

## Homework 7 (Deadline 15:00, May 13, submit your files to TronClass)

Please submit the source code only. The file name should include your student ID number. For example, if your ID number is 406290123, then the file names for problems 1 and 2 should be **406290123\_hw7\_1.txt** and **406290123\_hw7\_2.txt**, respectively.

### 1. Twin primes

A twin prime is a prime number that is either 2 less or 2 more than another prime number—for example, either member of the twin prime pair (41, 43). In other words, a twin prime is a prime that has a prime gap of two.

Write a program print out all **twin prime numbers** between two integers N and M.

#### Input

Ask user to input N and M.

#### Output

Output all twin primes between N and M in the first line. In the second line, output the number of twin primes. For example, if N=2 and M=100, the output should look like

```
3  5  7  11 13 17 19 29 31 41 43 59 61 71 73
15
```

### 2. Root-finding

Work out the third problem from the midterm exam. Here are some important tips:

- [1] The input radius,  $r$ , determines the number of roots. If  $n\pi \leq r < (n+1)\pi$ , there are  $n+1$  roots. Split the range,  $[0, r]$ , into  $(n+1)$  intervals. The first  $n$  intervals are  $[(i-1)\pi, i\pi]$  for  $i = 1, \dots, n$ . The last interval should be  $[n\pi, r]$ , since the function  $\sqrt{r^2 - x^2}$  requires  $x \leq r$ .
- [2] One should avoid using exact values of  $n\pi$  for the upper or lower limits of the initial interval because  $\tan n\pi$  diverges. Use  $\pi = 3.14159$ .

