# Useable Memory

Imagine a world where a “foot” was 12 inches to one person and 11 inches to another. The only thing common to the two people with yard sticks would be the size of the inch. Their yard sticks placed side to side would be different. There are two gigabytes, two megabytes, and two kilobytes, each meaning something slightly different then its counterpart. It so happens that 2 ^10th power is almost 1000 (it’s 1024) and 2 ^20th power is almost 1 million (it’s 1,048,576) and 2 ^30th power is almost 1 billion ( it’s 1,073,741,824). A kilobyte is 1000 bytes to person counting in decimal and 1024 bytes to a person using the binary representations. The only thing common to the two measurement systems is the size of a byte.

Your operating system uses both binary and decimal representations of hard drive space depending on where you look. The hard drive manufacturers use the decimal representation. I’ve seen people complain that HD manufacturers are using the most beneficial numbers to rate their products, but I don’t agree with this. If you use the decimal system you know exactly how many bytes your hard drive will hold without having to think about it. If you use the binary representation, you have to do a calculation to figure the exact number of bytes your hard drive will hold.

Let’s use the example of an 80 gigabyte hard drive. A typical 80 gig will have 80,048,390,144, but Windows will report that as 74.5GB in some places. If we calculate 80,048,390,144/1,048,576 we get roughly 74.55, (binary) gigabytes. A 160 GB drive would be 160,000,000,000/1,073,741,824 or 149.0116119 (binary) gigabytes. To get the values in (binary) megabytes simply divide by 1,048,576.

Flash memory has a much smaller storage to surface area of the chip, so there are higher allowable variances in the manufacturing process, so while in hard drives, the difference between a group of 500GB drives is negligible, about a .1-.5% variance, flash memory manufacturers consider 1-3% an acceptable variance for Tier 1 memory. Anything higher than 3% is usually reserved for integrated devices that don’t require stricter guidelines on variances.

**Information cited from dslreports.com user forums and pcmag.com*

| Memory Size | Word Document* | PDF Document* | Photos* | PowerPoint* | Full Length Movie* | Songs* |
|---|---|---|---|---|---|---|
| 128MB | 2,304 | 384 | 76 | 357 | n/a | 28 |
| 256MB | 4,718 | 786 | 153 | 715 | n/a | 57 |
| 512MB | 9,437 | 1,573 | 307 | 1,430 | n/a | 115 |
| 1GB | 18,874 | 3,146 | 614 | 2,860 | n/a | 230 |
| 2GB | 37,749 | 6,291 | 1,229 | 5,719 | 1 | 460 |
| 4GB | 75,497 | 12,583 | 2,457 | 11,439 | 2 | 921 |
| 8GB | 150,995 | 25,166 | 4,915 | 22,878 | 5 | 1,843 |
| 16GB | 301,990 | 50,331 | 9,830 | 45,756 | 10 | 3,686 |
| 32GB | 603,980 | 100,663 | 19,661 | 91,512 | 21 | 7,372 |
| 64GB | 1,207,959 | 201,326 | 39,321 | 183,024 | 42 | 14,745 |

*Word Document based on an average file size of 50kb
*PDF Document based on an average file size of 300kb
*Photos based on an average file size of 1.5MB
*PowerPoint based on an average file size of 330kb (10 slides)
*Movies based on an average file size of 1.5GB for 1 move
*Songs based on an average file size of 4MB per 1 song

*Note: USB drive memory capactiy is never 100% of stated capacity. Most USB drive capacity ranges from 90 - 98% useable memory. (e.g. - a 1GB drive holds roughly 800MB)

*All statistics are estimates and will vary depending on exact file size and/or combination with other files.