

# Circular primes

## Problem 35 (<http://projecteuler.net/problem=035>)

The number, 197, is called a circular prime because all rotations of the digits: 197, 971, and 719, are themselves prime.

There are thirteen such primes below 100: 2, 3, 5, 7, 11, 13, 17, 31, 37, 71, 73, 79, and 97.

How many circular primes are there below one million?

## Solution

```
In [1]: ▶ def prime(m=0):
        if m > 2:
            yield 2
        if m > 3:
            yield 3
        p, n, q = 5, 3, 9
        while (not m) or (p < m):
            if all(p % x for x in range(3, n+1, 2)):
                yield p
            p += 2
            while p > q:
                q += n
                n += 1
                q += n

        ptable = list(prime(1000000))

        def isprime(n):
            if n <= ptable[-1]:
                return n in ptable
            q = int(n ** 0.5) + 1
            for x in ptable:
                if n % x == 0:
                    return False
                if x > q:
                    return True
            if q > ptable[-1]:
                for x in range(ptable[-1], q, 2):
                    if n % x == 0:
                        return False
            return True

        def iscircular(n):
            n = str(n)
            return all(isprime(int(n[i:]+n[:i])) for i in range(1, len(n)))

        print(len([x for x in ptable if iscircular(x)]))
```

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