**Level 1: Presentation Notes**

1. Number systems used in Computer Science
   1. List the main features of the Decimal System

* 1. List the main features of the Binary System

* 1. List the main features of the Octal System

* 1. List the main features of the Hexadecimal System

1. Compare and contrast the Decimal and Binary systems

|  |  |  |
| --- | --- | --- |
| **Criteria** | **Decimal System** | **Binary System** |
| Digits  Used |  |  |
| Addition Example |  |  |
| Powers of  Base |  |  |
| Value of 111 |  |  |

1. Convert the following binary numbers to decimal:
2. Convert the following decimal numbers to binary:
3. Add the following binary numbers. (verify your answers using decimal)

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |

1. List the main features of the following Computer Memory Structures:
   1. Bit
   2. Byte
   3. Word
   4. Integer Data Type
   5. Double Word

**Level 2: Research Questions**

1. The was a first generation processor that was used in many early game systems and personal computers. Google “8085 microprocessor architecture” to answer these questions.
   1. Year Introduced
   2. Size of data bus (in bits)
   3. Largest data number (in binary and decimal)
   4. Size of address bus (in bits)
   5. Largest memory address (in binary and decimal)
2. The year the Intel 8085 microprocessor was introduced was 1976.
3. The data bus is 8 bit.
4. Requires +5V supply to operate at 3.2 MHZ
5. The address bus is 8-16 bit.
6. The Intel 8086 microprocessor was the processor used in the first IBM PCs running the DOS operating system. Google “8086 microprocessor architecture” to answer these questions.
   1. Year Introduced
   2. Size of data bus (in bits)
   3. Largest data number (in decimal)
   4. Size of address bus (in bits)
   5. Largest memory address (in decimal)
7. It was introduced in 1976 and was released in 1978
8. 8086 is a 16-bit microprocessor.
9. 8086 can access up to 1 Mb of memory.
10. 8086 has 20-bit address bus.
11. 8086 can access up to 1 Mb of memory.
12. The Intel 80286 microprocessor a common processor used in IBM PCs running the Windows operating system. Google “80286 microprocessor architecture” to answer these questions.
    1. Year Introduced
    2. Size of data bus (in bits)
    3. Largest data number (in decimal)
    4. Size of address bus (in bits)
    5. Largest memory address (in decimal)
13. Was introduced in 1982
14. The data bus is 16 bits
15. The largest data number is 11111111 is binary and decimal is 2^8-1 decimal
16. The address bus is 16 bits.
17. The modern PCs run either a 32 bit or 64 bit Windows operating system. Google “32 vs 64 bit” to answer these questions.
    1. How do these systems differ in data capacity? (explain using bits)
    2. How do these systems differ in memory capacity? (explain using bits)
    3. How do these systems differ in hardware requirements?
18. 64-bit is more capable than 32-bit processor because it can handle more data at once.
19. 64-bit processor is capable of storing more computational values, including memory addresses it means that about 4 billion times of 32-bit processor
20. 64 bit processor aren’t capable of running 16 bits program because they are older and sometimes aren’t capable of running older 32 bit programs
21. Research and explain how negative (-) numbers are represented using bits and how they are stored in computer memory.

An integer is a number with no fractional part; it can be **positive**, negative or zero.

In ordinary usage, one uses a minus sign to designate a negative integer”

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1. Research and explain how floating point (decimal) numbers are represented using bits and how they are stored in computer memory.

“The exponent is **stored** as an unsigned integer, for 32-bits **floating**-**point values**, this field is 8 bits. The rest of the binary digits are **stored** in an integer field, in the 32-bit case this field is 23 bits”

**Level 3: Sample Program**

1. Explain the result of the following Ptyhon operations:
   1. bin(11)
   2. oct(11)
   3. hex(11)

number = input("Enter a 4 digit decimal number:")

index = 0

for char in number :

index += 1

print("Digit ", index, " is : ", bin(int(char)))

number = input("Enter a 4 digit decimal number:")

index = 0

for char in number :

index += 1

print("Digit ", index, " is : ", oct(int(char)))

number = input("Enter a 4 digit decimal number:")

index = 0

for char in number :

index += 1

print("Digit ", index, " is : ", hex(int(char)))