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---

① No, the correct way is:

```
flag[i] = True;
turn = j;
while (flag[j] && turn = j)
    Do No-Op
Critical Section
flag[i] = False;
```

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② binary هردو ← semaphore mutex 1
semaphore w 1
دو سمافور داریم
و یک readCount

```
writer():
  do {
    wait(w);
    signal(w);
  } while(True)
```

```
Reader:
  do {
    wait(mutex);
    readCount++;
    if(readCount == 1) {
      wait(w)
    } Signal(mutex);
    wait(mutex);
    readCount--;
    if(readCount == 0) -> Signal(
```

```
    Signal(mutex);
  }
  while(True);
```

(3)

frame size = $2^3 \times 2^{10} = 2^{13}$ bytes

frames = $\frac{2^{32}}{2^{13}} = 2^{19}$, pages = $\frac{2^{31}}{2^{13}} = 2^{18}$

(4)

Optimal:

7	7	7	2	2	2	7	2	7
	0	0	0	0	0	0	0	0
		1	1	3	4	3	1	1

Page faults = $\frac{9}{20} = \frac{45}{100} = \%45$

Second Chance:

✗	✗	✓	✗	✗	✗	✗	✓	✗	✗	✓	✓
7,0	0,0	0,1	1,0	1,0	3,0	0,1	3,0	4,0	0,0	0,1	0,1
0,0	1,0	1,0	2,0	2,0	0,0	3,0	4,0	0,0	2,0	2,0	2,0
1,0	2,0	2,0	0,0	0,0	3,0	4,0	0,0	2,0	3,0	3,0	3,1

✓	✗	✗	✓	✗	✗	✓	✗	✗	✓	✓
0,1	0,0	2,0	2,1	3,0	1,0	1,1	2,0	0,0	0,1	0,0
2,1	2,0	3,0	3,0	1,0	2,0	2,0	0,0	1,0	1,0	1,1
3,1	3,0	4,0	1,0	2,0	0,0	0,0	1,0	2,0	2,0	2,0

Page Fault = $\frac{11}{20} = \frac{55}{100} = \%55$

LRU:

7	7	7	2	2	4	4	4	0	1	1	1
	0	0	0	0	0	0	3	3	3	0	0
		1	1	3	3	2	2	2	2	2	7

Page Fault = $\frac{12}{20}$ = $\frac{60}{100}$ = %60

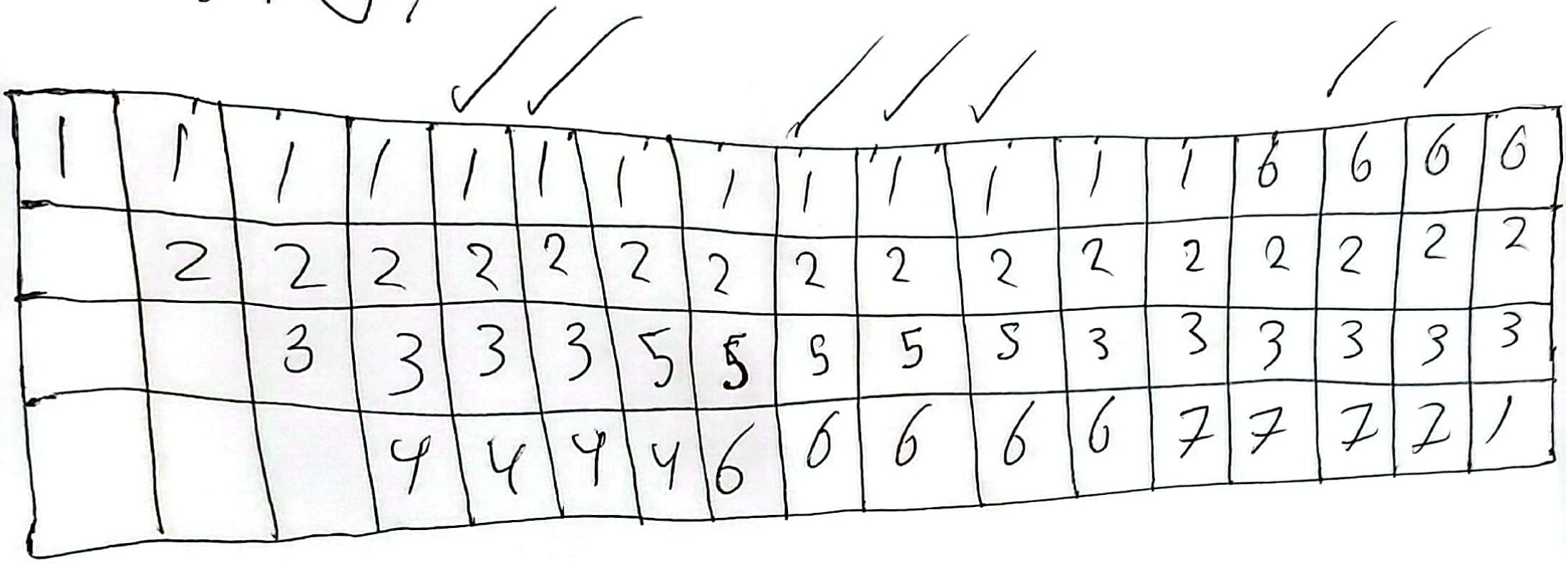
Ex (5) Second Chance

x	x	x	x	✓	✓	x	x	x	x	✓	✓	✓	x	x
1,0	1,0	1,0	1,0	1,0	1,1	2,1	3,0	4,0	1,0	1,0	1,1	2,1	5,0	6,0
2,0	2,0	2,6	2,0	2,1	2,1	3,0	4,0	1,0	2,0	2,1	2,1	5,0	6,0	1,0
3,0	3,0	3,0	3,0	3,0	3,0	4,0	1,0	2,0	5,0	5,0	5,0	6,0	1,0	2,0
4,0	4,0	4,0	4,0	4,0	4,0	1,0	2,0	5,0	6,0	6,0	6,0	1,0	2,0	3,0

x	x	✓	✓	x	x	x
1,0	2,0	2,0	2,1	3,1	7,0	6,0
2,0	3,0	3,1	3,1	7,0	6,0	2,0
3,0	7,0	7,0	7,0	6,0	2,0	3,0
7,0	6,0	6,0	6,0	2,0	3,0	1,0

Page Result: $\frac{10}{17} = 58.82\%$

LRU:



Page Fault = $\frac{10}{17}$ = 58.82%