CS 3413
Assignment 4

Due Date: October 9th, 2020 at 9:30 am

ASSIGNMENT IS TO BE COMPLETED INDIVIDUALLY BY ALL STUDENTS!

Your solution is to be written in C and submitted via D2L.

There are three kinds of threads: canoe, paddle and shipper. Canoe and paddle threads produce canoes and paddels respectively that need to be assembled to create a sale package. Once two paddles and one canoe are available, the shipper thread consumes two paddles and one canoe to produce a sale package.

You do not want extra canoes or paddles. Therefore, you must guarantee that the producing threads (canoe and paddle) will wait to produce more elements until after a sale package is created.

In other words:

- If a canoe thread produces a canoe when no paddles are present, it has to wait for two paddles to be produced.
- If a paddle thread produces two paddles when no canoe is present, it has to wait for a canoe to be produced.

It takes a random amount of time, between 2 and 5 seconds, to create each paddle or canoe.

Write synchronization code for paddle and canoe producers, as well as the shipper, that enforces these constraints. Note that:

- There is one paddle thread and one canoe thread.
- There is a shipper thread that consumes two paddles and one canoe to produce a sale package.

When an element is created you are to output what was produced. For example,

```
We have a paddle.
We have a canoe.
```

When you have two paddles and one canoe, they are consumed to form a sales package. For example,

```
We now have a shipment!
```

Your program will run for n seconds such that your threads will not start a new sales package after that time, where n is specified on the command line (ie. 100 seconds):

```
./a.out 100
```