

COMP9315 Sample Exam, Q4 Sample Solution

(a) sequential scan, b=20, B=5, repl=LRU

```
#requests = 20 (obvious)
#reads    = 20 (no re-use)
#hits     = 0 (nothing is requested twice)
```

After 15 requests

```
Buffers [0] [1] [2] [3] [4]
Contents R10 R11 R12 R13 R14
```

(b) sequential scan, b=10, B=5, repl=MRU

```
reads = (1st scan) 5 to fill buffer + 5 for next 5 pages
        + (2nd scan) no read for 4 pages, then read for next 6 pages
        [we keep replacing the last buffer page]
```

Mark MRU with *

```
request R0 [R0*,--,--,--] read
request R1 [R0,R1*,--,--] read
request R2 [R0,R1,R2*,--,--] read
request R3 [R0,R1,R2,R3*,--] read
request R4 [R0,R1,R2,R3,R4*] read
request R5 [R0,R1,R2,R3,R5*] read
request R6 [R0,R1,R2,R3,R6*] read
request R7 [R0,R1,R2,R3,R7*] read
request R8 [R0,R1,R2,R3,R8*] read
request R9 [R0,R1,R2,R3,R9*] read
request R0 [R0*,R1,R2,R3,R9] hit
request R1 [R0,R1*,R2,R3,R9] hit
request R2 [R0,R1,R2*,R3,R9] hit
request R3 [R0,R1,R2,R3*,R9] hit
request R4 [R0,R1,R2,R4*,R9] read
request R5 [R0,R1,R2,R5*,R9] read
request R6 [R0,R1,R2,R6*,R9] read
request R7 [R0,R1,R2,R7*,R9] read
request R8 [R0,R1,R2,R8*,R9] read
request R9 [R0,R1,R2,R8,R9*] hit
```

```
#requests = 20 (two scans)
#reads    = 15 (see above)
#hits     = 5 (see above)
```

MRU not great for this request pattern

After 15 requests

```
Buffers [0] [1] [2] [3] [4]
Contents R0 R1 R2 R4 R9
```

(c) S Join T, bS=5, bT=10, B=10

```
for i in 0..4 {
  request S[i]
  for T in 0..9 {
    request T[i]
    join tuples from S[i] and T[j]
  }
}
```

one request for each page of S
with each page of S, request all pages of T

total requests = 5 + 5*10 = 55

Initially

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	-	-	-	-	-	-	-	-	-	-

After 5 requests

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	S0	T0	T1	T2	T3	-	-	-	-	-

After 10 requests

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	S0	T0	T1	T2	T3	T4	T5	T6	T7	T8

After 11 requests (replace MRU buffer[9])

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	S0	T0	T1	T2	T3	T4	T5	T6	T7	T9

After 12 requests (replace MRU buffer[9])

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	S1	T0	T1	T2	T3	T4	T5	T6	T7	T9

After 15 requests (all required pages are loaded)

Buffers	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Contents	S1	T0	T1	T2	T3	T4	T5	T6	T7	T9

#requests is easy to work out (see above) = 55

#reads = 5 (for S) + 10 (on first pass over T)
+ 1 (on each subsequent T pass, looking at pattern)
= 5 + 10 + 1*4 = 19

#hits = #requests - #reads = 55 - 19 = 36

```
#requests = 55  
#reads    = 19  
#hits     = 36
```