

Name(s) _____ Period _____ Date _____

Activity Guide KEY - Bytes and File Sizes



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:](#)
- **Computer Hope - How much is 1 byte, kilobyte, megabyte, gigabyte, etc.?**
<http://www.computerhope.com/issues/chspace.htm>

Unit	Number of Bytes (approx)	Example of File Type or Data Measured in this Unit
Kilobyte (KB)	1,000 (10^3 , one thousand)	.txt (text)
Megabyte (MB)	1,000,000 (10^6 , one million) or 1 MB = 1,000 KB	.jpeg (image)
Gigabyte (GB)	1,000,000,000 (10^9 , one billion) Or 1 GB = 1,000 MB	.mov (video)
Terabyte (TB)	1,000,000,000,000 (10^{12} , one trillion) Or 1TB = 1,000 GB	large .iso file (disk image) or harddrive
Petabyte (PB)	1,000,000,000,000,000 (10^{15} , one quadrillion) Or 1PB = 1,000 TB	A very large database such as Facebook photos which is reportedly about 350 Petabytes.
Exabyte (EB)	1,000,000,000,000,000,000 (10^{18} , one quintillion) Or 1EB = 1,000 PB	The entire amount of data transferred over the entire internet is measured in the hundreds (or soon thousands) of exabytes annually, though estimates 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”

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	2.5 KB

.jpg image		Typically 100 - 1000 KB
animated .gif image		Typically 250 KB - 2MB
.pdf file		Typically under 10MB
Audio file as .mp3		Typically about 1MB per minute
movie file such as .mov or .mp4		Typically about 15MB/min or 1GB/hr for decent quality video

Test your knowledge!

The first 3 questions here are from: [Stanford University - CS 101](#)

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 it fits: 600 MB + 2000 MB is 2600 MB. 2600 MB is 2.6 GB, so it will fit on the 4 GB drive no problem. Equivalently we could say that the 4 GB drive has space for 4000 MB.

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

100 times 500 KB is 50000 KB, which is 50 MB

3. 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 takes up about 1 MB per minute. 20 hours, 60 minutes/hour, $20 * 60$ yields 1200 minutes. So that's about 1200 MB, which is 1.2 GB

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?

An hour of high quality video is probably about 1GB. So the salesperson is wrong - the phone could store a lot more video.

2. 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?

These are actually pretty close in file size, though the song on mp3 would probably be a little bit bigger. For Shakespeare: 3.5 million characters of plain ascii text is about 3.5MB
Typically Mp3 audio is about 1MB per minute, so a 4 min song would be about 4MB.

3. **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).

- A terabyte is about 1 trillion bytes, so that means it's 8 trillion **bits** (since 1 Byte = 8 bits).
- The internet connection is 1 million bps, so that means it will take (8 trillion / 1 million) = 8 million seconds to transfer.

$$\begin{array}{rcl} 8 \text{ trillion} & 8,000,000,000,000 \\ \hline 1 \text{ million} & 1,000,000 & = 8,000,000 \text{ seconds} \end{array}$$

- 8 million seconds = 133,333.33 **minutes** = 2,222.22 **hours** = 92.59 **days**.