

```
//
```

```
#include<iostream>
#include<cstdio>
#include<iomanip>
#include<cassert>
#include<string>
#include<cmath>
#include<iostream>
#include<cmath>
#include<sstream>
#include<stdio.h>
#include<stdlib.h>
using namespace std;
```

```
const int N = 100;
int A[N];
const int M = 7;
int gap[M];
int maxm;
bool done;
int kount = 0;
```

```
void initgap()
{
    gap[0] = 1;
    int m = 0;
    done = false;
    while(not done)
    {
        gap[m+1] = 2*gap[m] + sqrt(gap[m]);
        if(gap[m+1] > N)
            done = true;
        else m++;
    }
    maxm = m;
}
```

```
void writegap()
{
    for(int m = 0; m <= maxm; m++)
        cout << " gap[" << m << "] = " << gap[m];
    cout << endl;
}
```

```
void swap(int&x, int&y)
{
    int z = x;
    x = y;
    y = z;
}
```

```
void writeA()
{
    for(int i = 0; i < N; i++)
        if(i%20-19)
            cout << A[i] << " ";
        else cout << A[i] << endl;
    cout << endl;
}
```

```
void initA()
{
    for(int i = 0; i < N; i++)
        A[i] = rand()%899 + 100;
}
```

```

void sort(int A[N])
{
    for(int m = maxm; m >= 0; m--)
        if(gap[m] < N)
        {
            int g = gap[m];
            done = false;
            while(not done)
            {
                done = true;
                for(int i = g; i < N; i++)
                    if(A[i] < A[i-g])
                    {
                        swap(A[i],A[i-g]);
                        done = false;
                        kount++;
                    }
            }
        }
}

int main()
{
    srand(1);
    initA();
    writeA();
    cout << "N = " << N << endl;
    initgap();
    cout << "maxm = " << maxm << endl;
    writegap();
    sort(A);
    cout << "kount = " << kount << endl;
    writeA();
    return 1;
}

```

```
978 167 103 386 987 335 448 298 582 215 842 640 867 943 998 384 594 966 724 231
948 163 578 903 748 784 598 739 145 595 794 928 663 702 220 556 937 569 659 520
589 502 965 457 351 870 647 845 742 372 882 691 341 461 596 989 151 100 729 101
595 524 930 259 133 955 620 970 430 280 397 825 587 363 283 839 139 735 590 782
913 378 474 255 739 875 150 791 875 779 792 472 209 628 536 242 490 158 119 820
```

```
N = 100
```

```
maxm = 5
```

```
gap[0] = 1 gap[1] = 3 gap[2] = 7 gap[3] = 16 gap[4] = 36 gap[5] = 78
```

```
kount = 327
```

```
100 101 103 119 133 139 145 150 151 158 163 167 209 215 220 231 242 255 259 280
283 298 335 341 351 363 372 378 384 386 397 430 448 457 461 472 474 490 502 520
524 536 556 569 578 582 587 589 590 594 595 595 596 598 620 628 640 647 659 663
691 702 724 729 735 739 739 742 748 779 782 784 791 792 794 820 825 839 842 845
867 870 875 875 882 903 913 928 930 937 943 948 955 965 966 970 978 987 989 998
```

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//
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