

Test Case	Sleep time	# producers	# consumers	Output Result
1	2	1	1	producer produced 24113 consumer consumed 24113 producer produced 20657 consumer consumed 20657
2	5	4	1	producer produced 915 producer produced 5930 producer produced 14184 producer produced 19762 consumer consumed 19762 producer produced 21984 consumer consumed 21984 producer produced 25664 consumer consumed 25664 consumer consumed 14184 consumer consumed 5930 consumer consumed 915 producer produced 3695 producer produced 11930 producer produced 23744 producer produced 9060 consumer consumed 9060 consumer consumed 23744 consumer consumed 11930 producer produced 21488 consumer consumed 21488 producer produced 18647 consumer consumed 18647 consumer consumed 3695
3	10	16	1	producer produced 26923 producer produced 27302 producer produced 6403 producer produced 12383 producer produced 19245 consumer consumed 19245 consumer consumed 12383 producer produced 13784 consumer consumed 13784 producer produced 733 consumer consumed 733 producer produced 17665 consumer consumed 17665 producer produced 4693 consumer consumed 4693 producer produced 17776 consumer consumed 17776 producer produced 23296 consumer consumed 23296

				producer produced 19029 consumer consumed 19029 producer produced 3002 consumer consumed 3002 producer produced 28324 consumer consumed 28324 producer produced 21373 consumer consumed 21373 producer produced 17134 consumer consumed 17134 producer produced 23915 consumer consumed 23915 producer produced 5329 consumer consumed 5329 producer produced 21058 consumer consumed 21058 producer produced 4800 consumer consumed 4800 producer produced 27941 consumer consumed 27941 producer produced 5741
4	2	1	2	producer produced 26829 producer produced 26560 consumer consumed 26560 consumer consumed 26829
5	5	4	2	producer produced 15751 producer produced 1749 producer produced 7141 consumer consumed 7141 producer produced 10565 consumer consumed 10565 consumer consumed 1749 producer produced 5562 consumer consumed 5562 consumer consumed 15751 producer produced 23214 producer produced 23214 producer produced 11582 consumer consumed 11582 consumer consumed 23214 consumer consumed 23214 producer produced 28604 producer produced 24829 producer produced 36 consumer consumed 36 consumer consumed 24829 producer produced 10397 consumer consumed 10397

				consumer consumed 28604 producer produced 10951 producer produced 27206 consumer consumed 27206
6	10	16	2	producer produced 25974 producer produced 5813 producer produced 29748 producer produced 11824 producer produced 18219 consumer consumed 18219 consumer consumed 11824 consumer consumed 29748 producer produced 18140 consumer consumed 18140 producer produced 5399 consumer consumed 5399 producer produced 24612 consumer consumed 24612 producer produced 1383 consumer consumed 1383 producer produced 13883 consumer consumed 13883 producer produced 6237 consumer consumed 6237 producer produced 14722 consumer consumed 14722 producer produced 13269 consumer consumed 13269 producer produced 8681 consumer consumed 8681 producer produced 12448 consumer consumed 12448 producer produced 27776 consumer consumed 27776 producer produced 25170 consumer consumed 25170 producer produced 7122 consumer consumed 7122 producer produced 2352 consumer consumed 2352 producer produced 18605 consumer consumed 18605 producer produced 8616 consumer consumed 8616 producer produced 6124
7	2	1	4	producer produced 20411 producer produced 14839 consumer consumed 14839

				producer produced 24406 consumer consumed 24406 consumer consumed 20411
8	5	4	4	producer produced 9334 producer produced 20029 producer produced 17622 producer produced 21224 consumer consumed 21224 consumer consumed 17622 producer produced 18088 consumer consumed 18088 consumer consumed 20029 producer produced 8654 producer produced 20728 consumer consumed 20728 consumer consumed 8654 producer produced 6775 consumer consumed 6775 producer produced 13036 producer produced 9632 consumer consumed 9632 producer produced 19740 consumer consumed 19740 consumer consumed 13036 producer produced 16642 producer produced 11820 consumer consumed 11820 producer produced 12134 consumer consumed 12134 consumer consumed 16642 consumer consumed 9334
9	10	16	4	producer produced 21558 producer produced 16674 producer produced 8439 producer produced 16295 consumer consumed 16295 consumer consumed 8439 consumer consumed 16674 consumer consumed 21558 producer produced 26317 producer produced 13237 producer produced 13237 consumer consumed 13237 consumer consumed 13237 producer produced 14524 producer produced 6585 consumer consumed 6585 producer produced 10074

				producer produced 23921 consumer consumed 23921 consumer consumed 10074 producer produced 28813 consumer consumed 28813 consumer consumed 14524 producer produced 25292 producer produced 29069 consumer consumed 29069 producer produced 11676 producer produced 14001 consumer consumed 14001 consumer consumed 11676 producer produced 27780 consumer consumed 27780 consumer consumed 25292 producer produced 879 producer produced 22779 consumer consumed 22779 producer produced 18791 producer produced 4472 consumer consumed 4472
10	2	1	16	producer produced 20318 consumer consumed 20318 producer produced 10561 consumer consumed 10561
11	5	4	16	producer produced 17132 producer produced 13270 producer produced 8145 producer produced 6222 consumer consumed 6222 consumer consumed 8145 producer produced 3522 consumer consumed 3522 consumer consumed 13270 producer produced 29553 producer produced 226 consumer consumed 226 consumer consumed 29553 consumer consumed 17132 producer produced 3967 consumer consumed 3967 producer produced 18762 producer produced 26681 producer produced 6961 consumer consumed 6961 consumer consumed 26681 consumer consumed 18762

				producer produced 17018 producer produced 29763 consumer consumed 29763 producer produced 24560 consumer consumed 24560
12	10	16	16	producer produced 10001 producer produced 14597 producer produced 13907 producer produced 754 producer produced 25923 consumer consumed 25923 consumer consumed 754 consumer consumed 13907 consumer consumed 14597 consumer consumed 10001 producer produced 1557 producer produced 18180 producer produced 11648 producer produced 24670 producer produced 28063 consumer consumed 28063 consumer consumed 24670 consumer consumed 11648 consumer consumed 18180 consumer consumed 1557 producer produced 10013 producer produced 8042 producer produced 3063 producer produced 628 producer produced 5550 consumer consumed 5550 consumer consumed 628 consumer consumed 3063 consumer consumed 8042 consumer consumed 10013 producer produced 2654 producer produced 29880 producer produced 7143 producer produced 12022 producer produced 29743 consumer consumed 29743 consumer consumed 12022 consumer consumed 7143

Result Summary:

Based on the table, we can see that the number of producers always greater than or equal to a number of consumers. In order for a consumer to consume an item in the buffer, the buffer must be not empty. And in order for a producer to produce an item and send it to the buffer, the buffer must be not full. Therefore, for all the test cases, the consumer tends to wait until producer produces the item to the buffer, then it starts to consume the item when the buffer has item. The producer stops producing any more items to the buffer when the buffer is full, and wait till the consumer to consume the item, which frees up space for the buffer again.

Overall, the longer the sleeping time, the more items will be produced and consumed. If the sleeping time maintains at a constant, and there are a lot more consumers than producers, the consumers must wait for a long time for an item. This works vice versa for the producer. Therefore, only increasing number of producers or consumers, and not caring about the others, does not help the system process. The difference between the number of producers and consumers should be kept as small as possible.