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handout03.txt

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```

88 3. Producer/consumer example:
89
90  /*
91  "buffer" stores BUFFER_SIZE items
92  "count" is number of used slots. a variable that lives in memory
93  "out" is next empty buffer slot to fill (if any)
94  "in" is oldest filled slot to consume (if any)
95  */
96
97  void producer (void *ignored) {
98      for (;;) {
99          /* next line produces an item and puts it in nextProduced */
100         nextProduced = means_of_production();
101         while (count == BUFFER_SIZE)
102             ; // do nothing
103         buffer [in] = nextProduced;
104         in = (in + 1) % BUFFER_SIZE;
105         count++;
106     }
107 }
108
109 void consumer (void *ignored) {
110     for (;;) {
111         while (count == 0)
112             ; // do nothing
113         nextConsumed = buffer[out];
114         out = (out + 1) % BUFFER_SIZE;
115         count--;
116         /* next line abstractly consumes the item */
117         consume_item(nextConsumed);
118     }
119 }
120
121 /*
122 what count++ probably compiles to:
123 reg1 <-- count      # load
124 reg1 <-- reg1 + 1   # increment register
125 count <-- reg1     # store
126
127 what count-- could compile to:
128 reg2 <-- count     # load
129 reg2 <-- reg2 - 1  # decrement register
130 count <-- reg2     # store
131 */
132
133 What happens if we get the following interleaving?
134
135 reg1 <-- count
136 reg1 <-- reg1 + 1
137 reg2 <-- count
138 reg2 <-- reg2 - 1
139 count <-- reg1
140 count <-- reg2
141

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142
143 4. Some other examples. What is the point of these?
144
145 [From S.V. Adve and K. Gharachorloo, IEEE Computer, December 1996,
146 66-76. http://rsim.cs.uiuc.edu/~sadve/Publications/computer96.pdf]
147
148 a. Can both "critical sections" run?
149
150     int flag1 = 0, flag2 = 0;
151
152     int main () {
153         tid id = thread_create (p1, NULL);
154         p2 (); thread_join (id);
155     }
156
157     void p1 (void *ignored) {
158         flag1 = 1;
159         if (!flag2) {
160             critical_section_1 ();
161         }
162     }
163
164     void p2 (void *ignored) {
165         flag2 = 1;
166         if (!flag1) {
167             critical_section_2 ();
168         }
169     }
170
171 b. Can use() be called with value 0, if p2 and p1 run concurrently?
172
173     int data = 0, ready = 0;
174
175     void p1 () {
176         data = 2000;
177         ready = 1;
178     }
179     int p2 () {
180         while (!ready) {}
181         use(data);
182     }
183
184 c. Can use() be called with value 0?
185
186     int a = 0, b = 0;
187
188     void p1 (void *ignored) { a = 1; }
189
190     void p2 (void *ignored) {
191         if (a == 1)
192             b = 1;
193     }
194
195     void p3 (void *ignored) {
196         if (b == 1)
197             use (a);
198     }
199

```