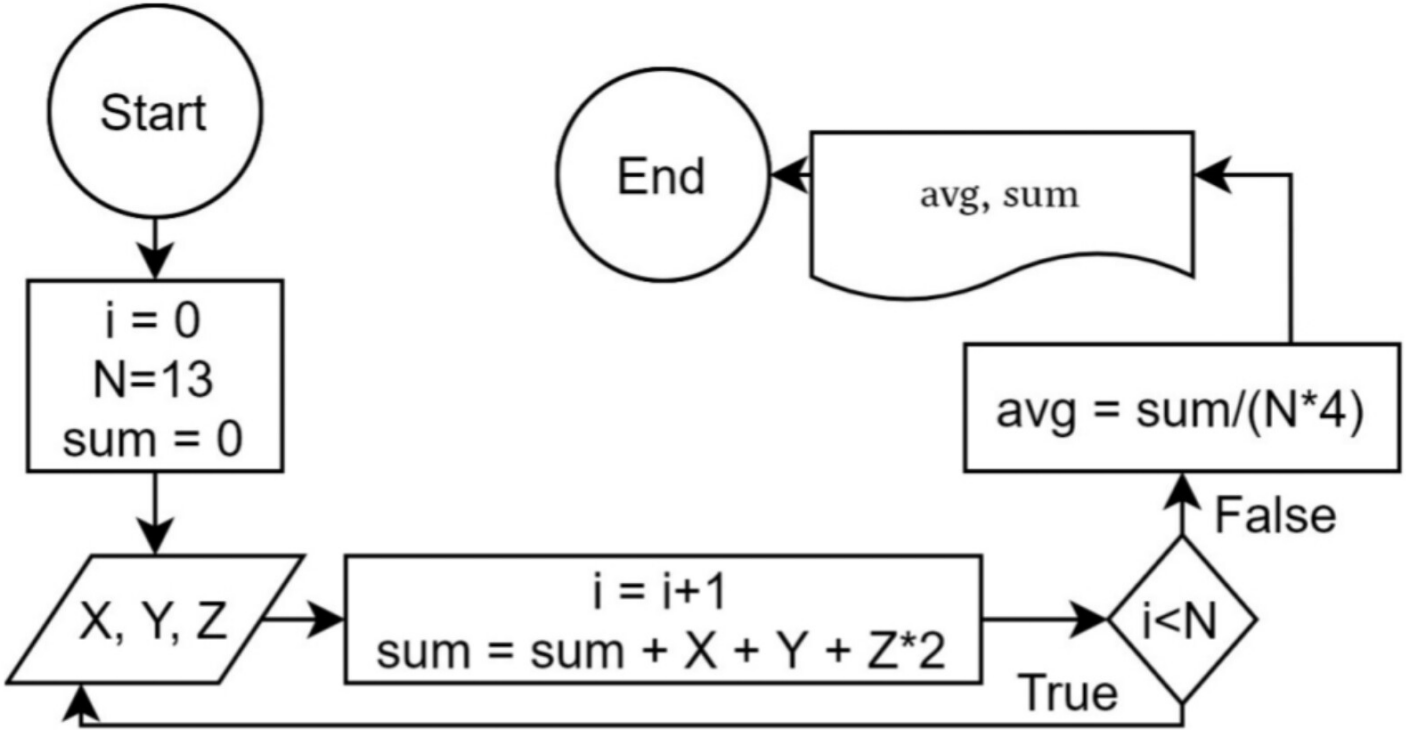
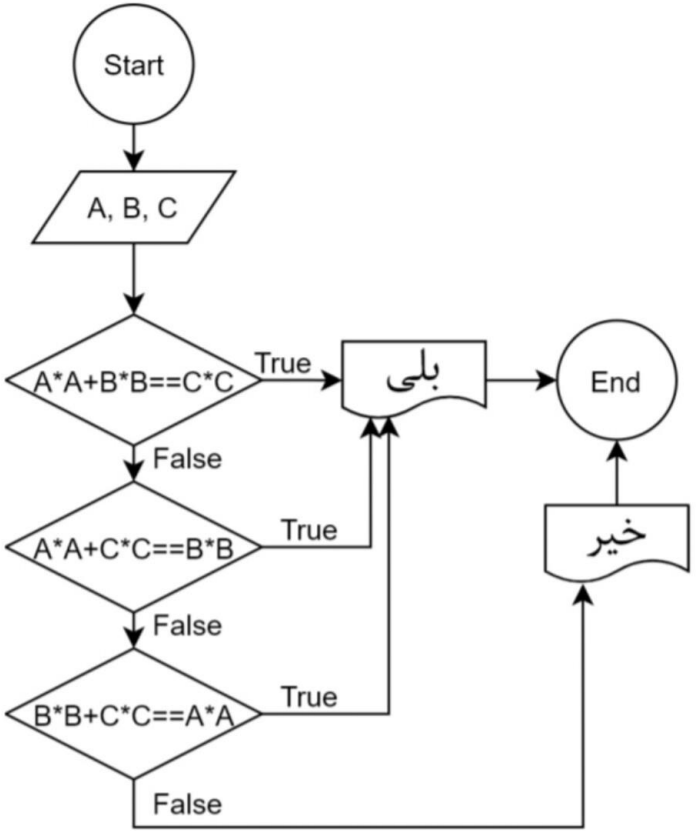


فلوچارت زوج و فرد بودن اعداد.

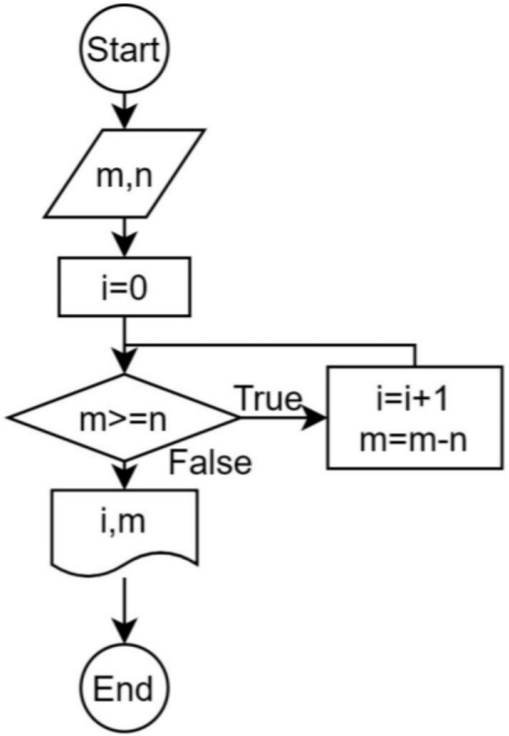


فلوچارت برای میانگین معدل نمرات دانشجویی.

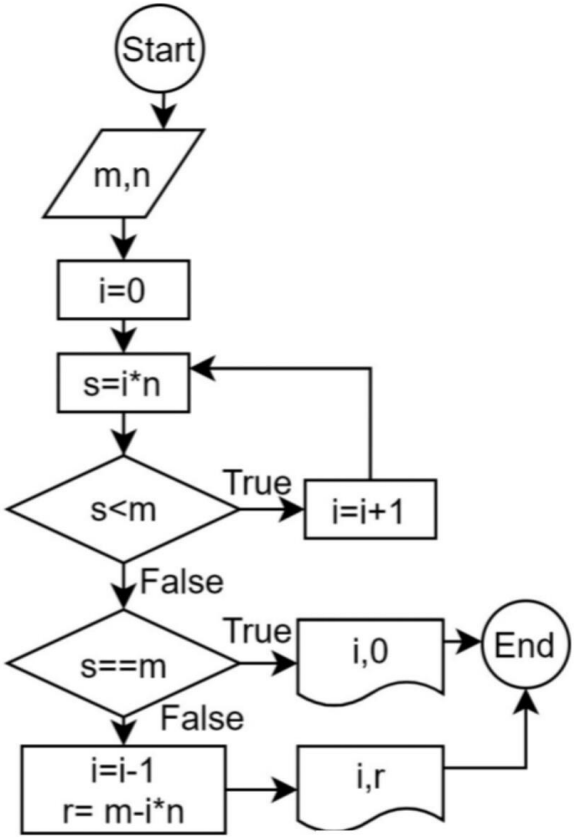


فلوچارت برای تعیین قائم الزاویه بودن سه عدد ورودی.

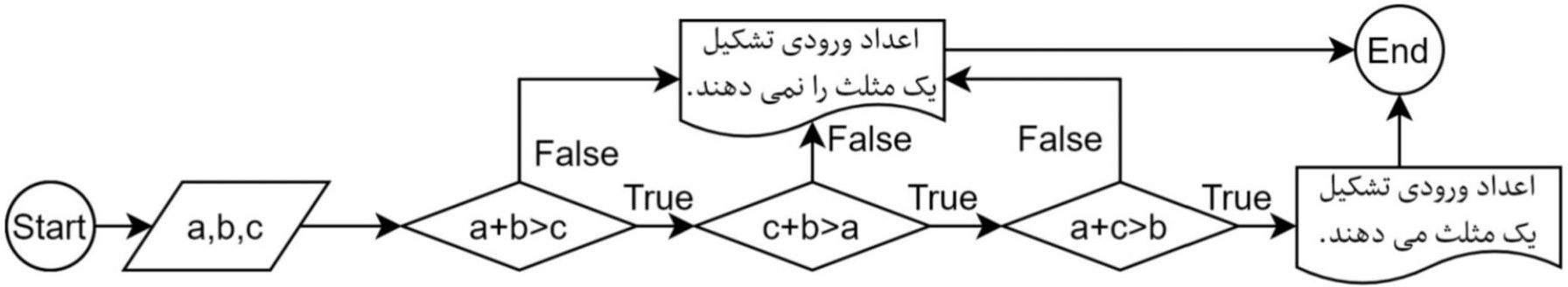
روش اول با تفریق های متوالی



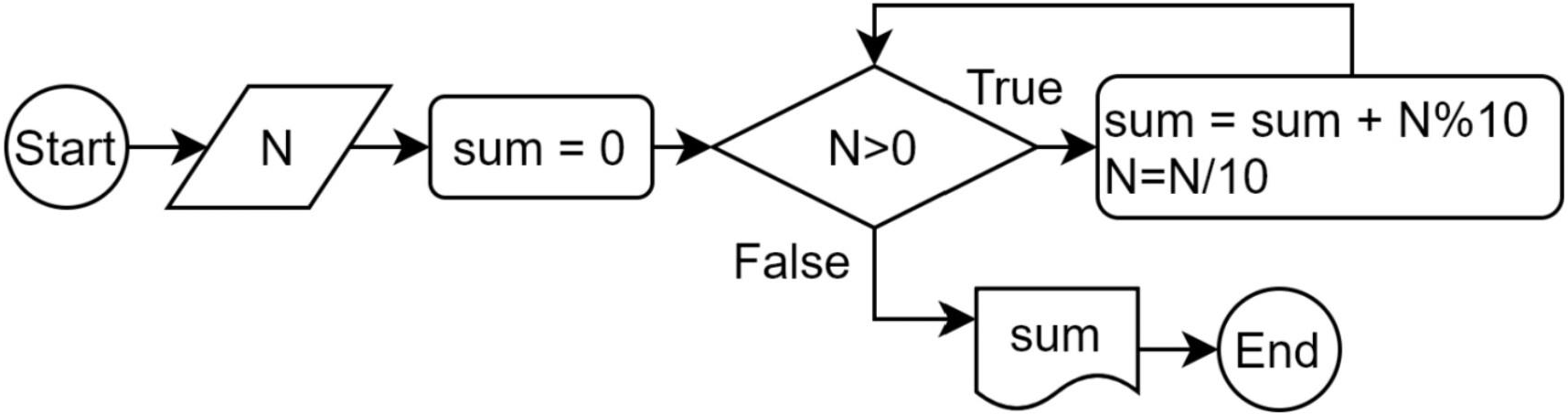
روش دوم با ضربهای متوالی



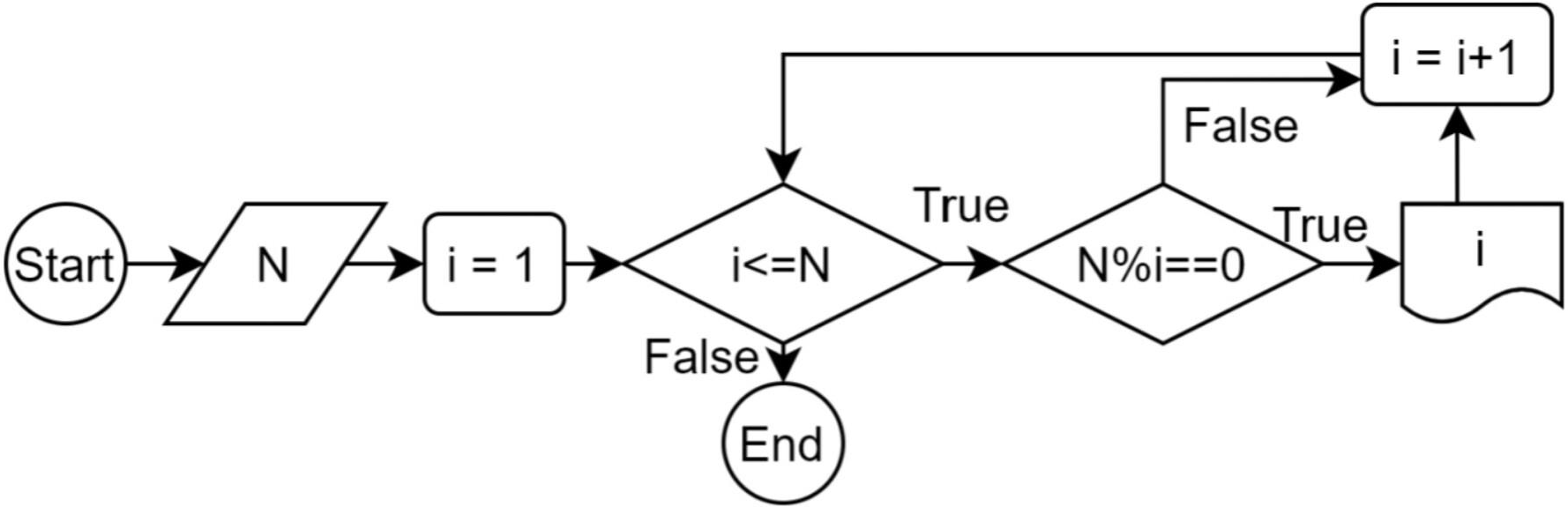
فلوچارت برای محاسبه خارج قسمت و باقیمانده تقسیم M بر N.



فلوچارت برای تشخیص مثلث ساز بودن سه عدد ورودی.



فلوچارت محاسبه مجموع ارقام یک عدد طبیعی.



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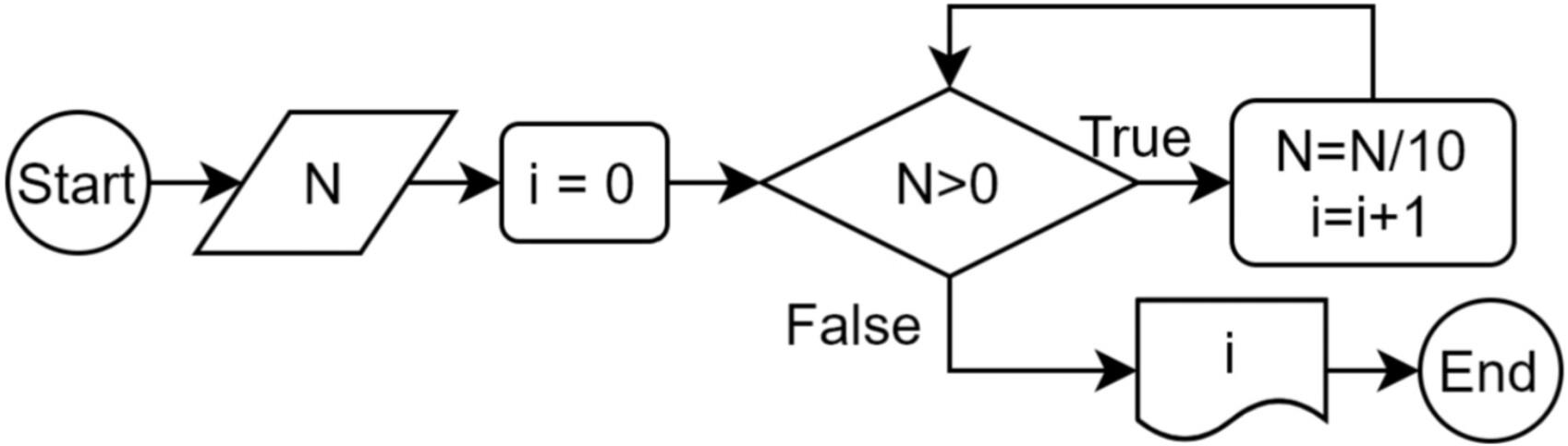

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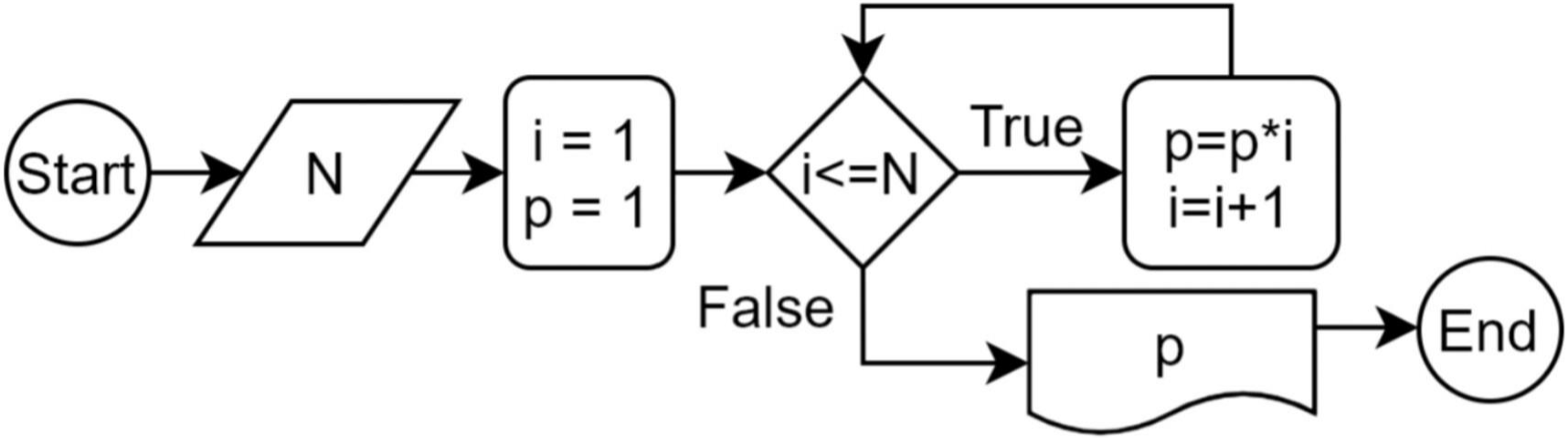

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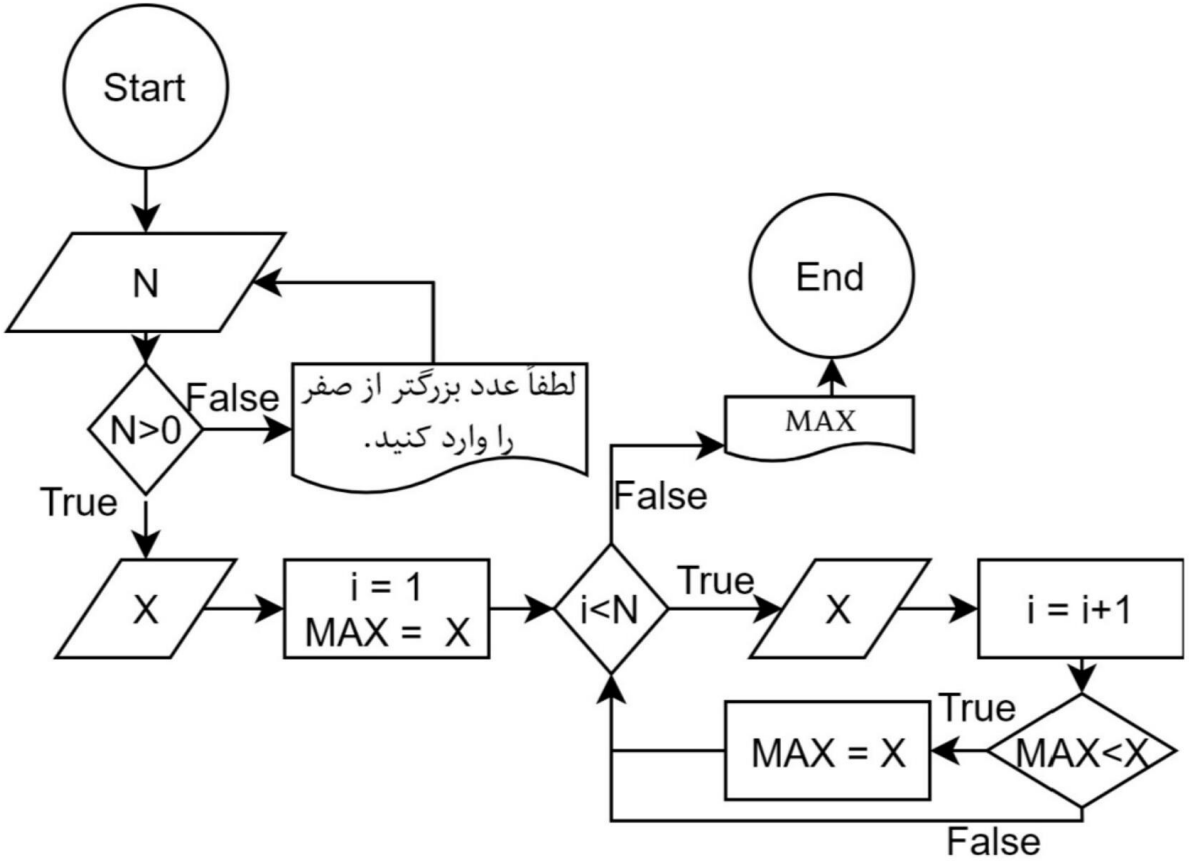
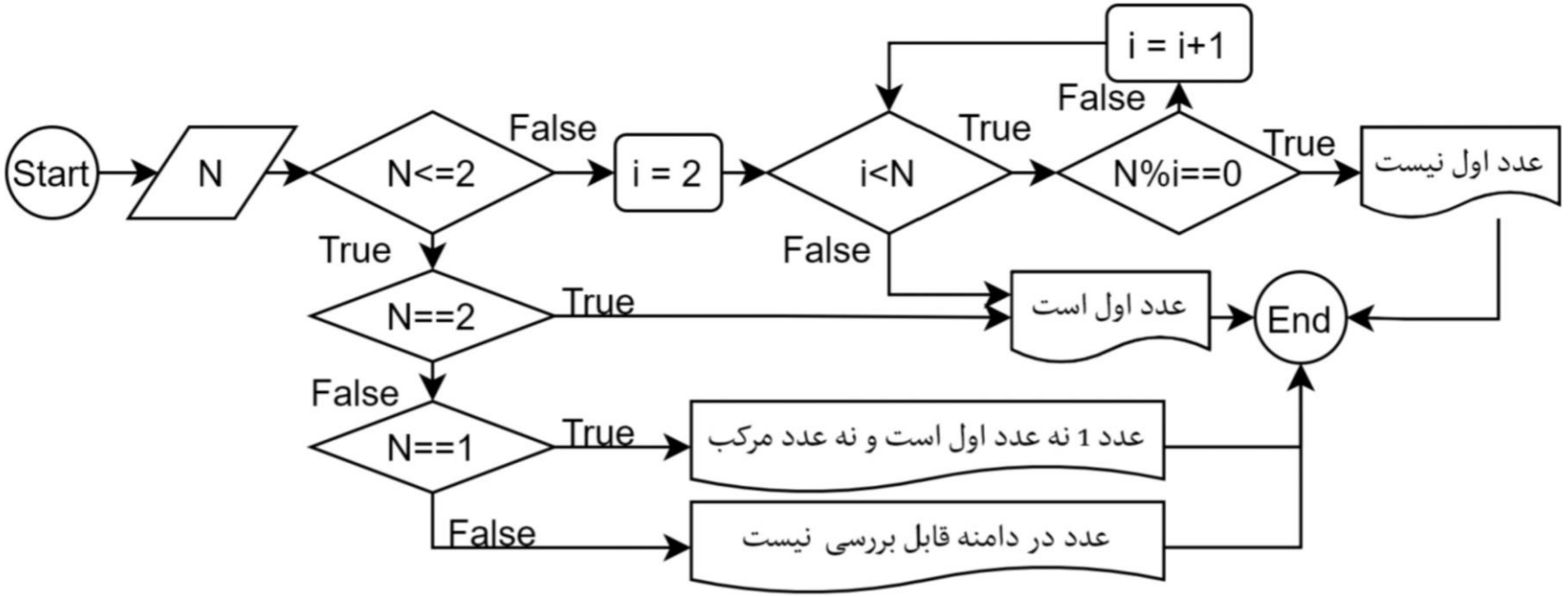
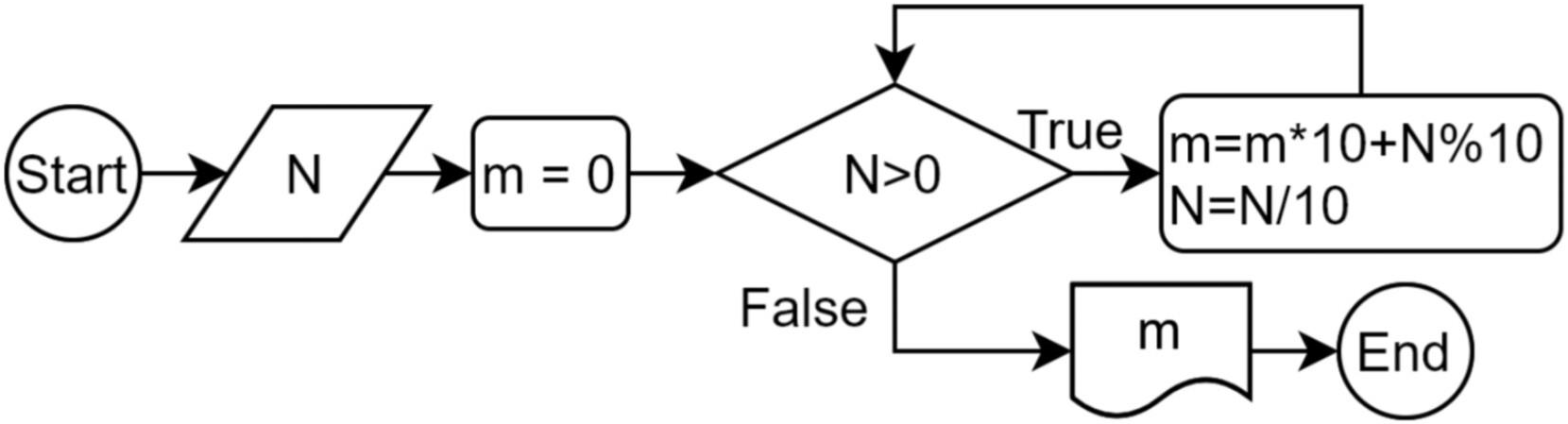


فلوچارت برای پیدا کردم مقدار بیشینه.



فلوچارت تعیین اول بودن یک عدد طبیعی.



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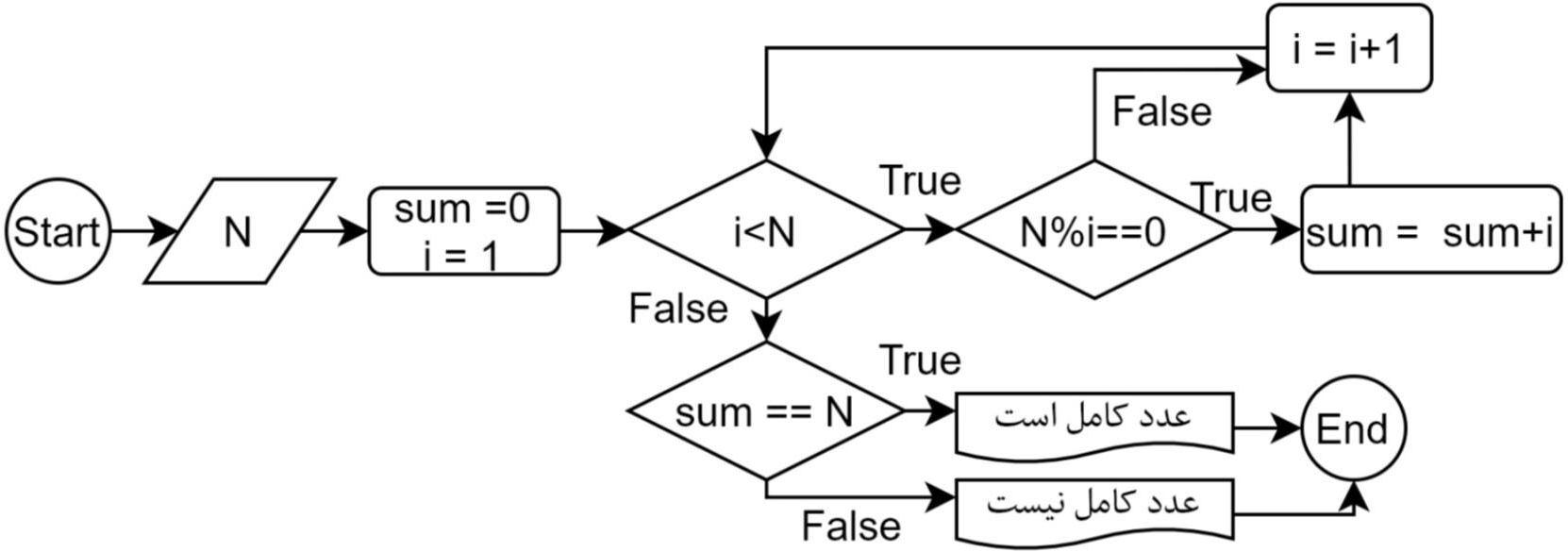

فلوچارت محاسبه کامل بودن یک عدد طبیعی.