367. Valid Perfect Square

Given a **positive** integer *num*, write a function which returns True if *num* is a perfect square else False.

Follow up: Do not use any built-in library function such as `sqrt`.

Example 1:

Input: num = 16
Output: true

Example 2:

Input: num = 14
Output: false
My Approach:

```
def isPerfectSquare(self, N: int) -> bool:
        # code here
        if N==1:
            return True
        start = 1
        end = N
        ans = 0
        while start<=end:
            mid = (end+start)//2
            if mid*mid==N:
                return True
            elif mid*mid>N:
                end = mid-1
            elif mid*mid<N:
                ans = mid
                start = mid+1
        return ans*ans==N
        # if num==1:
        #     return True
        # count = 0
        # for i in range(1,num):
        #     if i*i<=num:
        #         count = count+1
        #     else:
```

```
        #          break
        # return count*count==num
```

Best appraoch:

```
#0th Bitwise
    def BitwiseTrick(self, num):
        root = 0
        bit = 1 << 15

        while bit > 0 :
            root |= bit
            if root > num // root:
                root ^= bit
            bit >>= 1
        return root * root == num

    #1.Using Newton's Method

    def NewtonMethod(self, num):
         r = num
         while r*r > num:
             r = (r + num/r) // 2
         return r*r == num

    #2.Math Trick for Square number is 1+3+5+ ... +(2n-1)

    def Math(self, num):
         i = 1
         while (num>0):
             num -= i
             i += 2
         return num == 0

   #3. Binary Search Method ===> important

    def BinarySearch(self, num):
         left = 0
         right = num

         while left <= right:
             mid = left + (right-left)//2
             if  mid ** 2 == num:
```

```
            return True
        elif mid ** 2 > num:
            right = mid -1
        else:
            left = mid +1
    return False

#4.Linear Method (Naive) - For comparison

def Linear(self, num):
    i = 1
    while i ** 2 <= num:
        if i ** 2 == num:
            return True
        else:
            i += 1
    return False
```