Byte Units

KB = 2^{10}
MB = 2^{20}
GB = 2^{30}
TB = 2^{40}
PB = 2^{50}
EB = 2^{60}

4GB = 4×2^{30} bytes

N = number of bits in memory address then 2^N is number memory cells

32 bit memory address = 2^{32} memory cells

each memory cell is 1 byte

2^{32} bytes memory = $2^{30} \cdot 2^2$ bytes = 4 GB

$x^y \cdot x^z = x^{y+z}$

$x^{yz} = x^y \cdot x^z$

32GB memory = $2^5 \cdot 2^{30}$ bytes = 2^{35} = 35 bits in memory address

31GB memory = $31 * 2^{30} = 2^{4.954} * 2^{30} = 2^{34.954}$

34.954 bits in memory address? round up to 35

3TB memory $\approx 2^2 * 2^{40} = 2^{42}$ = 42 bits memory address

$2^1 = 2$ $2^2 = 4$

17

$2^4 = 16$ $2^5 = 32$

37 bit memory address = 2^{37} memory cells = $2^7 * 2^{30}$ bytes = 128 GB

32 bit memory address

1d memory 4GB 4,294,967,296 output wires decoder

2d memory ~~2GB x 2GB~~

16 bits x 16 bits memory address

↑ rows ↑ columns

65,536 bytes x 65,536 bytes

$2^6 \times 2^{10}$

64 kB x 64 kB

17 bit memory address

8.5 x 8.5

8 x 9

9 x 8 → 9 bits row, 8 bits col

9 x 9

9 bits row

9 bits column

2^9 output lines = 2^9 memory cells = 2^9 bytes

STB in 2d

$S \times 2^{40} = 2^3 * 2^{40} = 2^{\frac{43}{}}$ 43 = min mar size $43/2$ $44/2$

22 bits for row

22 bits for col

4 MB x 4 MB

$2^2 = 4\ 2^3 = 8$

-52 =

0011 0100 abs value in binary -48

1100 1011 complement

+ 0000 0001 add 1

1100 1100 two's complement

C C hex