Algorithm Programming Assignment #2

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Code:

```
int main() {
    int n;
    cin>>n;
    int A[n];
    int B[n];
    for (int i=0; i<n; i++) {          //輸入兩數列
        cin>>A[i];
    }
    for (int i=0; i<n; i++) {
        cin>>B[i];
    }
    int A_begin=0, B_begin=0;          //紀錄目前的開頭、結尾
    int A_end=n-1, B_end=n-1;
    int A_mid,B_mid;

//用while每次把陣列長度砍半，直到長度為2，因此執行O(lgn)次
//每次設mid為陣列中間的element，比較A_mid、B_mid，較大的把後半段砍掉，較小的把前半段砍掉

    while ((A_end-A_begin+1)>=3 && (B_end-B_begin+1)>=3) {
        A_mid = (A_begin + A_end)/2;
        B_mid = (B_begin + B_end)/2;
        if ( A[A_mid] > B[B_mid] ) {
            if ((A_end-A_begin+1)%2==1) {
                A_end=A_mid;
                B_begin=B_mid;
            }
            else{
                A_end=A_mid+1;
                B_begin=B_mid;
            }
        }
        else{
            if ((A_end-A_begin+1)%2==1) {
                B_end=B_mid;
                A_begin=A_mid;
            }
            else{
                B_end=B_mid+1;
                A_begin=A_mid;
            }
        }
    }

//找出剩下四個元素中間的兩個，相加除二
    int ans=0;
    if (A[A_begin]>B[B_begin]) {
        ans+=A[A_begin];
    }
    else{
        ans+=B[B_begin];
    }
    if (A[A_end]>B[B_end]) {
        ans+=B[B_end];
    }
    else{
        ans+=A[A_end];
    }
    cout<<(ans/2)<<endl;
```

```
    return 0;
}
```

execute time:

O(lg n) time algorithm:

n=1000

```
ans = 4893345
time = 37
Program ended with exit code: 0
```

n=100000

```
ans = 5006983
time = 36
Program ended with exit code: 0
```

O(nlgn) time algorithm:

n=1000

```
ans = 4893345
time = 45
Program ended with exit code: 0
```

n=100000

```
time = 4507
ans = 5006983
Program ended with exit code: 0
```

由於nlgn 和 lgn差了n倍
因此若n變大，時間差就變很大