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Practical No. 13: Verifying Goldbach Conjecture:

Practical based on accepting an even positive integer (greater than 2) from the user and expressing it as sum of two primes.

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Verifying Goldbach Conjecture:

Goldbach Conjecture

The Goldbach Conjecture is a yet unproven conjecture stating that every even integer greater than two is the sum of two prime numbers. The conjecture has been tested up to 400,000,000,000,000.

Goldbach's conjecture is one of the oldest unsolved problems in number theory and in all of mathematics.

For example,

$$4 = 2 + 2$$

$$6 = 3 + 3$$

$$8 = 3 + 5$$

$$10 = 3 + 7 = 5 + 5$$

$$12 = 5 + 7$$

$$14 = 3 + 11 = 7 + 7 \text{ etc.}$$

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Verifying Goldbach Conjecture:

Origins of Goldbach Conjecture

In 1742, the Prussian mathematician Christian Goldbach wrote a letter to Leonhard Euler in which he proposed the following conjecture:

Every integer greater than 2 can be written as the sum of three primes.

He considered 1 to be a prime number, a convention subsequently abandoned. So today, Goldbach's original conjecture would be written:

Every integer greater than 5 can be written as the sum of three primes.

Euler, becoming interested in the problem, answered with an equivalent version of the conjecture:

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Verifying Goldbach Conjecture:

Origins of Goldbach Conjecture

Every even number greater than 2 can be written as the sum of two primes, adding that he regarded this a fully certain theorem ("ein ganz gewisses Theorema"), in spite of his being unable to prove it.

The former conjecture is today known as the "ternary" Goldbach conjecture, the latter as the "strong" or "binary" Goldbach conjecture. The conjecture that all odd integers greater than 9 are the sum of three odd primes is called the "weak" Goldbach conjecture. Both questions have remained unsolved ever since, although the weak form of the conjecture is much closer to resolution than the strong one.

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Verifying Goldbach Conjecture:

Python Code:

```
File Edit View Run Kernel Settings Help True
+ - X [ ] > < Code Python
[ ]: # Verifying Goldbach Conjecture
def isPrime(n):
    for i in range(2,n):
        if n%i == 0:
            return 0
    return 1

def goldbach(no):
    if no%2 != 0:
        return "Error {} is not an even number ".format(no)
    elif no <= 2:
        return "Error {} is not greater than 2, Goldbach Conjecture is observed only in even numbers greater than 2".format(no)
    else:
        for i in range(3,no):
            if isPrime(i) == 1:
                for l in range(i,no):
                    if isPrime(l) == 1:
                        if no == (i+l):
                            print(i,"+",l,"=",no)

no = int(input("Enter Even Number greater than 2: "))
goldbach(no) |
```

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Sample 1 Output:

Enter Even Number greater than 2: 8

$$3 + 5 = 8$$

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Sample 2 Output:

Enter Even Number greater than 2: 10

$$3 + 7 = 10$$

$$5 + 5 = 10$$

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Sample 3 Output:

```
Enter Even Number greater than 2: 14
```

```
3 + 11 = 14
```

```
7 + 7 = 14
```



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Sample 4 Output:

Enter Even Number greater than 2: 56

$$3 + 53 = 56$$

$$13 + 43 = 56$$

$$19 + 37 = 56$$