Assignment 1

作业范围：
1-Parallelizing programs, processes, threads.pdf
2-Basic concurrent programs.pdf

2.7 Assume that the integer array `a[1:n]` has been initialized.

(a) Write an iterative parallel program to compute the sum of the elements of `a` using `PR` processes. Each process should work on a strip of the array. Assume that `PR` is a factor of `n`.

2.10 Consider the following program:

```
int x = 0, y = 0;
co x = x + 1; x = x + 2;
// x = x + 2; y = y - x;
oc
```


(a) Suppose each assignment statement is implemented by a single machine instruction and hence is atomic. How many possible histories are there? What are the possible final values of `x` and `y`?

(b) Suppose each assignment statement is implemented by three atomic actions that load a register, add or subtract a value from that register, then store the result. How many possible histories are there now? What are the possible final values of `x` and `y`?

2.12 Consider the following program:

```
int x = 2, y = 3;
co ⟨x = x + y;⟩ // ⟨y = x * y;⟩
```

(a) What are the possible final values of `x` and `y`?

(b) Suppose the angle brackets are removed and each assignment statement is now implemented by three atomic actions: read a variable, add or multiply, and write to a variable. Now what are the possible final values of `x` and `y`?

2.17 Consider the following program:

```
co ⟨await (x >= 3)  x = x - 3; ⟩
// ⟨await (x >= 2)  x = x - 2; ⟩
// ⟨await (x == 1)  x = x + 5; ⟩
oc
```

For what initial values of x does the program terminate, assuming scheduling is weakly fair? What are the corresponding final values? Explain your answer.

2.33 Consider the following program:

```
int x = 10, c = true;

co ⟨await x == 0; c = false;⟩
// while (c) ⟨x = x - 1;⟩
oc
```

(a) Will the program terminate if scheduling is weakly fair? Explain.

(b) Will the program terminate if scheduling is strongly fair? Explain.

(c) Add the following as a third arm of the co statement:

```
while true ⟨if (x < 0) ⟨x = 10;⟩⟩
```

Repeat parts (a) and (b) for this three-process program.