

# Solutions for Program Assignment 1

CSCI2100A

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## 1 Exercise 1.15

**Analysis:** The most intuitive implementation is to convert both the decimal numbers into binary ones. Then compare them bit by bit. A easier way without converting is to directly divide 2 until both of them are 0. In each step, if the results of mod 2 are different, add the answer by 1. One place you should pay attention to is that if you stop the while loop when any one of them is 0, you will be wrong on the case like 65535 and 0. The sample code is shown below.

```
#include <stdio.h>

int main()
{
    int T, a, b, ans, i;

    scanf("%d", &T);
    for (i = 0; i<T; i++) {
        scanf("%d%d", &a, &b);
        ans = 0;
        while (a || b) { /*stop when a and b are both 0*/
            if (a%2!=b%2) ans++; /*start to compare from the low order position*/
            a = a/2; /*then drop the position which has been compared*/
            b = b/2;
        }
        printf("%d\n", ans);
    }
    return 0;
}
```

## 2 Exercise 1.19

**Analysis:** About input, if you manipulate char instead of string, please do not remember to read the new line character at the end of the first line. This problem mainly aims to examine your skill on dealing with strings. In C language, you can directly convert char to int by using a converter (int) before the variable. Some tricky points you may pay attention to: i). 0 and 1 are not prime; ii).  $n_{min}$  can never be 0; iii). do not update  $n_{min}$  until you have read the whole string. The sample code is shown below.

```
#include <stdio.h>
#include <math.h>

int isprime(int num)
```

```

{
    if (num == 0 || num == 1) return 0; /*special cases*/
    int start = (int)sqrt(num);
    int i, ans = 1;
    for (i=2; i<=start; i++) {
        if (!(num%i)) {
            ans = 0;
            break;
        }
    }
    return ans;
}

int main()
{
    int T, min, max, i, j;
    char ch;
    int times[26]; /*save the times one character appears in the string*/

    scanf("%d", &T);
    getchar(); /*read the new line character*/
    for (i = 0; i<T; i++) {
        min = 256;
        max = 0;
        for (j=0; j<26;j++) times[j] = 0;
        while ((ch=getchar())!='\n') times[(int)(ch)-(int)('a')]+=1;
        for (j=0; j<26;j++) {
            if (times[j]) {
                if (times[j]>max) max=times[j];
                if (times[j]<min) min=times[j];
            }
        }
        if (isprime(max-min)) printf("YES\n");
        else printf("NO\n");
    }
    return 0;
}

```