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Part1 - How to build and use

1.1 How to build

```
yufanxue$ make  
gcc -c -o semaphore_support.o semaphore_support.c -Wall -g  
gcc -o pirates-ninjas -Wall -g -pthread -lm pirates-ninjas.c semaphore_support.o
```

```
yufanxue$ make clean  
rm -f pn *.o  
rm -f -rf *.dSYM
```

1.2 How to use

```
yufanxue$ ./pirates-ninjas 7 2 3  
yufanxue$ ./pirates-ninjas 7 2  
yufanxue$ ./pirates-ninjas 7
```

First parameter : Time to run in seconds. Required argument

Second parameter : Number of Pirates. Optional, default 5

Third Parameter : Number of Ninjas. Optional, default 5

Part2 - Examples and Test cases

2.1 Example

```
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 1 2 3
```

Time to Live (seconds) : 1

Number of Pirates : 2

Number of Ninjas : 3

```
-----  
Pirate 0 | Waiting  
Pirate 0 | Costume preparation  
Pirate 1 | Waiting  
Pirate 1 | Costume preparation  
Ninja 0 | Waiting  
Ninja 1 | Waiting  
Ninja 2 | Waiting  
Pirate 1 | Leaving  
Pirate 1 | Waiting  
Pirate 0 | Leaving  
Ninja 0 | Costume preparation
```

```
.....  
Pirate 1 | Leaving  
Ninja 0 | Costume preparation  
Ninja 0 | Leaving  
-----
```

Pirate 0 : Entered 136 / Left 136

Pirate 1 : Entered 137 / Left 137
Ninja 0 : Entered 137 / Left 137
Ninja 1 : Entered 137 / Left 137
Ninja 2 : Entered 136 / Left 136

2.2 Test cases

```
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 10 5 5
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 10 12 13
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 15 12 13
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 100 22 33
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 150 50 33
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 200 100 100
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 300 2 3
yufanxues-mbp:project-02-part2 yufanxue$ ./pirates-ninjas 350 150 200
```

Result: All test cases upon passed without deadlock

Part3 - Pseudo Code

3.1 Precondition

1) Here I use P() as wait(), V() as signal()

2) Initially,

```
semaphore_t mutex_Register = 1;
semaphore_t mutex_NinjaCount = 1;
semaphore_t mutex_PirateCount = 1;
semaphore_t mutex_Depratment = 1;
semaphore_t mutex_Team = 2;
```

3.2 Pseudo code

<p>Ninja</p> <p>*****</p> <p>P(mutex_Register)</p> <p>P(mutex_NinjaCount)</p> <p> NinjaCount++;</p> <p> If(NinjaCount == 1)</p> <p> P(mutex_Depratment)</p> <p>V(mutex_NinjaCount)</p> <p>V(mutex_Register)</p> <p>*****</p> <p>P(mutex_Team)</p> <p><u>Do something here</u></p> <p>V(mutex_Team)</p> <p>*****</p> <p>P(mutex_NinjaCount)</p> <p> NinjaCount--;</p> <p> If(NinjaCount == 0)</p> <p> V(mutex_Depratment)</p> <p>V(mutex_NinjaCount)</p>	<p>Pirate</p> <p>*****</p> <p>P(mutex_Register)</p> <p>P(mutex_PirateCount)</p> <p> PirateCount++;</p> <p> If(PirateCount == 1)</p> <p> P(mutex_Depratment)</p> <p>V(mutex_PirateCount)</p> <p>V(mutex_Register)</p> <p>*****</p> <p>P(mutex_Team)</p> <p><u>Do something here</u></p> <p>V(mutex_Team)</p> <p>*****</p> <p>P(mutex_PirateCount)</p> <p> PirateCount--;</p> <p> If(PirateCount == 0)</p> <p> V(mutex_Depratment)</p> <p>V(mutex_PirateCount)</p>
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Thanks a lot !