Euler Project problems 1-25

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.
   1. Find the sum of all the multiples of 3 or 5 below 1000.
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. 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...
   2. By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
3. The prime factors of 13195 are 5, 7, 13 and 29.
   1. What is the largest prime factor of the number 600851475143 ?
4. A palindromic number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is 9009 = 91 × 99.
   1. Find the largest palindrome made from the product of two 3-digit numbers.
5. 2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder.
   1. What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20?
6. The sum of the squares of the first ten natural numbers is,
   1. 12 + 22 + ... + 102 = 385
   2. The square of the sum of the first ten natural numbers is,
   3. (1 + 2 + ... + 10)2 = 552 = 3025
   4. 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.
   5. Find the difference between the sum of the squares of the first one hundred natural numbers and the square of the sum.
7. By listing the first six prime numbers: 2, 3, 5, 7, 11, and 13, we can see that the 6th prime is 13.
   1. What is the 10 001st prime number?
8. The four adjacent digits in the 1000-digit number that have the greatest product are 9 × 9 × 8 × 9 = 5832.
   1. 73167176531330624919225119674426574742355349194934  
      96983520312774506326239578318016984801869478851843  
      85861560789112949495459501737958331952853208805511  
      12540698747158523863050715693290963295227443043557  
      66896648950445244523161731856403098711121722383113  
      62229893423380308135336276614282806444486645238749  
      30358907296290491560440772390713810515859307960866  
      70172427121883998797908792274921901699720888093776  
      65727333001053367881220235421809751254540594752243  
      52584907711670556013604839586446706324415722155397  
      53697817977846174064955149290862569321978468622482  
      83972241375657056057490261407972968652414535100474  
      82166370484403199890008895243450658541227588666881  
      16427171479924442928230863465674813919123162824586  
      17866458359124566529476545682848912883142607690042  
      24219022671055626321111109370544217506941658960408  
      07198403850962455444362981230987879927244284909188  
      84580156166097919133875499200524063689912560717606  
      05886116467109405077541002256983155200055935729725  
      71636269561882670428252483600823257530420752963450
   2. Find the thirteen adjacent digits in the 1000-digit number that have the greatest product. What is the value of this product?