
Euler Problem #123: Prime Square Remainders

All the prime numbers until ten million (there are 664579)

```
In[224]:= primelist = Select[Range[10 000 000], PrimeQ[#] &];
```

```
In[225]:= Length@primelist
```

```
Out[225]= 664 579
```

Perform the calculation that was given in the problem and return a list of (n, nth prime number, nth prime square remainder)

This 'prime square remainder' is described on the problem page, it's a little hard to describe

```
In[230]:= calculatedNums = {#, primelist[[#]], Mod[(primelist[[# + 1]]^2 + primelist[[# - 1]]^2),  
primelist[[#]]^2]} & /@ Range[2, 664 578];
```

Showing the test case (the remainder first exceeds 10^9 when $n=7037$)

```
In[238]:= calculatedNums[[7035 ;; 7037]]
```

```
Out[238]= {{7036, 71 039, 568 968}, {7037, 71 059, 5 047 960 801}, {7038, 71 069, 284 520}}
```

Select the terms of the list for which the remainder exceeds 10^{10} , and it turns out that the remainder first does this when $n=9595$

```
In[241]:= wantedNums = Select[calculatedNums, #[[3]] > 1010 &];
```

```
In[243]:= wantedNums[[1]]
```

```
Out[243]= {9595, 100 043, 10 005 000 913}
```