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Actividad colaborativa - Manejo de semáforos

En los programas multiproceso, a menudo hay una división del trabajo entre los procesos. En un patrón común, algunos procesos son productores y otros son consumidores. Los productores crean artículos de algún tipo y los agregan a una estructura de datos (o área común), mientras que los consumidores quitan esos artículos y los procesan.

Implementa una solución a este problema utilizando semáforos y procesos. Tu programa deberá cumplir algunas restricciones:

- La semilla para los números aleatorios debe ser 12345.
- La solución deberá estar contenida en un solo archivo fuente que recibe los parámetros de línea de comandos el tamaño del buffer.
- La solución deberá crear los recursos IPC necesarios.
- Deberá crear primero tres consumidores, esperar 5 segundos y crear tres productores.
- Cada productor colocará entre 1 y 5 productos.
- Cada consumidor tomará entre 1 y 3 productos.
- Por último, cada consumidor solo tomará productos 3 veces (no importa cuantos tomen por vez) y terminará. Cuando todos los consumidores hayan acabados, se deben terminar a todos los productores y eliminar todos los recursos IPC creados.

```
$ .\solution buffer_size
```

Ejemplos de uso:

```
$ .\solution
usage: \solution buffer_size
---------------------------------------------------------------------------
$ .\solution texto
descending: the parameter must be a positive integer number
---------------------------------------------------------------------------
$ .\solution -10
descending: the parameter must be a positive integer number
---------------------------------------------------------------------------
$ .\solution 0
descending: the parameter must be a positive integer number
---------------------------------------------------------------------------
$ .\solution 10
PID = 16099 - creating consumer
PID = 16099 - creating consumer
PID = 16099 - creating consumer
Consumer 16101 trying to access the buffer.
Consumer 16100 trying to access the buffer.
Consumer 16100 accessing the buffer.
Consumer 16100 trying to get 1 product(s) - occupied space = 0
Consumer 16102 trying to access the buffer.
PID = 16099 - creating consumer
PID = 16099 - creating consumer
PID = 16099 - creating consumer
Producer 16103 trying to access the buffer.
Producer 16103 accessing the buffer.
Producer 16103 trying to put 5 product(s) - free space = 10.
Producer 16103 put their products.
Consumer 16100 took their products.
Consumer 16100 is going to sleep.
Consumer 16101 accessing the buffer.
Producer 16103 is going to sleep.
Consumer 16101 trying to get 1 product(s) - occupied space = 4
Consumer 16101 took their products.
Consumer 16101 is going to sleep.
Producer 16104 trying to access the buffer.
Consumer 16102 accessing the buffer.
Producer 16104 accessing the buffer.
Consumer 16102 trying to get 1 product(s) - occupied space = 3
Producer 16104 trying to put 5 product(s) - free space = 7.
Consumer 16102 took their products.
Producer 16104 put their products.
Consumer 16102 is going to sleep.
Producer 16104 is going to sleep.
Producer 16105 trying to access the buffer.
Producer 16105 accessing the buffer.
Producer 16105 trying to put 5 product(s) - free space = 3.
Consumer 16100 trying to access the buffer.
Producer 16103 trying to access the buffer.
Consumer 16101 trying to access the buffer.
Consumer 16100 accessing the buffer.
Consumer 16100 trying to get 3 product(s) - occupied space = 7
Consumer 16100 took their products.
Consumer 16100 is going to sleep.
Consumer 16101 accessing the buffer.
Consumer 16101 trying to get 3 product(s) - occupied space = 4
Consumer 16102 trying to access the buffer.
Producer 16105 put their products.
Consumer 16101 took their products.
Producer 16105 is going to sleep.
Producer 16103 accessing the buffer.
Consumer 16101 is going to sleep.
Producer 16103 trying to put 4 product(s) - free space = 4.
Producer 16103 put their products.
Consumer 16102 accessing the buffer.
```

```
Producer 16103 is going to sleep.
Consumer 16102 trying to get 3 product(s) - occupied space = 10
Consumer 16102 took their products.
Consumer 16102 is going to sleep.
Producer 16104 trying to access the buffer.
Producer 16104 accessing the buffer.
Producer 16104 trying to put 4 product(s) - free space = 3.
Consumer 16100 trying to access the buffer.
Consumer 16100 accessing the buffer.
Producer 16105 trying to access the buffer.
Consumer 16101 trying to access the buffer.
Consumer 16100 trying to get 1 product(s) - occupied space = 7
Consumer 16100 took their products.
Consumer 16102 trying to access the buffer.
Producer 16103 trying to access the buffer.
Consumer 16100 is going to sleep.
Consumer 16101 accessing the buffer.
Consumer 16101 trying to get 1 product(s) - occupied space = 6
Consumer 16101 took their products.
Consumer 16101 is going to sleep.
Consumer 16102 accessing the buffer.
Producer 16104 put their products.
Consumer 16102 trying to get 1 product(s) - occupied space = 5
Consumer 16102 took their products.
Producer 16104 is going to sleep.
Consumer 16102 is going to sleep.
Producer 16105 accessing the buffer.
Producer 16105 trying to put 4 product(s) - free space = 2.
Consumer 16100 has ended
Consumer 16101 has ended
Consumer 16102 has ended
```

Rúbrica de evaluación:

Ponderación	
+10 puntos	Verifica que el programa reciba la cantidad correcta de parámetros. En caso de que no sea así, el programa despliega un mensaje adecuado y termina, regresando -2 como resultado de su ejecución.
+10 puntos	Verifica que `buffer_size` sea un número entero válido (mayor a cero). En caso de que no sea así, el programa despliega un mensaje adecuado y termina, regresando -3 como resultado de su ejecución.
+20 puntos	Crea todos los recursos IPC necesarios y de forma correcta.
+20 puntos	Crea la cantidad correcta de procesos en la forma especificada.
+10 puntos	Espera a que terminen todos los consumidores.
+20 puntos	Termina a los productores y elimina los recursos IPC.

TIPS: Revisa la implementación propuesta en "The Little Book of Semaphores"de Allen B. Downey: `http://greenteapress.com/semaphores/LittleBookOfSemaphores.pdf`