

# 1 Problems

## 1.1 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.

Language: Python  
Date: 4/11/2016  
Comments:  
Time taken: 5 minutes

Answer: 233168

## 1.2 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.

Language: Python  
Date: 4/11/2016  
Comments: The *sum()* function is pretty neat.  
Time taken: 10 minutes

Answer: 4613732

### 1.3 Problem 3

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

What is the largest prime factor of the number 600851475143?

Language: Python and C++

Date: 4/11/2016

Comments: Using the square root of the number was pretty cool. Still fairly slow with the main loop.

Time taken: 30 minutes

Answer: 6857

### 1.4 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.

Language: Python

Date: 4/11/2016

Comments: `numb[::-1]` is really dodgy.

Time taken: 10 minutes

Answer: 906609

## 1.5 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?

Language: Python and C++

Date: 5/11/2016

Comments: We use the given case and multiply by the primes below the target.

Time taken: 40 minutes

Answer: 232792560

## 1.6 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.

Language: Python

Date: 5/11/2016

Comments: We use  $\frac{n(n+1)}{2}$  to find the sum of the numbers.

Time taken: 10 minutes

Answer: 25164150

## 1.7 Problem 7

By listing the first six prime numbers: 2, 3, 5, 7, 11, and 13, we can see that the 6th prime is 13.

What is the 10 001st prime number?

Language: Python

Date: 5/11/2016

Comments:

Time taken: 5 minutes

Answer: 104743

## 1.8 Problem 8

The four adjacent digits in the 1000-digit number that have the greatest product are  $9 \times 9 \times 8 \times 9 = 5832$ .

Find the thirteen adjacent digits in the 1000-digit number that have the greatest product. What is the value of this product?

Language: Python

Date: 5/11/2016

Comments: Convert to string.

Time taken: 10 minutes

Answer: 23514624000

## 1.9 Problem 9

A Pythagorean triplet is a set of three natural numbers,  $a < b < c$ , for which,

$$a^2 + b^2 = c^2$$

For example,  $3^2 + 4^2 = 9 + 16 = 25 = 5^2$

There exists exactly one Pythagorean triplet for which  $a + b + c = 1000$ .

Find the product  $abc$ .

Language: C++

Date: 5/11/2016

Comments: Nothing too interesting.

Time taken: 15 minutes

Answer: 31875000

## 1.10 Problem 10

The sum of the primes below 10 is  $2 + 3 + 5 + 7 = 17$ .

Find the sum of all the primes below two million.

Language: Java

Date: 5/11/2016

Comments: Sieve of Eratosthenes.

Time taken: 10 minutes

Answer: 142913828922