Manacher's Algorithm

Problem

Find the longest palindromic substring of any given string .

a b a a d a a x z
1 2 1 1 3 1 1 1 1

a b c b c b a
1 1 2 4 2 1 1

a b b a
1 1 1 1

a b a c a b a c a b b
1 2 1 4 1 5 1 3 1 1 1

a b b a
1 1 1 1

a # b # b # a
1 2 1 2 5 2 1 2 1
0 1 0 1 4 1 0 1 0

```
///0 based index
///d1[i] = i center dhore koyta odd palindrome ase
///d2[i] = koyta even , 2 ta mider 2nd ta center
void manacher() {
    int l = 0, r = -1;
    for(int i=0;i<n;i++) {
    int k = (i > r ? l : min(d1[l+r-i], r-i));
    while(i-k >= 0 && i+k < n && a[i-k] == a[i+k]) ++k;
    d1[i] = k--;
    if(i+k > r) l = i-k, r = i+k;
    }
    l = 0, r = -1;
    for(int i=0;i<n;i++) {
    int k = (i > r? 0: min(d2[l+r-i+1], r-i+1))+1;
    while(i-k >= 0 && i+k-1 < n && a[i-k] == a[i+k-1]) ++k;
    d2[i] = --k;
    if(i+k-1 > r) l = i-k, r = i+k-1;
    }
}
```

```
s  = a b b a
d1 = 1 1 1 1
d2 = 0 0 2 0
```

```
a b c c b a
1 1 1 1 1 1
0 0 0 3 0 0
```

```
a b a c a b a c a b b
1 2 1 4 1 5 1 3 1 1 1
0 0 0 0 0 0 0 0 0 0 1
```

Problem

Minimum Number of characteres needed to append at the end of a string to make it palindrome.

d c a b b a
1 1 1 1 1 1
0 0 0 0 2 0