

Computer Organization Benchmarking Project

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COMPUTER SPECIFICATIONS

1. The brand of CPU (Intel or AMD): Apple Silicon
2. The model of CPU: Apple M1 Max
3. The number of cores on CPU: 10-core CPU and 32-core GPU
4. The clock rate of CPU in GHz: 3.2 GHz
5. The amount of memory in GB: 32 GB
6. The speed of memory: 128-bit LPDDR4X SDRAM
7. The capacity of hard drive: 1 TB
8. The type of hard drive: SSD
 - a. Max sequential read speed: 2900 MB/s
 - b. Max sequential write speed: 2215 MB/s
 - c. Max random read speed: 3400 MB/s
 - d. Max random write speed: 2715 MB/s

RESULTS FOR BENCHMARKS

1) First Benchmark (32-bit Integer operation benchmark):

```
ujjawal@Ujjawals-MBP Study % python3 integerBenchmark.py
Benchmark 1:
32-bit Integer operation benchmark
Which includes additions, multiplication, and division' is: 314.02557587623596 seconds
```

2) Second Benchmark (64-bit Floating point operation benchmark):

```
ujjawal@Ujjawals-MBP Study % python3 floatingBenchmark.py
Benchmark 2:
64-bit Floating point operation benchmark
Which includes additions, multiplication, and division' is: 339.2457480430603 seconds
```

3) Third Benchmark (Memory benchmark):

```
• ujjawal@Ujjawals-MBP Study % python3 memoryBenchmark.py
Benchmark 3:
Memory benchmark
Which includes reading from, and writing to array, 4 bytes each time is: 690.1815009117126 seconds
```

4) Fourth Benchmark (Hard drive benchmark 1):

```
• ujjawal@Ujjawals-MBP Study % python3 hardDriveBenchmarkOne.py
Benchmark 4:
Hard Drive benchmark 1
Which includes reading from, and writing to file, 100 bytes each time is: 2.2190968990325928 seconds
```

5) Fifth Benchmark (Hard drive benchmark 2)

```
• ujjawal@Ujjawals-MBP Study % python3 hardDriveBenchmarkTwo.py
Benchmark 5:
Hard Drive benchmark 2
Which includes reading from, and writing to file, 10000 bytes each time is: 0.7096550464630127 seconds
```

Benchmark	Benchmark Recorded Time	Reference Time (seconds)	Benchmark Ratio (Reference Time/Benchmark Recorded Time)
First Benchmark	314.0256	100	0.3184
Second Benchmark	339.2457	100	0.2947
Third Benchmark	690.1815	100	0.1449
Fourth Benchmark	2.2190	250	112.6634

Fifth Benchmark	0.7096	10	14.0924
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FINAL BENCHMARK (Combined)

Geometric mean of all the benchmarks

$$= \sqrt[5]{\text{Benchmark 1} * \text{Benchmark 2} * \text{Benchmark 3} * \text{Benchmark 4} * \text{Benchmark 5}}$$

$$= (0.3184 * 0.2947 * 0.1449 * 112.6634 * 14.0924) ^ {1/5}$$

$$= 1.8485$$