## Exercises

1. Consider the following algorithm:

| Algorithm 6.15: Semaphore algorithm A | |
|---|---|
| semaphore S ← 1, T ← 0 | |
| **p** | **q** |
| p1: wait(S) | q1: wait(T) |
| p2: write("p") | q2: write("q") |
| p3: signal(T) | q3: signal(S) |

   (a) What are the possible outputs of this algorithm?

   (b) What are the possible outputs if we erase the statement wait(S)?

   (c) What are the possible outputs if we erase the statement wait(T)?

2. What are the possible outputs of the following algorithm?

| Algorithm 6.16: Semaphore algorithm B | | |
|---|---|---|
| semaphore S1 ← 0, S2 ← 0 | | |
| **p** | **q** | **r** |
| p1: write("p") | q1: wait(S1) | r1: wait(S2) |
| p2: signal(S1) | q2: write("q") | r2: write("r") |
| p3: signal(S2) | q3: | r3: |

3. What are the possible outputs of the following algorithm?

| Algorithm 6.17: Semaphore algorithm with a loop | |
|---|---|
| semaphore S ← 1<br>boolean B ← false | |
| **p** | **q** |
| p1: wait(S) | q1: wait(S) |
| p2: B ← true | q2: while not B |
| p3: signal(S) | q3: write("*") |
| p4: | q4: signal(S) |

4. Show that if the initial value of S.V in Algorithm 6.3 is $k$, at most $k$ processes can be in the critical section at any time.