Unit 7, Lesson 14

Is a Smartphone Smart Enough to Go to the Moon?

Let's compare digital media and computer hardware using scientific notation.

14.1 Old Hardware, New Hardware

In 1966, the Apollo Guidance Computer was developed to make the calculations that would put humans on the Moon.

Your teacher will give you information for different devices from 1966 to 2023. Choose one device, and compare the specifications of that device with the 1966 Apollo Guidance Computer. If you get stuck, consider using scientific notation to help with the calculations.

For reference, storage is measured in bytes, processor speed is measured in hertz, and memory is measured in bytes. "Kilo" stands for 1,000, "mega" stands for 1,000,000, "giga" stands for 1,000,000,000, and "tera" stands for 1,000,000,000,000.

1. Which device did you choose?
2. How many times more information than the 1966 Apollo Guidance Computer can this device store?

3. How many times faster than the 1966 Apollo Guidance Computer is this device's processor speed?

4. How many times more memory than the 1966 Apollo Guidance Computer can this device store?

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14.2 A Bit More on Bytes

For each question, think about what information you would need to figure out an answer. Your teacher may provide some of the information you ask for. Write your answers using scientific notation.

1. Mai found a 1980's computer magazine with an advertisement for a machine with hundreds of kilobytes of storage! Mai was curious and asked, "How many kilobytes would my dad's new computer hold?"

2. The old magazine showed another ad for a 750-kilobyte floppy disk, a device used in the past to store data. How many gigabytes is this?

3. Mai is writing a 1-page essay for school on her computer. Estimate how many 1-page essays it would take for Mai to fill up a floppy disk. Explain or show your reasoning.

4. Mai likes to go to the movies with her friends and knows that a high-definition film takes up a lot of storage space on a computer. Estimate how many floppy disks it would take to store a high-definition movie. Explain or show your reasoning.

5. How many seconds of a high-definition movie would one floppy disk be able to hold?

6. If you fall asleep watching a movie streaming service, and it streams movies all night while you sleep, how many floppy disks of information would that be?

Are you ready for more?

Humans tend to work with numbers using powers of 10, but computers work with numbers using powers of 2. A "binary kilobyte" is 1,024 bytes instead of 1,000, because $1{,}024 = 2^{10}$. Similarly, a "binary megabyte" is 1,024 binary kilobytes, and a "binary gigabyte" is 1,024 binary megabytes.

1. Which is bigger, a binary gigabyte or a regular gigabyte? How many more bytes is it?

2. Which is bigger, a binary terabyte or a regular terabyte? How many more bytes is it?