Josephus Algorithm

The problem

According to the legend, during **the Great Jewish Revolt against the Romans**, a group of **40 Jewish soldiers** found themselves **trapped in a cave.**

Instead of surrendering to the Romans, they decided to **commit suicide**, forming a **circle** and **killing** each other **every third man** until all were dead.

The mathematical problem :

If there **are n people** numbered from 1 to n in a group, and every **k-th person is eliminated in a circle**,

what person will be the last one **remaining alive**?

Algorithm

```
Let  Qc a circular Queue
Let  len(Qc) = n
Let  r the distance to choose a player that will die
     (Note: In common or popular J.A , r=1)
from i=1 to i<= len (Qc) ; i++
    enqueue (Qc,i)
Let  x=s where s is the start index Pi starts J.A
P = x - 1
while   len(Qc)>1 :
        u = P + r % len(Qc)
        if  u==P then
            u = u+1
        P = u % len (Qc)
        Dequeue (Qc)
        P = u % len(Qc)
```

Algoritmo

Sea Qc una cola circular.

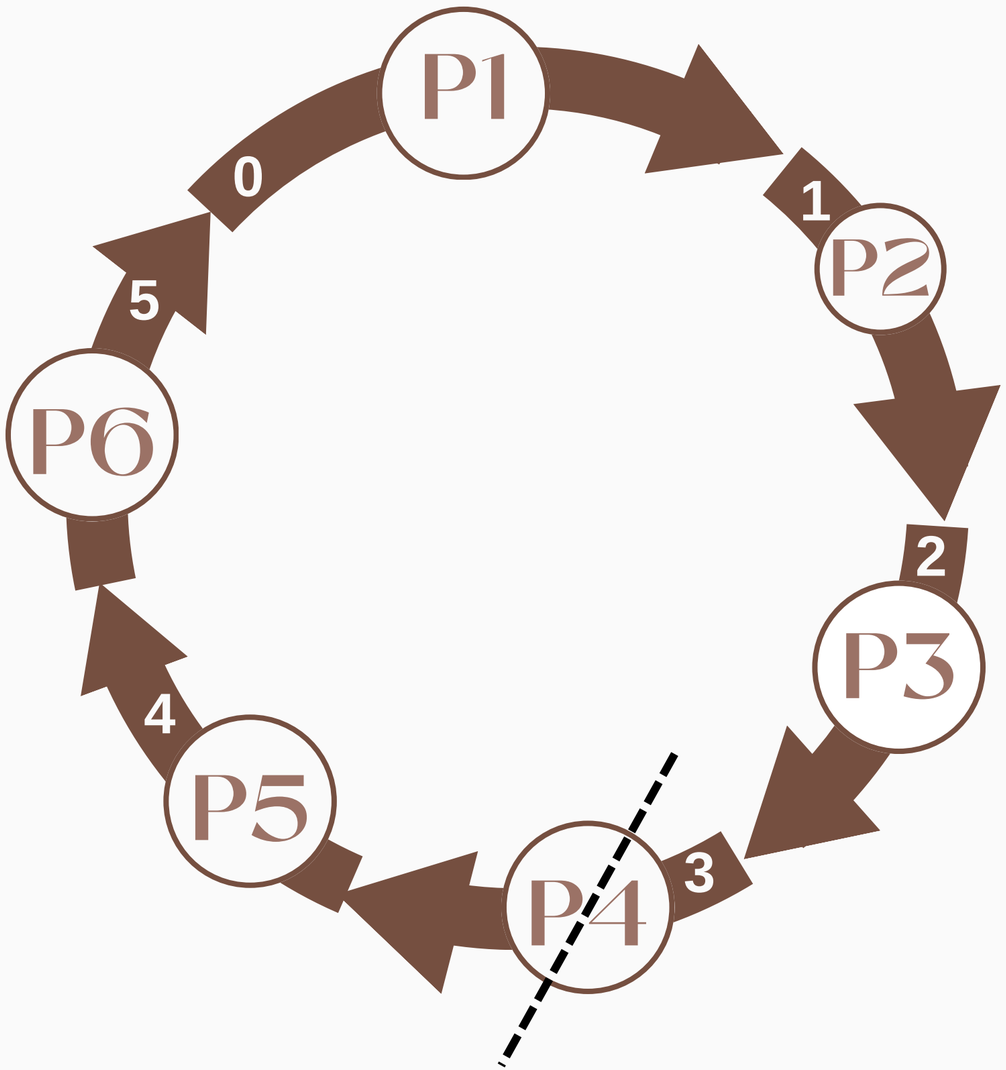
Sea len(Qc) = n.

Sea r la distancia para elegir un jugador que morirá.

(Nota: En el común o popular J.A, r=1).

```
desde i=1 hasta i<= len(Qc); i++
        encolar(Qc, i)
Sea x=s donde s es el índice de inicio donde Pi comienza el J.A
P = x - 1
mientras len(Qc) > 1:
    u = P + r % len(Qc)
    si u == P entonces
        u = u + 1
    P = u % len(Qc)
    desencolar(Qc)
    P = u % len(Qc)
```

1.



Let r = 3

start P1

P= 0

u= 0+3%6 = 3

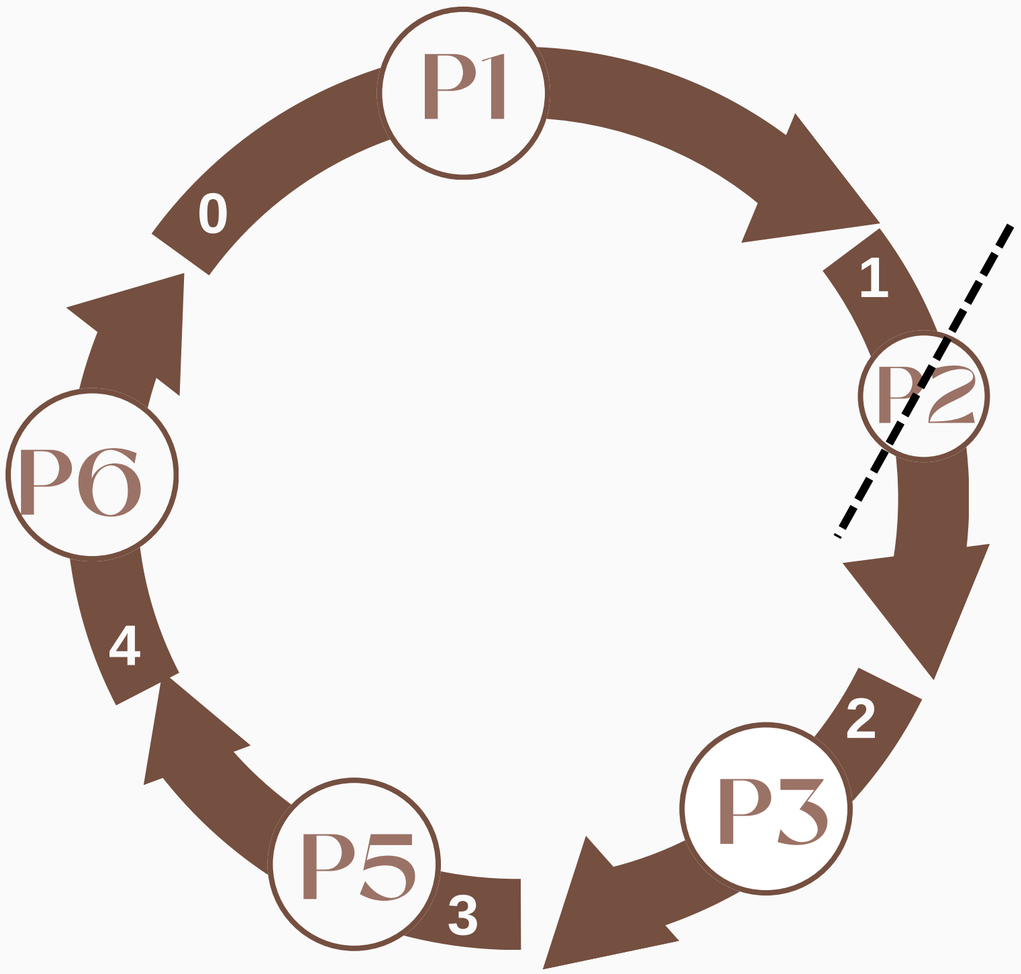
3==0 ? No

P= 3%6 = 3

Dequeue

P= 3%5 = 3

2.



P= 3

u= 3+3%5 =

6%5 = 1

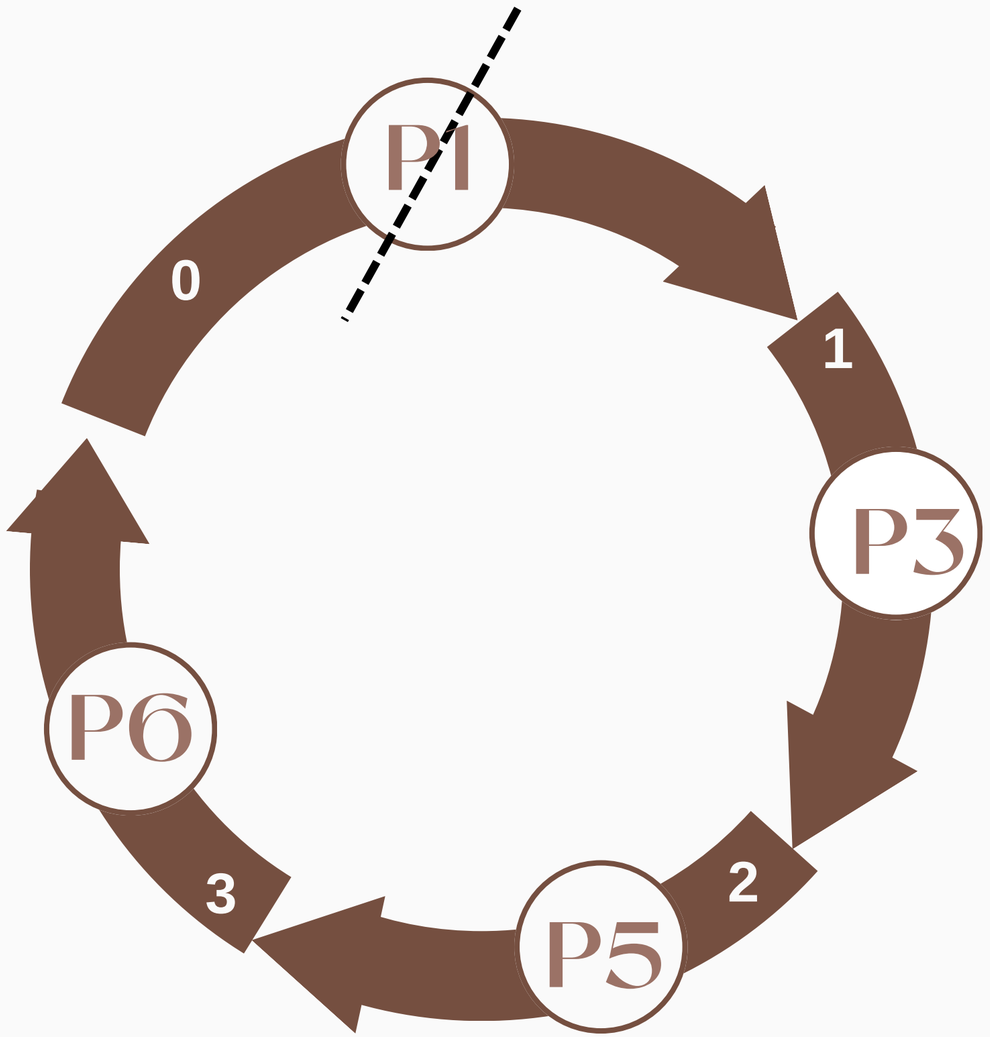
1==3 ? No

Dequeue

P= 1%5 = 1

P= 1%4 = 1

3.



P= 1

u= 1+3%4 = 4%4 = 0

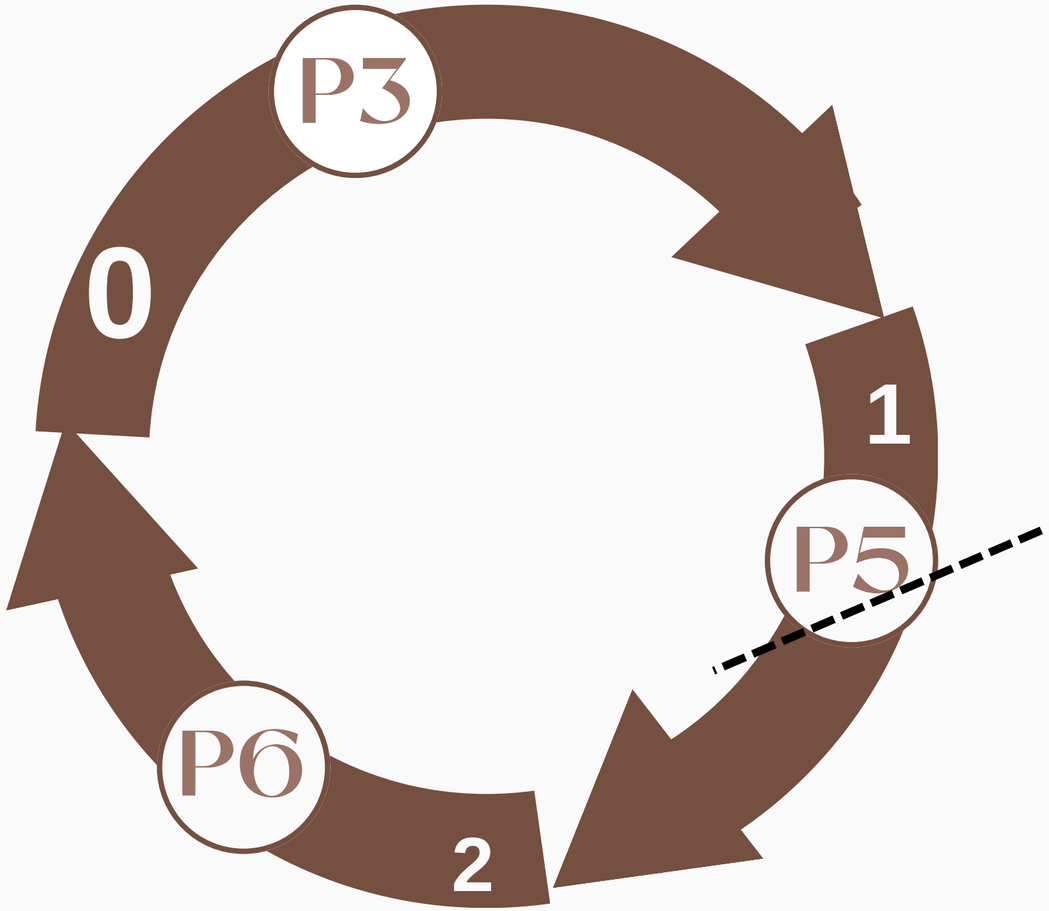
4==1 ? No

P= 0%4=0

Dequeue

P= 0%3 = 0

4.



P= 0

u= 0%3 = 3%3 = 0

0==0 ? sí

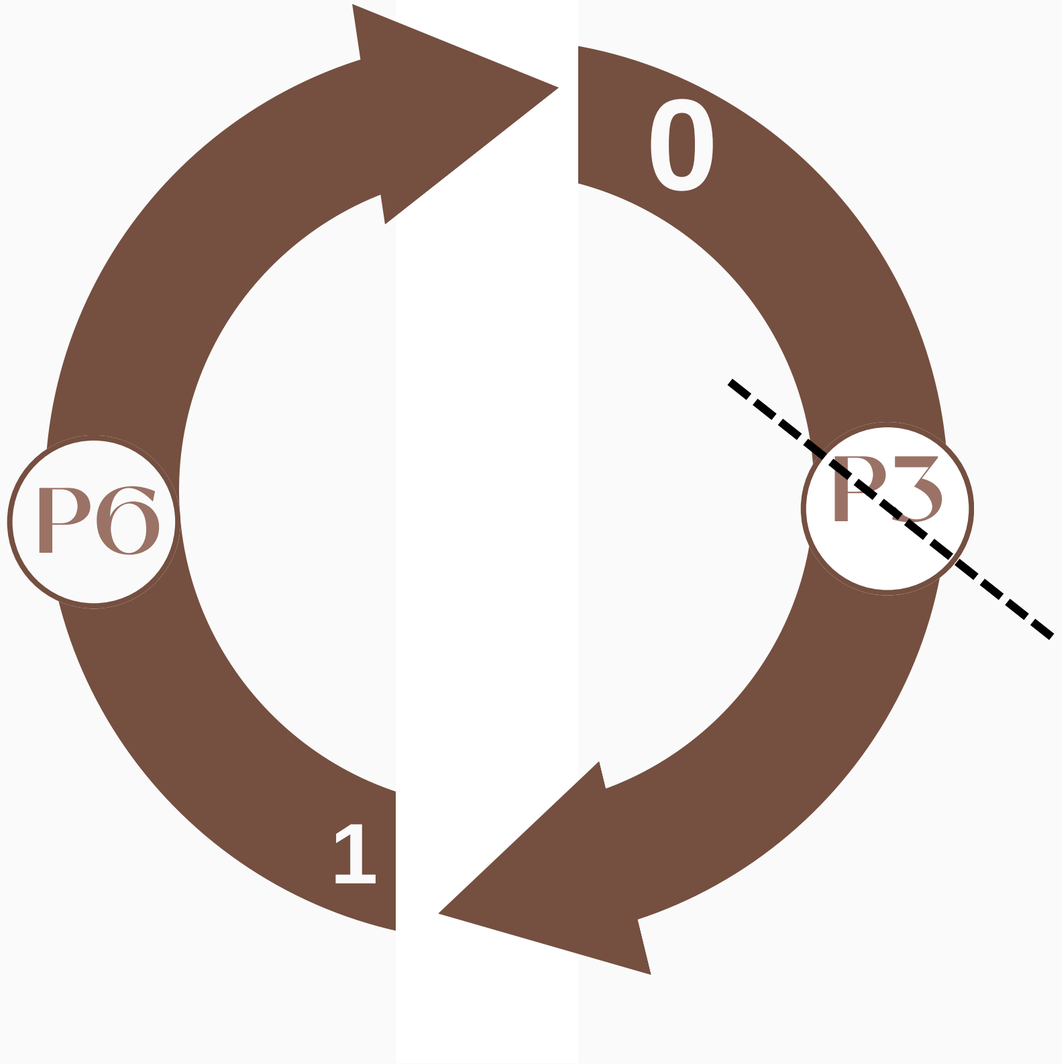
u=u+1 u=1

P= 1%3=1

Dequeue

P= 1%2 = 1

5.



P= 1

u= 1+3%2 = 4%2 = 0

0==1 ? no

P= 0%2=0

Dequeue

P= 0%1 =0

s(6) =P6

r=3

Practice Exercise

$$s(7) = P1$$

$r = 2$