

SoNguyenTo.cpp X

LyThuyetSo_01 > SoNguyenTo.cpp > ...

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```
1 #include <iostream>
2 #include <cmath>
3 using namespace std;
4 // O(log29N)
5 // O: Big O notation
6 bool isPrimeNum(long long); // O(log29N)
7 // so nguyen to chi co 2 uoc la 1 va chinh no
8 int main()
9 {
10     long long n;
11     cin >> n;
12     if (isPrimeNum(n))
13         cout << "YES";
14     else
15         cout << "NO";
16     return 0;
17 }
18
19 bool isPrimeNum(long long n)
20 {
21     if (n < 2)
22         return false;
23     for (long long i = 2; i <= sqrt(n); i++)
24         if (n % i == 0)
25             return false;
26     return true;
27 }
```

DemUoc.cpp 1 X

LyThuyetSo_02 > DemUoc.cpp > ...

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```
1  #include <iostream>
2  using namespace std;
3
4  // 1s co xap xi 10^7 vong lap
5  int DemUoc(long long);
6
7  int main()
8  {
9      long long n;
10     cin >> n;
11     int kq = DemUoc(n);
12     cout << kq;
13     return 0;
14 }
15
16 int DemUoc(long long n) // O(log2(N))
17 {
18     int dem = 0;
19     for (long long i = 1; i <= sqrt(n); i++)
20     {
21         if (n % i == 0)
22         {
23             dem++;
24             if (i != n / i)
25                 dem++;
26         }
27     }
28     return dem;
29 }
```

SoThuanNghich.cpp X

LyThuyetSo_03 > SoThuanNghich.cpp > ...

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```
1  #include <iostream>
2  using namespace std;
3
4  bool isRevNum(long long);
5
6  int main()
7  {
8      long long n;
9      cin >> n;
10
11     if (isRevNum(n) == true)
12         cout << "YES";
13     else
14         cout << "NO";
15
16     return 0;
17 }
18
19 bool isRevNum(long long n)
20 {
21     long long temp = n;
22     long long rev = 0;
23     for (long long t = n; t != 0; t /= 10)
24     {
25         rev = rev * 10 + t % 10;
26     }
27     return (temp == rev);
28 }
```

Fibo2.cpp

LyThuyetSo_04 > Fibo2.cpp > ...

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```
1  #include <iostream>
2  using namespace std;
3
4  bool isFibo(long long);
5
6  int main()
7  {
8      long long n;
9      cin >> n;
10     if (isFibo(n) == true)
11         cout << "YES";
12     else
13         cout << "NO";
14     return 0;
15 }
16
17 bool isFibo(long long n)
18 {
19     long long F0 = 0, F1 = 1, Fn;
20     // 2 trường hợp khởi tạo => là số fibo
21     if (n == 0 || n == 1)
22         return true;
23     for (int i = 3; i <= 93; i++)
24     {
25         Fn = F0 + F1;
26         F0 = F1;
27         F1 = Fn;
28         if (Fn == n)
29             return true;
30     }
31     return false;
32 }
```

SoFibonacci.cpp X

LyThuyetSo_05 > SoFibonacci.cpp > ...

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```
1  #include <iostream>
2  using namespace std;
3
4  void Fibo();
5
6  int main()
7  {
8      Fibo();
9      return 0;
10 }
11
12 void Fibo()
13 {
14     cout << "0 1" << endl;
15     long long F0 = 0, F1 = 1;
16     for (int i = 3; i <= 93; i++)
17     {
18         long long Fn = F0 + F1;
19         cout << Fn << endl;
20         F0 = F1;
21         F1 = Fn;
22     }
23 }
```

Legendre_Algorithm.cpp X

LyThuyetSo_06 > Legendre_Algorithm.cpp > ...

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```
1
2 // dem so luong so nguyen to p trong n! (p là so bat kì la so nguyen to)
3 // Ap dung Legendre Algorithm
4 // Cong thuc:
5 //  $Lg(p, n!) = n / p^1 + n / p^2 + \dots + n / p^k$  (Dk:  $p^k \leq n$ )
6
7 #include <iostream>
8 using namespace std;
9
10 int main()
11 {
12     long long n;
13     cin >> n;
14     long long dem = 0;
15     for (long long p = 5; p <= 5; p *= 5)
16     {
17         dem += n / p;
18     }
19     cout << dem;
20     return 0;
21 }
```

G- GCD_LCM.cpp X


LyThuyetSo_07 > G- GCD_LCM.cpp > fx lcm(ll, ll)

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```
1 // Ly thuyet so
2 // GCD(UCLN): uoc chung lon nhat
3 // LCM(BCNN): boi chung nho nhat
4 // do phuc tap:  $O(\log_2(\max(a, b)))$ : LogN
5 /*
6     Euclid Algorithm:
7     Base case (dk):
8     + khi  $b = 0 \Rightarrow a$  la GCD cua a va b
9     B1: gan gia tri b cho a
10    B2:  $b = a(\text{truoc}) \bmod b$ 
11    B3: lap lai toi khi  $b = 0 \Rightarrow$  GCD la a
12 */
13 // muc do uu tien: (), * / % va tu trai sang phai, + -
14 // GCD co san trong C++ => khai bao thu vien => nhap __gcd(a, b)
15 // #include <algorithm>
16
17 #include <iostream>
18 #include <algorithm>
19 #define ll long long
20
21 using namespace std;
22 // Euclid Algorithm
23 // UCLNN
24 ll gcd(ll a, ll b)
25 {
26     while (b != 0)
27     {
28         ll r = a % b;
29         a = b;
30         b = r;
31     }
32     // loop end when b equal 0
33     return a;
34 }
35
36 //BCNN
37 ll lcm(ll a, ll b)
38 {
39     return a * b / gcd(a, b);
40 }
41
42 int main()
43 {
44     ll a, b;
45     cin >> a >> b;
46     cout << gcd(a, b) << " " << lcm(a, b);
47     return 0;
48 }
```

PhanTichThuaSoNguyenTo.cpp 1 X

LyThuyetSo_08 > PhanTichThuaSoNguyenTo.cpp > ...

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```
1  /*
2   Phan tich thua so nguyen to (  $O(\log^2 N)$  )
3   end loop when the last number is 1
4  */
5
6  #include <iostream>
7  #define ll long long
8  using namespace std;
9
10 // tham so dau vao n ko phai la so nguyen to
11
12 void PtThuaSoNguyenTo(ll n)
13 {
14     for (int i = 2; i <= sqrt(n); i++)
15     {
16         if (n % i == 0)
17         {
18             while (n % i == 0)
19             {
20                 cout << i << " ";
21                 n /= i;
22             }
23         }
24     }
25     // neu n sau khi chia het ma n van khac 1 => la so nguyen to
26     if (n != 1)
27         cout << n;
28 }
29
30 int main()
31 {
32     ll n;
33     cout << "Nhap so can phan tich: ";
34     cin >> n;
35     cout << "\nCac thua so nguyen to cua n: ";
36     PtThuaSoNguyenTo(n);
37     return 0;
38 }
```


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```

1  /*
2      CAC CONG THUC KHONG CAN DUNG TOI LOOP
3      Do phuc tap la O(1)
4
5      * Phan tich thua so nguyen to
6      -  $n = p_1^{e_1} * p_2^{e_2} * \dots * p_k^{e_k}$ 
7      - voi moi p la thua so nguyen to
8      TU PT THUA SO NGUYEN TO => SO LUONG UOC
9
10     * So luong uoc cua N: ki hieu d(n)
11     -  $d(n) = (e_1 + 1)(e_2 + 1) \dots (e_k + 1)$ ;
12
13     * Tich tat ca cac uoc cua N: ki hieu la q(n)
14     - CTH TONG QUAT (chia int / int = int)
15     -  $q(n) = n^{(d(n)-1)/2}$ 
16     vd: n = 12
17      $d(12) = (2+1)(1+1) = 6$ 
18      $q(12) = 12^{(6-1)/2} = 12^2 = 144$ 
19     12: cac uoc (1 2 3 4 6 12)
20     1 x 12 = 12
21     2 x 6 = 12
22     3 x 4 = 12
23     => Tich bang 12 * 12 = 12^2 = 144: so luong uoc chia doi
24     - Neu la SO CHINH PHUONG thi d(n) la so le
25     =>  $q(n) = n^{(d(n)-1)/2} * \text{sqrt}(n)$ 
26     vd: n = 16
27      $d(16) = (4+1) = 5$ 
28      $q(16) = 16^{(5-1)/2} * \text{sqrt}(16) = 16^2 * 4 = 65536$ 
29     16: cac uoc (1 2 4 8 16)
30     1 x 16 = 16
31     2 x 8 = 16
32     4
33     Tich bang 16 * 16 * 4 = 16^2 * 4 = 1024 * 4 = 4096
34 */

```

```

E: DongDu.cpp X
LyThuyetSo_10 > E: DongDu.cpp > f: main()
  Click here to ask Blackbox to help you code faster
1  /*
2  LY THUYET dong du
3  - MODULAR (MODULO)
4  - Khong dung ham POW dc vi trong ham pow phai tinh toan xong moi mod dc
5  - Con dong du phai mod trong qua trinh
6  - Dung khi ket qua VUOT TRAN DU LIEU LONG LONG
7  - CAC CONG THUC:
8      1)  $(A + B) \bmod C = (A \bmod C + B \bmod C) \bmod C$ 
9          + (de khong bi tran so)
10         + C thuong la  $1e9+7$ , va C la int
11         + C thuong la  $10^{15}$  va C la Long Long
12         + Gia tri sau khi mod deu thuoc trong Long Long
13      2)  $(A * B) \bmod C = [(A \bmod C) * (B \bmod C)] \bmod C$ 
14          + Tuong tu nhu phep cong
15      3)  $A^B \bmod C = [(A \bmod C)^B] \bmod C$ 
16      4)  $(A / B) \bmod C = [(A \bmod C) * B^{(-1) \bmod C}] \bmod C$ 
17  */
18 #include <iostream>
19 #include <cmath>
20 #define ll long long
21 #define mod 1000000007
22 using namespace std;
23
24 // De bai:  $(a)^b \bmod c$ 
25 int main()
26 {
27     int a, b;
28     cin >> a >> b;
29     // a, b <=  $10^9 \Rightarrow$  dung binary search
30     ll tich = 1;
31     // Neu a, b <=  $10^9$ 
32
33     for (int i = 1; i <= b; i++)
34     {
35         tich *= a; // tich se bi tran Long Long
36         // nhan sau khi roi mod qua moi vong Lap
37         tich %= mod; // cach lam du va dung
38     }
39
40     cout << tich % mod;
41
42     return 0;
43 }
44
45 /* Bai: 1
46 De bai:  $(a + b) \bmod c$  (a, b, c <=  $10^{18}$ )
47 */
48 /*
49 int main()
50 {
51     ll a, b, c;
52     /* Cach lam sai
53     a = LLONG_MAX, b = LLONG_MAX, c = LLONG_MAX;
54
55     cout << (a + b) % c;
56
57     cout << LLONG_MAX << endl;
58     a = LLONG_MAX, b = LLONG_MAX, c =  $1e9+7$ ;
59     cout << (a % c + b % c) % c;
60
61     return 0;
62 }

```

G: PhiHamEuler.cpp X

LyThuyetSo_11 > G: PhiHamEuler.cpp > ...

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```
1  /*
2     LyThuyet:
3     - Dem so nguyen to cung nhau, nhan tu gia tri tu 1 -> n
4     - dau || trong cong thuc la tich
5     - Cth:
6     +  $\phi(n) = n * (1 - 1/p_1) * (1 - 1/p_2) \dots$ 
7     + P la cac thua so nguyen to
8  */
9
10 // Buoi06.1
11 #include <iostream>
12 #include <cmath>
13 using namespace std;
14
15 long long Euler(long long);
16
17 int main()
18 {
19     long long n;
20     cin >> n;
21     cout << Euler(n);
22     return 0;
23 }
24
25 long long Euler(long long n)
26 {
27     long long res = n;
28     for (long long i = 2; i <= sqrt(n); i++)
29     {
30         if (n % i == 0)
31         {
32             while (n % i == 0)
33             {
34                 n /= i;
35                 // cong thuc
36             }
37             res = res - res / i;
38             // kiem tra neu i la thua so ngto
39         }
40         // neu n khac => n la thua so nguyen to cuoi cung
41     }
42     if (n != 1)
43     {
44         res = res - res / n;
45     }
46     return res;
47 }
```