

Philip Pesic

Week 2

January 29 2023

Week 2 Q20

Question 1

Explain how the base 16, Hex numbering systems work.

In base 16, there are 16 singular digits: 0-9, and then a-f. Much like how our decimal system utilizes 10 digits before requiring a new place value to represent a larger number, the hexadecimal system uses 16 digits before requiring a new place value. In the decimal system, each new place value multiplies the previous one by 10. In hex, it multiplies by 16.

Example: The decimal number 15 can be represented in Hex by the value F. Each new place value in decimal is multiplied by 10, for example the 1s place and the 10s place. In hex, this is 1s place and 16s place, etc.

Question 2

Convert Hex 7777 to binary, decimal and Hexadecimal.

Hex 7777: $7 \times 4096 + 7 \times 256 + 7 \times 16 + 7 \times 1$. (Represented in decimal)

Decimal: 30583

Binary: 0111011101110111

Question 3

What really are the 1's and 0's of digital devices?

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In digital devices, 0 and 1 are used to relay information. Because a transistor can only have 2 states, on and off, these typically relay information in binary. If a transistor wants to relay the decimal number 8, it would change its state to: on, off, off, off; representing 1000 in binary.

Question 4

What is the history of the base 60 number system?

The base 60 number system was used in ancient babylon. It did not have the 3 defining characteristics of our modern number systems: position, max number of digits in a position, and position value.

Question 5

How do you use the base 60 number system today in your everyday life?

Some things in our modern life are still characteristic of the base 60 system, such as 60 seconds in a minute and 60 minutes in an hour.

Question 6

What was the first use of a binary code system?

The first practical use of a binary code system was in computers. Since transistors can only have 2 states, on or off. The binary code system in computers is representative of these states, and is used to represent information relayed by transistors.

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Question 7

Why are digital electronic designs used more commonly than analog electronic designs?

Digital electronic designs are commonly used today because it is much easier to represent digital values. With the 0s and 1s that relay information in electronics, it is impossible to create a perfectly analog design since analog information is infinitely variable.

Question 8

Who was the true inventor of Morse Code?

Alfred Vail was the true inventor of morse code. Samuel Morse, who had the original idea for the telegraph and morse code, was assisted by Alfred Vail in creating a simpler, more efficient code.

Question 9

What is a device driver?

Drivers are programs that convert/translate binary code from a computer into a more user friendly format. For example, drivers are responsible for translating 100 into the decimal number 4.

Question 10

Why is base two (2) the soul of the computer?

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Transistors can only have 2 states, on or off. The binary code system (base 2) in computers is representative of these states, and is used to represent information relayed by transistors.

Computers would likely be highly inefficient/impossible without base 2.

Question 11

What is the hierarchy of numbers as discussed in this lecture?

The hierarchy of numbers is the collection of a base, digits, and place values that make up number systems.

Example: Decimal system | Base 10 | Digits 0-9 | place values multiplied by 10; 100s, 10s, 1s

Question 12

Are 1's and 0's really used in digital devices?

In digital devices, 0s and 1s are simply representative of the on/off state of transistors. Wires and transistors aren't really flowing with tiny plastic 0s and 1s.

Question 13

How does an analog device differ from a digital device?

Analog devices have a range of values that can vary by an infinitely small amount. A faucet, a typically analog device, has a range of different pressure outputs depending on the state of the control. This can be an infinitely small amount practically impossible to represent digitally. If a faucet were digital, it could have 3 possible output values; off, partially on, completely on. Both

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represent the pressure of water coming out of a faucet, but the analog faucet is infinitely more accurate, at the cost of being impossible to digitally represent.

Question 14

How does the positional notation in a modern number system work?

Positional notation, or place value, is utilized to represent values higher than what can be represented by a single digit. In the decimal system, each place value increases by a factor of 10x. The value 8 means the digit 8 multiplied by 1, since it is in the 1s place. 82 means there is 8 in the 10s place and 2 in the 1s place, or $10 \times 8 + 1 \times 2$. Each place value increases by 10 times the previous value ($10 \times 1 = 10\text{s place}$).

Question 15

What are the different physical implementations of 1's and 0's?

0s and 1s are the only code that a digital device utilizes. They represent the on/off state of a transistor, which electrically relays information. For ease of use, the physical implementation/storage of this on/off state is 0 and 1.

Question 16

What is the Morse Code for your first name?

My first name, Philip, in morse code is :

.-- -. . .--.

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Question 17

How does the Modern number system help your limited Crow?

The digit and positional notations of the modern number system is incredibly useful as it overcomes our CROW. Instead of remembering 10, or 100, or 275087533 individual things, we represent them with digits within place values, which is 1 concept, compared to 275087533 individual things.

Question 18

What is a Unit?

A unit is simply a thing or entity. We represent these entities with digits, or a code that can encompass many units in a very efficient manner.

Question 19

What are the different number systems discussed in the “Number System” Video?

The number systems video discusses the most commonly used number systems today. These are binary (base 2), octal (base 8), decimal (base 10), and hexadecimal (base 16). Each of these bases represent the number of digits and the coefficient of the place value's equation in their respective system.

Question 20

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How is the code the soul of the machine?

Binary/digital code is the soul of the machine because the basis for all information within a machine. Every operation, every signal, every pixel, and every bit of data is represented in binary code. Without it, there would be no way to represent or store information, hence there would be no machine.