**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 Intel 8085 microprocessor 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 - 1977
   2. Size of data bus (in bits) – 8 bits
   3. Largest data number (in binary and decimal) -
   4. Size of address bus (in bits) - 16
   5. Largest memory address (in binary and decimal)
2. 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)
3. 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)
4. 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?
5. Research and explain how negative (-) numbers are represented using bits and how they are stored in computer memory.
6. Research and explain how floating point (decimal) numbers are represented using bits and how they are stored in computer memory.

**Level 3: Sample Program**

1. Explain the result of the following Python operations:
   1. bin(11) – 0b1011 (This result shows a decimal number that was changed into a binary number)
   2. oct(11) – 0o13 (This result shows a decimal number that was changed into a octal number)
   3. hex(11) – 0xb (This result shows a decimal number that was changed into a hexadecimal number)
2. Explain the following Ptyhon operations:
   1. bin(‘11’) - Why does this operation give an error? Because 11 is being seen as a string
   2. int(‘11’) - Why does this work? Because it is saying that 11 is an integer
   3. bin(int(‘11’)) - Why does this fix the problem? Because int specifies that 11 is an integer.
3. Modify the following sample Python program to print out the digits in:
   1. Binary
   2. Octal
   3. Hexadecimal

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

index = 0

for char in number :

index += 1

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