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1 Section1

1.1 basic

```

1 #include <bits/stdc++.h>
2 using namespace std;
3 #define ll long long
4
5 int main() {
6
7     cout<<"for define \n";
8     return 0;
9 }

```

2 Section2 Math

2.1 GCD

```

1 #include<iostream>
2 using namespace std;
3 int GCD(int x,int y){
4     while(y != 0){
5         return GCD(y,x%y);
6     }
7     return x;
8 }
9
10 int main(){
11     int a,b;
12     cin>>a>>b;
13     int gcd = GCD(a,b);
14     int lcm = a*b/gcd;
15
16     cout<<"最大公因數為: "<<gcd<<' \n';
17     cout<<"最小公倍數為: "<<lcm<<' \n';
18     return 0;
19 }

```

3 Section3 String

3.1 string

```

1 #include<iostream>
2 #include<string>
3 using namespace std;
4
5 int main(){
6     //初始化字串
7     string s1 = "",s2 = "";
8     long long a;
9     int b;
10
11     //吃整行(含空格)
12     getline(cin,s1);
13
14     //compare,assign,串接
15     s1 == s2;
16     s1 = s2;
17     s1 += s2[i];
18
19     //字串切割,i:起始位置,len:幾個
20     s1 = s1.substr(i,len);
21
22     //轉成數字或數字轉字串
23     s1 = to_string(a);
24     s2 = to_string(b);
25     a = stoll(s1);
26     b = stoi(s2);
27
28     //判斷數字,字母
29     isdigit(s1[i]);
30     isalpha(s2[i]);
31     return 0;
32 }

```

4 Section4 小工具

4.1 permutation

```

1 #include<iostream>
2 #include<algorithm>
3 using namespace std;
4
5 int main(){
6     string a = "abc";
7     string b = "cba";
8     sort(a.begin(),a.end());
9     do{
10         cout<<a<<"\n"; //把更新的字串印出
11     }while(next_permutation(a.begin(),a.end())); //產生下一個排列
12
13     bool isSamePer =
14         is_permutation(a.begin(),a.end(),b.begin()); //檢查b字串
15
16     prev_permutation(a.begin(),a.end()); //產生上一個排列結果
17
18     return 0;
19 }

```

5 Section5 Graph

5.1 kruskal

```

1 #define maxn 200005
2 #define MP make_pair
3 int N,M;
4 int par[maxn],Rank[maxn];
5 vector<pair<int,int>> G[maxn*2]; //雙向邊,所以x2
6
7 struct edge{
8     int x,y,w;
9     bool operator<(const edge& rhs) const{

```

```

10     return w<rhs.w;
11 }
12 }e[maxn*2]; //雙向邊，所以x2
13
14 int Find(int a){
15     return par[a]==a?a:(par[a] = Find(par[a]));
16 }
17
18 bool Union(int a, int b){
19     a = Find(a);
20     b = Find(b);
21     if(a==b) return false;
22     int tmp = Rank[a] + Rank[b];
23     if(Rank[a]>=Rank[b]){
24         Rank[a] = tmp;
25         par[b] = a;
26     }
27     else{
28         par[a] = b;
29         Rank[b] = tmp;
30     }
31     return true;
32 }
33
34 void kruskal(){
35     for(int i=0; i<N; i++){
36         G[i].clear();
37         par[i] = i;
38         Rank[i] = 1;
39     }
40     int m = 0, tot = 0;
41     for(int i=0,u,v,w; i<M; i++){
42         scanf("%d %d %d",&u,&v,&w);
43         e[m++] = edge{u,v,w};
44         e[m++] = edge{v,u,w};
45         tot += w;
46     }
47     sort(e,e+m);
48
49     int mst = 0, cost = 0;
50     for(int i=0,u,v,w; i<m; i++){
51         u = e[i].x;
52         v = e[i].y;
53         w = e[i].w;
54         if(Union(u,v)){
55             cost += w;
56             mst++;
57             G[u].push_back(MP(v,w));
58             G[v].push_back(MP(u,w));
59         }
60         if(mst==N-1)
61             break;
62     }
63     printf("%d\n",tot-cost);
64 }

```

5.2 floyd

```

1 //N為點的個數，G為記錄路徑長的二維振烈
2 for(int k=0; k<N; k++){
3     for(int i=0; i<N; i++){
4         for(int j=0; j<N; j++){
5             G[i][j]=min(G[i][j],G[i][k]+G[k][j]);
6         }
7     }
8 }

```

5.3 Dijkstra

```

1 struct Data{
2     int u,w;
3     bool operator<(const Data&rhs) const
4     {

```

```

5         return w>rhs.w;
6     }
7 };
8
9 void sol(int s){
10     memset(d,0x3f,sizeof(d));
11     memset(vis,0,sizeof(vis));
12     d[s] = 0;
13     priority_queue<Data> pq;
14     pq.push(Data{s,0});
15
16     while(!pq.empty()){
17         Data k = pq.top();
18         pq.pop();
19         int u = k.u;
20         if(vis[u]) continue;
21         vis[u] = 1;
22
23         for(int i=0; i<G[u].size(); i++){
24             int v = G[u][i].first, w = G[u][i].second;
25             if(d[v]>d[u]+w){
26                 d[v] = d[u] + w;
27                 pq.push(Data{v,d[v]});
28             }
29         }
30     }
31 }

```

6 Java

6.1 java biginterger

```

1 import java.io.*;
2 import java.util.*;
3 import java.math.BigInteger;
4
5 public class bigint {
6     public static void main(String args[]) {
7         Scanner cin = new Scanner(System.in);
8         //Java大數運算宣告BigInteger
9         //首先宣告plus代表做加法運算
10        BigInteger plus = BigInteger.valueOf(0);
11        //首先宣告minus代表做減法運算
12        BigInteger minus = BigInteger.valueOf(0);
13        while ( cin.hasNext() ) {
14            //接下來讀入一整行字串
15            String str = cin.next();
16            //宣告num代表讀入進來的一整行數字
17            //然後把str丟到BigInteger num裡面
18            BigInteger num = new BigInteger(str);
19            if ( str.equals("0") ) break;
20            else {
21                plus = plus.add(num);
22                minus = minus.subtract(num);
23            }
24        }
25        System.out.print("The plus sum is " + plus +
26            "\n");
27        System.out.print("The minus sum is " + minus
28            + "\n");
29    }
30 }

```

7 數學公式

7.1 thm

• 中文測試

$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6}$$