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CSCI 202

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### Specification of Computer:

- o The brand of CPU (Intel or AMD): **AMD**
- o The model of CPU (e.g. Intel i7-9700K Coffee Lake): **AMD Ryzen 5 5500U with Radeon**

### Graphics

- o The number of cores on CPU: **6 cores**
- o The clock rate of CPU in GHz: **2.10 GHz**
- o The amount of memory in GB: **8.00 GB**
- o The speed of memory: **DDR4 3200**
- o The capacity of hard drive: **256 GB**
- o The type of hard drive: magnetic or SSD: **SSD**

### SSD

- Max sequential read speed: 2100 Mb/s
- Max sequential write speed: 1400 Mb/s
- Max random read speed: 250000 IOPS
- Max random write speed: 180000 IOPS

### Screenshots of Benchmarks

```
C:\Users\sashe\OneDrive\Desktop\Academics\CSCI 202\project\BenchmarkingProject>.\a.exe
sum byte size:4
product byte size:4
quotient byte size:4
Time for integer operations: 14765120900 ns
```

Caption: Output of integer operations benchmark

```
C:\Users\sashe\OneDrive\Desktop\Academics\CSCI 202\project\BenchmarkingProject>.\a.exe
sum byte size:8
product byte size:8
quotient byte size:8
Time for floating point operations: 14827735500 ns
```

Caption: Output of floating-point operations benchmark

```
C:\Users\sashe\OneDrive\Desktop\Academics\CSCI 202\project\BenchmarkingProject>.\a.exe
Time for memory operations: 20064810300 ns
```

Caption: Output of memory operations benchmark

```
C:\Users\sashe\OneDrive\Desktop\Academics\CSCI 202\project\BenchmarkingProject>.\a.exe
Time for hard drive benchmark 1: 4271242200 ns
```

Caption: Output of Hard Drive benchmark 2

```
C:\Users\sashe\OneDrive\Desktop\Academics\CSCI 202\project\BenchmarkingProject>.\a.exe
Time for hard drive benchmark 2: 2748607200 ns
```

Caption: Output of Hard Drive benchmark 2

## Table recording the results of all the benchmarks

Name	Description	Execution time (ns)	Execution time (s)	Reference time (s)	Ratio
Integer Operations	<ul style="list-style-type: none"> <li>o <math>10^{10}</math> additions (of integer constants)</li> <li>o <math>5 \times 10^9</math> multiplication (of integer constants)</li> <li>o <math>2 \times 10^9</math> division (of integer constants)</li> </ul>	14765120900	14.765120900	100	6.7727179938
Floating Point Operations	o Same as integer, use <i>double precision</i> floating point numbers instead of integer.	14827735500	14.827735500	100	6.7441181427
Memory Operations	<ul style="list-style-type: none"> <li>o Read from <math>5 \times 10^9</math> different array elements, 4 bytes each time</li> <li>o Write to <math>5 \times 10^9</math> different array elements, 4 bytes each time</li> </ul>	20064810300	20.064810300	100	4.9838497600

Hard drive benchmark 1	o Read a whole file of 10 <sup>9</sup> bytes, 100 bytes each time o Write 10 <sup>9</sup> bytes to a file, 100 bytes each time	4271242200	4.271242200	250	58.530981923
Hard drive benchmark 2	o Read a whole file of 10 <sup>9</sup> bytes, 10000 bytes each time o Write 10 <sup>9</sup> bytes to a file, 10000 bytes each time	2748607200	2.748607200	10	3.6382062886
Geometric mean					8.651775603

## Summary of Results of Benchmarks using Geometric Mean

Summary of results using a single number (geometric mean): 8.651775603