

# Euler problems

April 24, 2018

Euler Problems

## 1 problem 1

If we list all the natural numbers below 10 that are multiples of 3 or 5, we get 3, 5, 6 and 9. The sum of these multiples is 23.

Find the sum of all the multiples of 3 or 5 below 1000.

```
In [2]: i = 1
        sum = 0
        for i in range(1000):
            if i % 3 == 0:
                sum += i
                #print i
            elif i % 5 == 0:
                sum += i
                #print i
            i += 1
        print sum
```

233168

## 2 problem 2

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

```
In [4]: fibonacci = [1, 2]
        final_sum = 0
        while True:
            sum = fibonacci[len(fibonacci) - 1] + fibonacci[len(fibonacci) - 2]
            if sum >= 4000000:
```

```

        break
    fibonacci.append(sum)
    #print sum
for number in fibonacci:
    if number % 2 == 0:
        final_sum += number
#print " "
#print " "
print "The final sum is: " + str(final_sum)

```

The final sum is: 4613732

### 3 Problem 3

The prime factors of 13195 are 5, 7, 13 and 29.

What is the largest prime factor of the number 600851475143 ?

```

In [13]: from math import sqrt
         i = 2
         factors = []
         prime = []
         #print i

         while i <= sqrt(600851475143):
             if 600851475143 % i == 0:
                 #print i
                 factors.append(i)
             i += 1
         #print "prime numbers:"
         for number in factors:
             x = 2
             while x <= sqrt(number):
                 if number % x == 0:
                     #print str(number) + "fail"
                     break
                 elif x >= sqrt(number) / 2:
                     prime.append(number)
                     #print number
                     break
                 else:
                     x += 1
             continue
         print "max prime number:"
         print max(prime)

```

max prime number:  
6857

## 4 Problem 4

A palindromic number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is  $9009 = 91 \times 99$ .

Find the largest palindrome made from the product of two 3-digit numbers.

```
In [8]: biggest_palindrome = []
        for x in xrange(100, 1000):
            for i in xrange(100, 1000):
                number = str(x * i)
                if number == str(x*i)[::-1]:
                    biggest_palindrome.append(number)
        print max(biggest_palindrome)
```

99999

## 5 Problem 5

2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder.

What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20?

```
In [10]: x = 20
         while True:
             if x % 11 == 0:
                 if x % 12 == 0:
                     if x % 13 == 0:
                         if x % 14 == 0:
                             if x % 15 == 0:
                                 if x % 16 == 0:
                                     if x % 17 == 0:
                                         if x % 18 == 0:
                                             if x % 19 == 0:
                                                 print x
                                                 break
             x += 20
```

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## 6 Problem 6

The sum of the squares of the first ten natural numbers is,

$1^2 + 2^2 + \dots + 10^2 = 385$  The square of the sum of the first ten natural numbers is,

$(1 + 2 + \dots + 10)^2 = 55^2 = 3025$  Hence the difference between the sum of the squares of the first ten natural numbers and the square of the sum is  $3025 - 385 = 2640$ .

Find the difference between the sum of the squares of the first one hundred natural numbers and the square of the sum.

```
In [11]: sum = 0
         for number in xrange(1, 101):
             sum += number
         sumsq = sum ** 2
         naturalsq = 0
         for number in xrange(1, 101):
             naturalsq += number ** 2
         print sumsq - naturalsq
```

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