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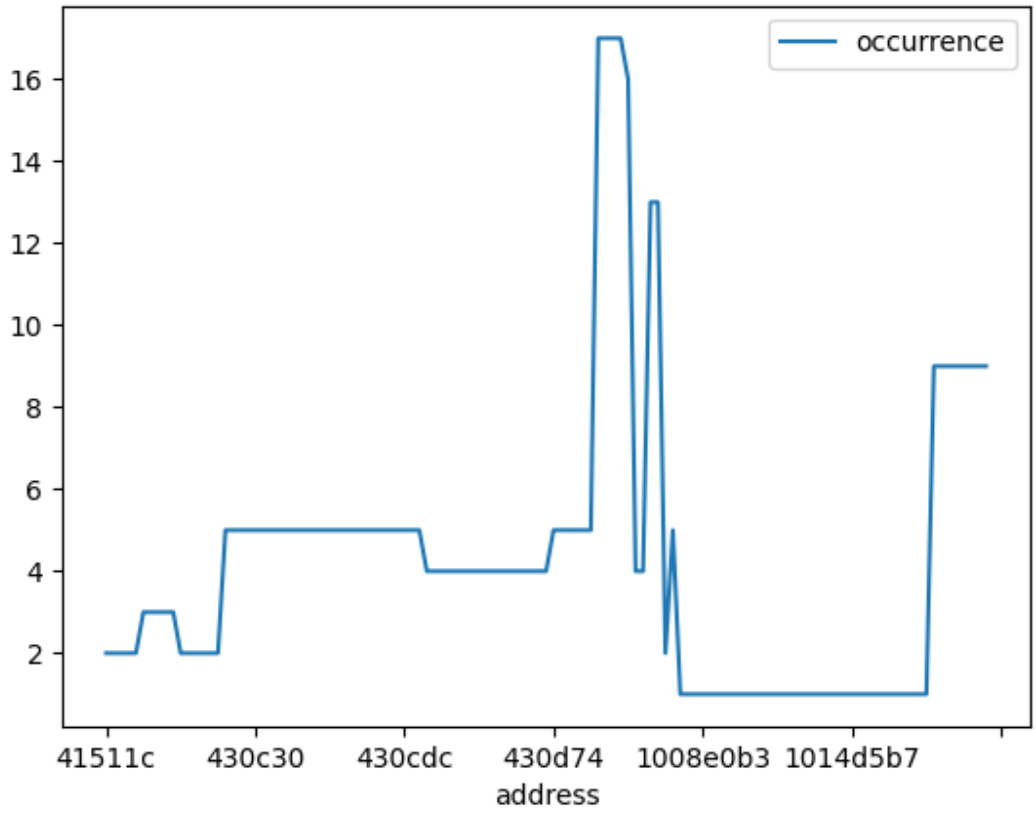
1.

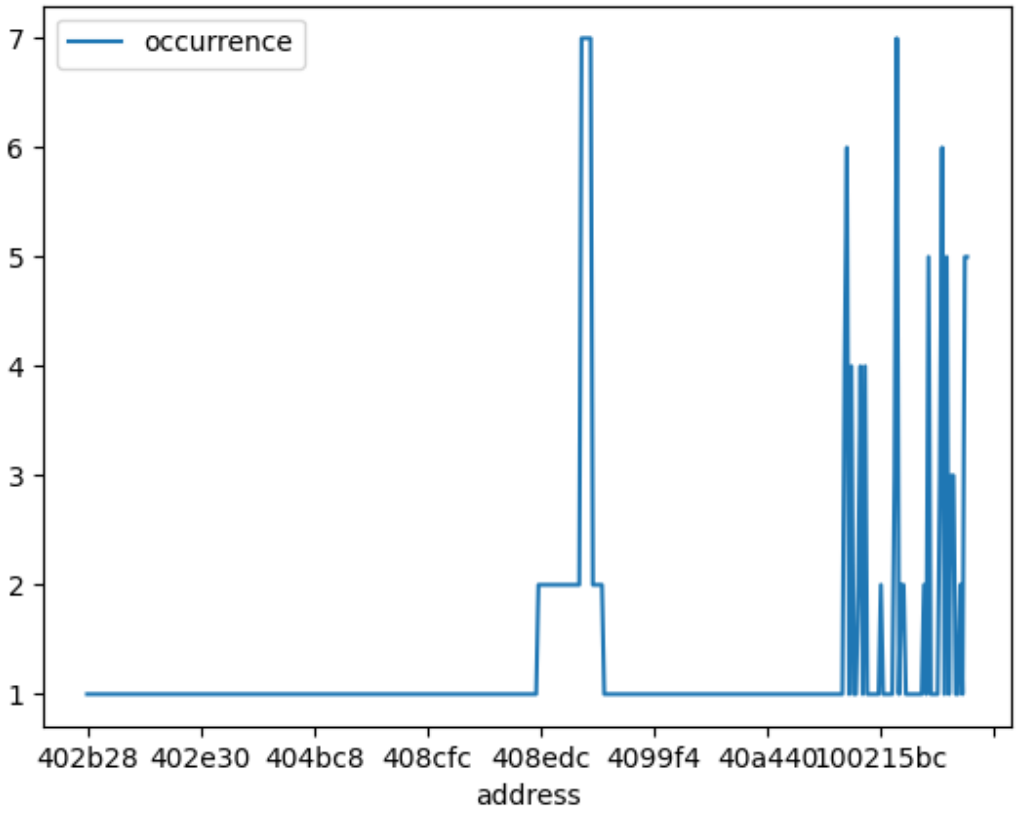
Considered 501 values out of total values for plotting the graph.

tex.din

```
operation    Occurrence
0               74
1               65
2              362
```




```
(B) frequency of read:130655
(C) Frequency of write:104513
```



cc.din

operation	Occurrence
0	78
1	49
2	374

(B) frequency of read: 159631
(C) Frequency of write: 83030
(d)

2.
(a)
For integers:

Attempt	macOS	Windows OS
Attempt 1	44 ms	36 ms
Attempt 2	39 ms	35 ms
Attempt 3	38 ms	40 ms
Attempt 4	38 ms	54 ms
Attempt 5	43 ms	42 ms

Average Execution time for macOS : 40.4ms
Average Execution time for Windows OS: 41.4ms

Performance ratio of Mac OS = Performance Mac/ Performance Windows = Execution Windows/ Execution Mac

=41.4/ 40.4
= 1.02475

Clock rate ratio = clock rate of windows/. Clock rate of Mac = 1.6/1.2 = 1.33

The performance ratio is different than clock rate ratio

For real numbers:

Attempt	macOS	Windows OS
Attempt 1	17 ms	25 ms
Attempt 2	36 ms	27 ms
Attempt 3	21 ms	27 ms
Attempt 4	24 ms	26 ms
Attempt 5	40 ms	30 ms

Average Execution time for macOS: 27.6
Average Execution Time for Windows OS: 27

Performance ratio of Mac OS = Performance Mac/ Performance Windows = Execution Windows/ Execution Mac

= 27.6/27
= 1.0222

Clock rate ratio = clock rate of windows/. = 1.6/1.2 = 1.33
Clock rate of Mac

The performance ratio is different than clock rate ratio

(b) After changing the algorithm:

For integers:

Attempt	macOS	Windows OS
Attempt 1	39 ms	45
Attempt 2	40 ms	41
Attempt 3	38 ms	43
Attempt 4	40 ms	43
Attempt 5	35 ms	39

Average Execution time for macOS : 40.4ms
Average Execution time for Windows OS: 42.2ms

Performance ratio of Mac OS = Performance Mac/ = Execution Windows/
Performance Windows Execution Mac

= 42.2/40.4 = 1.0445

Clock rate ratio = clock rate of windows/. = 1.6/1.2 = 1.33
Clock rate of Mac

The performance ratio is different than clock rate ratio

For real numbers:

Attempt	macOS	Windows OS
Attempt 1	41 ms	40
Attempt 2	49 ms	41
Attempt 3	42 ms	43
Attempt 4	39 ms	42
Attempt 5	41 ms	55

Average Execution time for macOS: 42.4ms
Average Execution Time for Windows OS: 44.2

Performance ratio of Mac OS = Performance Mac/ Performance Windows = Execution Windows/ Execution Mac

= 44.2/42.4 = 1.042

Clock rate ratio = clock rate of windows/. Clock rate of Mac = 1.6/1.2 = 1.33

The performance ratio is different than clock rate ratio

Based on the performance and costs of the two systems. I think windows OS is more cost effective than macOS because the its just 2-5% slower in the performance based on the performance ratio and in terms of cost it is around roughly 20-30% cheaper.

	macOS	Windows
Manufacturer	Apple	Dell
CPU Type	Dual-Core intel i5	Intel core i5
Memory	256 GB	1 TB
RAM	16 GB	8 GB
OS	macOS	Windows