

Introduction to Computer Science

Tutorial 4: iteration and problem solving

1. Manual Execution

Manually execute the following programs.

```
/* 1.1 */
int i = 1;
int a = 2;
for(i = 3; i <= 5; i += 2)
    a *= a;
```

```
/* 1.2 */
int i = 5;
int a = 0;
int b = 0;
for(i = 0; i <= 2; a++, i++)
    b = a + i;
```

```
/* 1.3 */
int i = 3;
int a = 2;
int b = 3;
i /= 5;
if (i)
    a = b;
else
    b = a;
a = (i += b, ++b);
```

2. Programs output

What is the output of these programs?

```
/* 2.1 */
int i, j;
for(i = 0; i < 3; i++)
    for(j = i+1; j < 3; j++)
        printf("%d %d\n", i, j);
```

```
/* 2.2 */
int i, j, a;
for(a = 0, i = 0; i <= 5; i++)
    for(j = 0; j <= 5; j++)
        a++;
printf("%d %d %d\n", a, i, j);
```

3. Problem Solving

For each of the following problems, write a C program to solve it.

3.1 Find all the divisors of a given positive number x , where x is received by standard input (using `scanf`).

3.2 Find all pairs (x, y) of coprime numbers, where x, y are smaller than 1000.

3.3 Find two natural numbers $a < b$ such that $a^2 = 2.b$ and $a + b = 1012$. Print their values.

3.4 Given a natural number n (received from the user from standard input), compute and print out the product $1 * 2 * \dots * n$ (factorial of n).

3.5 A Pythagorean triplet is a set of three natural numbers for which $a^2 + b^2 = c^2$. For example, $3^2 + 4^2 = 9 + 16 = 25 = 5^2$. Write a program that given a positive number n provided by the user, prints out all Pythagorean triplets where a, b and c are smaller than n .

3.6 Modify the Pythagorean triplet program so that the program terminates as soon as it finds the first Pythagorean triplet.