

README

April 21, 2016

Contents

1 Problem 1: Multips of 3 and 5	1
2 Problem 2: Even Fibonacci Numbers	1
3 Problem 3: Largest Prime Factor	2
4 Problem 4: Largest Palindrome Product	3
5 Problem 5: Smallest Multiple	5
6 Problem 6: Sum Square Difference	6
Project Euler Problems	

1 Problem 1: Multips of 3 and 5

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.

```
./1.rb
```

```
multiples = (1..999).select{|i| i%3 == 0 || i%5 == 0}
```

```
p multiples.inject(0) {|sum, p| sum+p}
```

2 Problem 2: Even Fibonacci Numbers

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.

`./2.rb`

```
def fib(n)
  # creates a Fibonacci sequence up to last number <= 4million
  # n = 7

  # [1,2]
  # [1,2,3]
  # [1,2,3,5]
  # [1,2,3,5,8]
  # [1,2,3,5,8,13]
  # [1,2,3,5,8,13,21]

  fib = [1,2]

  while fib.last <= n
    fib.push (fib.last + fib[(fib.count-2)])
  end

  evens = fib.select{|i| i%2==0}

  p evens.inject(0){|sum,x| sum+x}
end

fib(4000000)
```

3 Problem 3: Largest Prime Factor

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

What is the largest prime factor of the number 600851475143?

`./3.rb`

```
require 'prime'

def get_factors(n)
```

```

prime_array = []
p = 2

if n < 2
  return p
end

while p < n
  if n%p == 0 && Prime.prime?(p)
    prime_array.push(p)
    p prime_array
  end
  p +=1
end

return prime_array
end

p get_factors(600851475143)

```

4 Problem 4: Largest Palindrome Product

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.

```

./4.rb

def is_palindrome?(n)
  string = n.to_s
  mid = string.length/2

  a = string[0...mid]

  if string.length.even?
    b = string[mid..-1]
  else
    b = string[mid+1..-1]
  end
end

```

```

    a == b.reverse
end

def get_factors_max(high,low)

  prods = {}
  pals = []

  high.downto(low).each do |i|

    a = i
    b = i

    until b == low-1
      if is_palindrome?(a*a)
        puts "PAL"
        prods["#{a}*({a})"] = a*a
        puts prods["#{a}*({a})"]
        pals.push a*a
      else
        if is_palindrome?(a*(b-1))
          puts "PAL"
          prods["#{a}*({b-1})"] = a*(b-1)
          puts prods["#{a}*({b-1})"]
          pals.push a*(b-1)
        end
      end
      b = b-1
    end

  end

  max = pals.max

  return pals
end

def largest_palindrome

```

```

a = 999.downto(100).to_a
a2 = a

high = 999
highest_possible = 999*999
low = 100
lowest_possible = 100*100

get_factors_max(high,low)

end

p largest_palindrome
p largest_palindrome.max

```

5 Problem 5: Smallest Multiple

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?

```

./5.rb

i = 20

while (i%2 != 0 ||
      i%3 != 0 ||
      i%4 != 0 ||
      i%5 != 0 ||
      i%6 != 0 ||
      i%7 != 0 ||
      i%8 != 0 ||
      i%9 != 0 ||
      i%10 != 0 ||
      i%11 != 0 ||
      i%12 != 0 ||
      i%13 != 0 ||
      i%14 != 0 ||
      i%15 != 0 ||
      i%16 != 0 ||
      i%17 != 0 ||

```

```

                                i%18 != 0 ||
                                i%19 != 0 ||
                                i%20 != 0)

        i = i+1
    end

p i

```

6 Problem 6: Sum Square Difference

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.

```

./6.rb

range = (1..100)
squares = range.map { |i| i*i }
sum_squares = squares.inject(0) { |sum, i| sum + i }

sum = range.inject(0) { |sum, i| sum + i }

p sum**2 - sum_squares

```