1940223_2022-03-04 (number theory functions)

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AIM: Learn number theory functions

- $\tau(n)$ (toteint function) is the number of positive divisors of n
- $\sigma(n)$ (sigma function) is the sum of the positive divisors of n
- $\phi(n)$ (Euler function)is the number of positive integers which are relatively prime to and less than n

NOTE: If $\tau(n)$ is odd, we can say n is a perfect square. We can show this by taking pairs of factors d and n/d, and then showing that the middle term in the ordered sequence of factors is the square root of n.

[22]:
```
# Totient function
def tau(n):
    count = 0
    for i in range(1, n + 1):
        if n % i == 0: count = count + 1
    return count
#========================
# Sigma function
def sigma(n):
    sum = 0
    for i in range(1, n + 1):
        if n % i == 0: sum = sum + i
    return sum
#========================
# Euler's function
def gcd(a, b):
    r = a % b
    if r == 0: return b
    else: return gcd(b, r)
def phi(n):
    count = 0
    for i in range(1, n):
    # 1 and n are never relatively prime with n
        if gcd(i, n) == 1: count = count + 1
    return count
```

1 Check if number is perfect square

[25]:
```
def isPerfectSquare(n):
    if tau(n) % 2 == 1: return True
    else: return False

n = int(input(">> "))
isPerfectSquare(n)
```

```
>> 36
```

[25]:
```
True
```