Basic unit of information
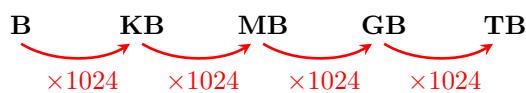
1 *bit* is the fundamental unit of information: 0 or 1.

$$1B = 8\,bit \qquad (256\,possibilities)$$

B　　　KB　　　MB　　　GB　　　TB

×1024　×1024　×1024　×1024

It would be desirable to multiply by 1000 for each increment of one unit, but as it is binary, $2^{10} = 1024$ is used instead.

例 1 How many 100MB files can fit on a 3GB USB flash drive?
3GB の USB フラッシュメモリに 100MB のファイルは何枚入るか？

問 1 Answer the following questions.

(1) How many 250MB video files can be stored on an 8GB SD card? (8GB の SD カードに 250MB の動画ファイルは何本保存できるか？)

(2) How many 800MB photo folders can be stored on a 4TB external HDD? (4TB の外付け HDD に 800MB の写真フォルダは何個保存できるか？)

(3) How many bits are in a 50KB Word file? (50KB のワードファイルは何 bit か？)

例 2 How many seconds does it take to upload a 100MB file on a 20Mbps connection? (theoretical value)
20Mbps の回線で 100MB のファイルをアップロードするには何秒かかるか？（理論値）

問 2 Answer the following questions.

(1) How many seconds does it take to download a 500MB video on a 1Gbps fiber connection?
1Gbps の光回線で 500MB の動画をダウンロードするには何秒かかるか？

(2) To distribute a 200MB video for an online class, how long does it take to upload on a 50Mbps connection?
オンライン授業で 200MB の動画を配信する。50Mbps の回線でアップロードするには何分何秒かかるか？

(3) A 200MB file was downloaded on a 50Mbps connection. If it actually took 40 seconds, what is the effective speed in Mbps?
50Mbps の回線で 200MB のファイルをダウンロードした。実際に 40 秒かかった場合、実効速度は何 Mbps か？

Basic unit of information

1 *bit* is the fundamental unit of information: 0 or 1.

$$1B = 8\,bit \qquad (256\,possibilities)$$

B　　**KB**　　**MB**　　**GB**　　**TB**

$\times 1024$　$\times 1024$　$\times 1024$　$\times 1024$

It would be desirable to multiply by 1000 for each increment of one unit, but as it is binary, $2^{10} = 1024$ is used instead.

例1 How many 100MB files can fit on a 3GB USB flash drive?
3GB の USB フラッシュメモリに 100MB のファイルは何枚入るか？

$$3GB = 3 \times 1000 = 3000MB$$

$$3000MB \div 100MB = 30$$

$\boxed{30 \text{ files}}$

問1 Answer the following questions.

(1) How many 250MB video files can be stored on an 8GB SD card? (8GB の SD カードに 250MB の動画ファイルは何本保存できるか？)

$$8GB = 8 \times 1000 = 8000MB$$

$$8000MB \div 250MB = 32$$

$\boxed{32 \text{ files}}$

(2) How many 800MB photo folders can be stored on a 4TB external HDD? (4TB の外付け HDD に 800MB の写真フォルダは何個保存できるか？)

$$4TB = 4000GB = 4,000,000MB$$

$$4,000,000MB \div 800MB = 5000$$

$\boxed{5000 \text{ folders}}$

(3) How many bits are in a 50KB Word file? (50KB のワードファイルは何 bit か？)

$$50KB = 50 \times 1000B = 50000B$$

$$50000B \times 8 = 400000bit$$

$\boxed{400000 \text{ bit } (40 \text{ 万 bit})}$

例2 How many seconds does it take to upload a 100MB file on a 20Mbps connection? (theoretical value)
20Mbps の回線で 100MB のファイルをアップロードするには何秒かかるか？（理論値）

$$100MB = 100 \times 8 = 800Mbit$$

$$800Mbit \div 20Mbps = 40 \text{ 秒}$$

$\boxed{40 \text{ seconds}}$

問2 Answer the following questions.

(1) How many seconds does it take to download a 500MB video on a 1Gbps fiber connection?
1Gbps の光回線で 500MB の動画をダウンロードするには何秒かかるか？

$$500MB = 500 \times 8 = 4000Mbit = 4Gbit$$

$$4Gbit \div 1Gbps = 4seconds$$

$\boxed{4 \text{ seconds}}$

(2) To distribute a 200MB video for an online class, how long does it take to upload on a 50Mbps connection?
オンライン授業で 200MB の動画を配信する。50Mbps の回線でアップロードするには何分何秒かかるか？

$$200MB = 200 \times 8 = 1600Mbit$$

$$1600Mbit \div 50Mbps = 32seconds$$

$\boxed{32seconds}$

(3) A 200MB file was downloaded on a 50Mbps connection. If it actually took 40 seconds, what is the effective speed in Mbps?
50Mbps の回線で 200MB のファイルをダウンロードした。実際に 40 秒かかった場合、実効速度は何 Mbps か？

$$200MB = 200 \times 8 = 1600Mbit$$

$$1600Mbit \div 40 \text{ 秒} = 40Mbps$$

$\boxed{40 \text{ Mbps}}$