Discussion [0b10] [2] [0x2]

Limits

(a) What is the biggest number that can be represented with two decimal digits?

(b) What is the biggest number that can be represented with three binary digits?

(c) What is the biggest number that can be represented with four hexadecimal digits?

Conversion

(a) Convert the following binary numbers into decimal.

11001 –> ___

1001001 –> ___

(b) Convert the following decimal numbers into binary.

12 –> _____

64 -> _____

127 -> _____

(c) Convert the following binary numbers into hexadecimal.

10011001 -> _____

11110111 -> _____

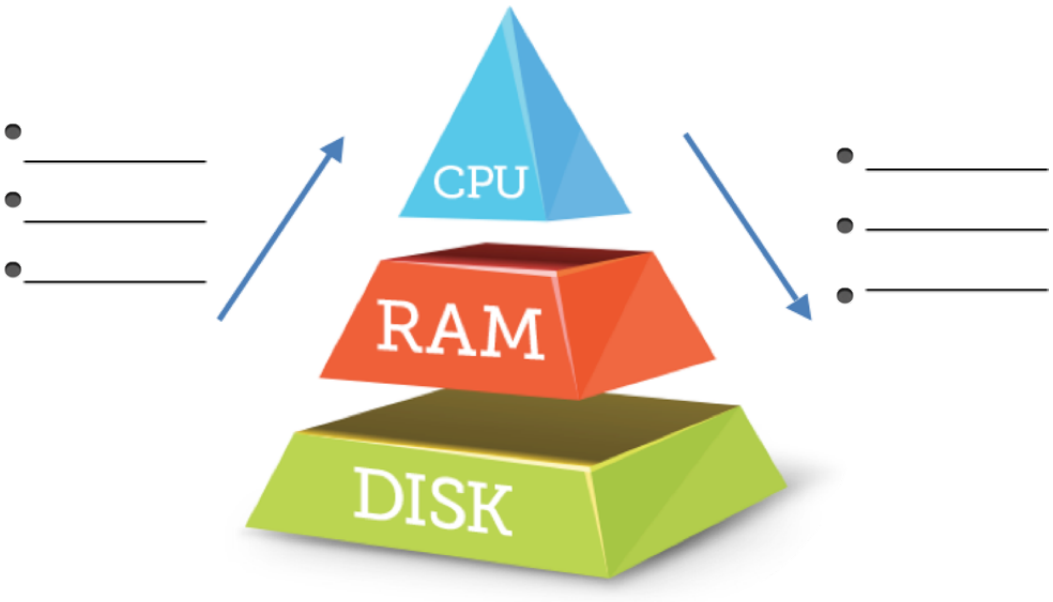
110000001111111111101110 -> _____

(d) Fill in the blanks.

Decimal	Binary	Hexadecimal
12		C
5		5
11	1011	
25	11001	
	10001	11
	11011	1B
8		
	1110	
		1E
		49

Memory Hierarchy

(a) Fill in the trends (size, cost, speed).



Reference Hex <—> Bin

BIN	HEX
0000	0
0001	1
0010	2
0011	3
0100	4
0101	5
0110	6
0111	7
1000	8
1001	9
1010	A
1011	B
1100	C
1101	D
1110	E
1111	F

Notes for Anatomy of a Computer (Summarized)

a. **Motherboard**
    i. Directly mounted on the case
    ii. Platform for adding components
    iii. Formed from several layers of printed circuit board (most of the wires are between the layers!)
b. **Power Supply**
    i. Converts AC power into DC power for the entire machine
    ii. A very important and often overlooked component!
c. **CPU Heatsink/Fan**
    i. Cools the CPU - heat produced by the CPU is breaking Moore's Law!
    ii. The fins increase the surface area of the metal - heat dispersion is directly proportional to surface area
d. **Central Processing Unit (CPU)**
    i. The "brain" of the computer - where all computation is performed
    ii. Has a "clock" that "ticks" - the computer does a small amount of work on each of these ticks, or cycles. This is analogous to a heartbeat. Processor speed is often measured in clock speed (i.e. 2.4 GHz, or 2.4 billion cycles/sec)
e. **Random Access Memory (RAM)**
    i. Electronic storage area
        1. Information stored here is temporary - memory is erased when the computer powers off. For this reason, RAM is typically referred to as "non-persistent storage".
        2. Stores bits as electric charges. Typically measured (currently) in gigabytes (GB)
    ii. RAM is a form of "caching", meaning that the information there is copied for a form of persistent storage for the purpose of increasing performance (RAM is many, many times faster than disk)
f. **Hard Drive(s)**
    i. Electronic storage area
        1. Information stored here is permanent. This is typically referred to as "persistent storage."
        2. Bits are stored as magnetized segments of metal. An "actuator" hovers over the multiple disks, or "platters", magnetizing the disk appropriately as it rotates below, it according to whether the bit is on or off. Reading the bits back involves checking the magnetization of the platter.
g. **Video/Graphics Card or Graphical Processing Unit (GPU)**
    i. Circuit board containing a Graphics Processing Unit (GPU), graphics memory, and other components dedicated to producing visual output. GPUs work similarly to CPUs, but are designed to be more specialized to graphics-based tasks, as opposed to the general computing tasks of the CPU. GPUs typically have many more cores than CPUs.
    ii. **examples:** people who game rely on these, this is almost always what makes or breaks a computer in terms of gaming.
h. **Computer Case**
    i. Often overlooked component of the machine's design
        1. Contains bays for mounting additional drives, fans, and vents for heat management
        2. Produced in a particular "form factor" which has to match that of the motherboard