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Operation Prime Factors

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Abstract

Sometimes factorization is easy. In this article we will be seeing a simple algorithm. It involves solving some simple equations of one variable. We will do this to reduce the size of the given number X. Everytime when X is divided by a prime number its size gets reduced. Secondly we look for a particular condition for X = A.B + r = (A + a).(B - b); if b is an integer or not. We will be using simple arithmetic and put it in the simplest way.

Keywords: Prime Number, Integer Factorization, Fundamental Theorem Of Arithmetic.

Introduction

Here is a simple algorithm to find all the factors. We will be using prime numbers for that. This will not work only when the Fundamental theorem of arithmetic is wrong. For X is a composite number there is a prime number to factorize it. We do that by using the prime numbers less than X.

Theory:

Let X = ax + b; and x is a prime number. The divisor x takes 2, 3, 5 and so on; accordingly x gets decreased. If b =/= 0 for all cases a <= x; then X is a prime number.

OPERATION_PRIME_FACTORS

Part 1.

```
  {
i=0, c=0, y=0
     divide X by D[i]   // D[i] contains prime numbers in increasing order

     if ( D[i] is a multiple of X )
       {
         c = c + 1
         X = q           // q and y are quotient and remainder respectively
print  ( D[i] is a factor of X )
           }
     repeat Part 1 if D[i] or D[i+1]  exactly divides X
     }
```

Part 2.

```
   {
    repeat 2.1, 2.1 2.3 if ( D[i] <= q )
    2.1. d = difference_( D[i], D[i+1] )
    2.2. q = quotient_( D[i], q, y, d )
    2.3. y = remainder_( D[i+1], R, y )
    }
```

Part. 2.1. difference_(D[i], D[i+1])

```
    {
      d = D[i+1] - D[i]
      return d
       }
```

Part. 2.2. quotient_(D[i], q, y, d)

Let X = A.B + r = (A + a).(B - b). If b is an integer then X is prime.

If (A + a) does not exactly divide (B.a - r) then take R as the remainder.

Let A, B and r be represented by D[i], q, y respectively.

```
      {
       b = (q*d - y)/( D[i+1] )
       if ( (q*d - y) is a multiple of D[i+1] )
         {
          c = c + 1
print  ( D[i+1] is a factor of X )
          q = q - b
          X = q
             }
         else: ( q = q - int b )
       return q
         }
```

Part. 2.3. remainder_(D[i+1], R, y)

Let X = (A + a).(B - b) = K.(B - n.K - R), where n.k is int b.

Therefore remainder in K - R

```
    if ( R> 0 )
    {
      y = D[i+1] - R
```

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Part 3.

```
{
 if ( c == 0 )
    print ( X is a prime number )
 else
    print ( X is a composite number )
  }
```

Conclusion

The algorithm ends only when all the factors are found ar confirms that X is a prime number. In any of the steps mentioned above no big calculations are included. The numbers involved in Part.2.2 will be much smaller for large values of X. Since all prime numbers less than X indirectly or directly divide it, the conclusion can't be wrong.

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Conflict of Interest

No known conflict of interest.

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