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|  |  | **Activity Guide - Bytes and File Sizes** | logo.png |

**What is a byte?**  A byte is a unit of data that is 8 bits long. A byte is the standard “chunk size” for binary information in most modern computers

**Larger Chunks of Data:** On modern computers the amount of information we can create and store has grown so large that we need new units of measurement to describe the size of our data. Use these websites for your research.

* **Stanford University - CS 101 - Kilobytes Megabytes Gigabytes**: <https://web.stanford.edu/class/cs101/bits-gigabytes.html>
* **Computer Hope - How much is 1 byte, kilobyte, megabyte, gigabyte, etc.?** <http://www.computerhope.com/issues/chspace.htm>

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| **Unit** | **Number of Bytes (approx)** | **Example of File Type or Data Measured in this Unit** |
| Kilobyte (KB) | 1000 | Word Processing Document |
| Megabyte (MB) | 1000000 | Mp3 music file |
| Gigabyte (GB) | 1000000000 | HD Movie |
| Terabyte (TB) | 1000000000000 | 40 Blue Ray disks |
| Petabyte (PB) | 1000000000000000 | Answers will vary |
| Exabyte (EB) | 1000000000000000000 | Answers will vary |

**How big are the files I use every day?** Try to determine the size of files you probably use every day. You can either research these answers online or check the size of actual files on your computer.

* PC/WINDOWS: Right-click and choose “Properties”
* MAC: Ctrl+click and choose “Get Info”

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| **File type** | **Size as # of pages, minutes, seconds, or dimensions** | **Size of file in Bytes, KB, MB, GB, etc.** |
| page of plain text (.txt) | About 500 words, or 2500 characters | 2500 Bytes, 2.5KB |
| .jpg image | Answers will vary | Answers will vary |
| animated .gif image | Answers will vary | Answers will vary |
| .pdf file | Answers will vary | Answers will vary |
| Audio file as .mp3 | Answers will vary | Answers will vary |
| movie file such as .mov or .mp4 | Answers will vary | Answers will vary |

# Test your knowledge!

The first 3 questions here are from: <https://web.stanford.edu/class/cs101/bits-gigabytes.html>

You can check the answers there.

1. Alice has 600 MB of data. Bob has 2000 MB of data. Will it all fit on Alice's 4 GB thumb drive?

Yes. 2600MB is roughly 2.6GB

1. Alice has 100 small images, each of which is 500 KB. How much space do they take up overall in MB?

50000KB is approx. 50MB

1. Your ghost hunting group is recording the sound inside a haunted classroom for 20 hours as MP3 audio files. About how much data will that be, expressed in GB?

MP3 audio is about 1 megabyte per minute, and 20 hours is 1200 minutes, so approx. 1200MB or 1.2GB

Here are a few more.

1. A salesperson is trying to sell you a phone that has 16 GB of memory saying, “that’s enough space to record an hour of high quality video!” This salesperson is probably wrong, but in which direction? Would you have more than enough memory or not enough?

High quality video is roughly 2Gb an hour. While the phone would have enough memory for an hour of video, 16GB isn’t a lot of memory for a smart phone.

1. Shakespeare’s complete works have approximately 3.5 million characters. Which is bigger in file size: Shakespeare’s complete works stored in plain ASCII text or a 4 minute song on mp3? How much bigger?

MP3 audio is about 1 megabyte per minute, so a 4 minute song would take up 4MB. One letter is one about byte so Shakespeare’s complete works would take 3,500,000 bytes which is approx. 3.5MB. The audio file is 0.5MB bigger

1. **Tricky**: Assume your Internet connection can transmit 1 million ***bits*** per second. Approximately how long would it take you to download 1 Terabyte of data? (Hint: first figure out how many bits a terabyte is, second be prepared to wait a long time).

One TB is 1,000,000,000,000 bytes which is 8,000,000,000,000 bits. 8,000,000,000,000/1,000,000 is 8,000,000 seconds, 133,333 minutes, 2,222 hours which is roughly 90 days