Exercise 1

10^12 calculations would have to be made and since we are able to calculate at 10^6/s 9\*(10^11)/(10^6) ≈ 10^6

It would take 10^6 seconds to compute the prime factors.

Exercise 2

The amount of primes in range 0 to x is approximately x/log(x).

The amount of primes in range 0 to 10^12 is 10^12/log(10^12), however we only have to test primes of order 12 so we can subtract 10^11/log(10^11) we get approximately 6.78\*10^10 primes. The amount of primes divided by the 10^6 calculations/s gives a total computation time of 6.78\*10^4s, making computation time 100x faster.

It requires storing (6.78\*10^10) 12 digit numbers. If each 12 digit number is 5 bytes, then we would need 5\*(6.78\*10^10) bytes of memory. This is about 300 gigabytes which would cost about 500SEK.