

# Teoria współbieżności

## Producenci i konsumenci bez zagłódzenia

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### 1 Poprawny kod (4 warunki + zmienna logiczna)

```
1 package agh.ics.concurrency.lab4;
2
3 import java.util.concurrent.locks.Condition;
4 import java.util.concurrent.locks.ReentrantLock;
5
6 public class CorrectRandomProduceConsume {
7     private int buffer = 0;
8     private final int bufferMax;
9     private final ReentrantLock lock = new ReentrantLock();
10    private final Condition firstProd = lock.newCondition();
11    private final Condition restProd = lock.newCondition();
12    private final Condition firstCons = lock.newCondition();
13    private final Condition restCons = lock.newCondition();
14
15    private boolean isFirstProducerWaiting = false;
16    private boolean isFirstConsumerWaiting = false;
17
18    public CorrectRandomProduceConsume(int bufferMax) {
19        this.bufferMax = bufferMax;
20    }
21
22    public void produce(int amount) {
23        lock.lock();
24        try {
25            while (isFirstProducerWaiting)
26                restProd.await();
27            isFirstProducerWaiting = true;
28            while (buffer + amount >= bufferMax)
29                firstProd.await();
30            buffer += amount;
31            isFirstProducerWaiting = false;
32            restProd.signal();
33            firstCons.signal();
```

```

34         } catch (InterruptedException e) {
35             e.printStackTrace();
36         } finally {
37             lock.unlock();
38         }
39     }
40
41     public void consume(int amount) {
42         lock.lock();
43         try {
44             while (isFirstConsumerWaiting)
45                 restCons.await();
46             isFirstConsumerWaiting = true;
47             while (buffer - amount < 0)
48                 firstCons.await();
49             buffer -= amount;
50             isFirstConsumerWaiting = false;
51             restCons.signal();
52             firstProd.signal();
53         } catch (InterruptedException e) {
54             e.printStackTrace();
55         } finally {
56             lock.unlock();
57         }
58     }
59
60     public void print() {
61         System.out.println(this.buffer);
62     }
63
64 }

```

## 2 Zagłódzenie na 2 warunkach

-7: 27690	+8: 26488	-2: 31342	+2: 31206	+9: 24323	+9: 24370	+8: 26226	+3: 30943	+5: 29768	+4: 30360	-3: 32137	-1: 32138	-7: 32135	-3: 32130	-10: 32124	-8: 32133	-10: 32114	-1: 32144	-3: 32131	-2: 32148
-7: 28511	+8: 27252	-2: 32261	+2: 32280	+9: 25891	+8: 26994	+3: 31858	+5: 31858	+4: 31252	-3: 33981	-1: 33983	-7: 33988	-10: 33983	-10: 33969	-8: 33977	-10: 33957	-1: 33998	-3: 33972	-2: 33984	-2: 33988
-7: 29339	+8: 27999	-2: 33176	+2: 33116	+9: 25740	+9: 25848	+8: 27768	+3: 32761	+5: 31523	+4: 32144	-3: 34027	-1: 34028	-7: 34024	-3: 34029	-10: 34013	-8: 34023	-10: 34002	-3: 34035	-3: 34023	-2: 34038
-7: 30135	+8: 26758	-2: 34094	+2: 34006	+9: 26474	+9: 26561	+8: 28563	+3: 33669	+5: 32396	+4: 33026	-3: 34071	-1: 34072	-7: 34069	-3: 34072	-10: 34055	-8: 34063	-10: 34045	-1: 34081	-3: 34092	-2: 34092
-7: 30961	+8: 29524	-2: 35015	+2: 34955	+9: 27195	+9: 27288	+8: 29317	+3: 34577	+5: 33272	+4: 33924	-3: 35916	-1: 35915	-7: 35911	-3: 35917	-10: 35899	-8: 35910	-10: 35889	-1: 35924	-3: 35918	-2: 35917
-7: 31769	+8: 30388	-2: 35542	+2: 35878	+9: 27988	+9: 27971	+8: 30113	+3: 35486	+5: 34158	+4: 34822	-3: 36861	-1: 36859	-7: 36854	-3: 36860	-10: 36843	-8: 36854	-10: 36831	-1: 36867	-2: 36862	-2: 36862
-7: 32587	+8: 31862	-2: 36598	+2: 36729	+9: 28915	+9: 28979	+8: 30832	+3: 36301	+5: 35294	+4: 35717	-3: 37884	-1: 37883	-7: 37872	-3: 37884	-10: 37757	-8: 37797	-10: 37775	-1: 37811	-3: 37888	-2: 37888
-7: 33385	+8: 31834	-2: 37772	+2: 37714	+9: 29333	+9: 29402	+8: 31683	+3: 37293	+5: 35883	+4: 36665	-3: 38741	-1: 38744	-7: 38735	-3: 38741	-10: 38729	-8: 38738	-10: 38714	-1: 38759	-3: 38737	-2: 38747
-7: 34196	+8: 32593	-2: 38692	+2: 38652	+9: 30862	+9: 30121	+8: 32465	+3: 38189	+5: 36757	+4: 37493	-3: 39686	-1: 39688	-7: 39688	-3: 39686	-10: 39672	-8: 39683	-10: 39659	-1: 39695	-2: 39682	-2: 39692
-7: 35022	+8: 33302	-2: 39615	+2: 39598	+9: 30758	+9: 30864	+8: 33125	+3: 39188	+5: 37633	+4: 38393	-3: 40638	-1: 40631	-7: 40624	-3: 40631	-10: 40617	-8: 40627	-10: 40604	-1: 40639	-3: 40627	-2: 40637
-7: 35845	+8: 34126	-2: 40536	+2: 40472	+9: 31476	+9: 31591	+8: 33987	+3: 40806	+5: 38514	+4: 39276	-3: 41575	-1: 41579	-7: 41568	-3: 41575	-10: 41561	-8: 41571	-10: 41547	-1: 41582	-3: 41572	-2: 41581
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-7: 39187	+8: 37199	-2: 44214	+2: 44154	+9: 34338	+9: 34464	+8: 37187	+3: 43638	+5: 42827	+4: 42833	-3: 45353	-1: 45357	-7: 45349	-3: 45353	-10: 45336	-8: 45340	-10: 45325	-1: 45362	-3: 45340	-2: 45362
-7: 39985	+8: 37971	-2: 45134	+2: 45071	+9: 35057	+9: 35183	+8: 37891	+3: 44549	+5: 42891	+4: 43721	-3: 46297	-1: 46301	-7: 46295	-3: 46299	-10: 46279	-8: 46294	-10: 46269	-1: 46305	-3: 46291	-2: 46306
-7: 40717	+8: 38725	-2: 46068	+2: 45986	+9: 35788	+9: 35915	+8: 38553	+3: 45456	+5: 43763	+4: 44613	-3: 47241	-1: 47245	-7: 47239	-3: 47244	-10: 47222	-8: 47239	-10: 47212	-1: 47249	-3: 47236	-2: 47258
-7: 41518	+8: 39595	-2: 46991	+2: 46909	+9: 36529	+9: 36653	+8: 39323	+3: 46366	+5: 44638	+4: 45506	-3: 48185	-1: 48198	-7: 48184	-3: 48198	-10: 48166	-8: 48184	-10: 48156	-1: 48194	-3: 48183	-2: 48193
-7: 42327	+8: 40622	-2: 47981	+2: 47824	+9: 37212	+9: 37368	+8: 40214	+3: 47283	+5: 45586	+4: 46399	-3: 49129	-1: 49134	-7: 49127	-3: 49134	-10: 49109	-8: 49129	-10: 49108	-1: 49139	-3: 49125	-2: 49130
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-7: 55332	+8: 52658	-2: 62588	+2: 62545	+9: 48694	+9: 48807	+8: 52587	+3: 61834	+5: 59534	+4: 60626	-3: 64234	-1: 64253	-7: 64236	-3: 64248	-10: 64212	-8: 64225	-10: 64198	-1: 64253	-3: 64242	-2: 64236
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-7: 61858	+8: 58840	-2: 69946	+2: 69893	+9: 54421	+9: 54492	+8: 58807	+3: 69114	+5: 66546	+4: 67772	-3: 71798	-1: 71806	-7: 71788	-3: 71805	-10: 71764	-8: 71776	-10: 71749	-1: 71811	-3: 71801	-2: 71790
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2. P1 produkuje 1 i wywołuje firstCons budząc K1
3. K2, który chce skonsumować 3 wiesz się na firstCons (Tutaj dochodzi do zagłodzenia, ponieważ K1 może już nigdy nie zostać wybudzony)
4. P1 produkuje 1 i wywołuje firstCons budząc K2
5. K3, który chce skonsumować 3 wiesz się na firstCons
6. K1 wiesz się na firstCons
7. K2 wiesz się na firstCons
8. K4, który chce skonsumować 1 wiesz się na restCons
9. P2 produkuje 5 i wywołuje firstCons budząc K2
10. K2 konsumuje 3 i wywołuje restCons budząc K4
11. K4 wiesz się na restCons
12. P2 produkuje 5 i wywołuje firstCons budząc K3
13. K3 konsumuje 3 i wywołuje restCons budząc K4
14. K4 wiesz się na restCons
15. P1 wiesz się na firstProd
16. P2 - Pp wieszają się na restProd
17. K2 wiesz się na restCons
18. K3 wiesz się na restCons