**Level 1: Presentation Notes**

**Level 1 done on paper**

1. Number systems used in Computer Science
   1. List the main features of the Decimal System
   2. List the main features of the Binary System
   3. 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**

The 8085 microprocessor architecture was introduced in 1976

* 1. **Size of data bus (in bits)**

8085 microprocessor architecture has an 8 bit data bus

* 1. **Largest data number (in binary and decimal)**

2^8-1=255

* 1. **Size of address bus (in bits)**

The 8085 microprocessor architecture has a 16 bit address bus

* 1. **Largest memory address (in binary and decimal)**

2^16-1=65,535

1. **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**

The 8086 microprocessor architecture was made in 1976 and released to the public in 1978

* 1. **Size of data bus (in bits)**

The 8086 microprocessor architecture has a 16 bit data bus

* 1. **Largest data number (in decimal)**

2^16-1=65,535

* 1. **Size of address bus (in bits)**

The 8086 microprocessor architecture is 16 bits wide and has a 20 bit address bus

* 1. **Largest memory address (in decimal)**

2^20-1=1,048,575

1. **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**

The 80286 microprocessor architecture was introduced in 1982

* 1. **Size of data bus (in bits)**

The 80286 microprocessor architecture has a 16 bit data bus

* 1. **Largest data number (in decimal)**

2^16-1=65,535

* 1. **Size of address bus (in bits)**

The 80286 microprocessor architecture has a 24 bit data bus

* 1. **Largest memory address (in decimal)**

2^24-1=16,777,215

1. **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)**

32 bit processors can handle limited amounts of data. 64 bit processors are capable of utilizing more data at once and holding more storage and they have larger RAM capacity than 32 bit processors.

* 1. **How do these systems differ in memory capacity? (explain using bits)**

32 bit computers supports a maximum of 4 GB. A 64 bit computer can support over 4 GB of memory.

* 1. **How do these systems differ in hardware requirements?**

64-bit processors can come in dual-core, quad-core, six-core, and eight-core versions

1. **Research and explain how negative (-) numbers are represented using bits and how they are stored in computer memory.**Negative numbers are represented by the bit pattern. For computers to be able to store negative numbers in their storage, the value of the number has to be changed to 0 or 1.
2. **Research and explain how floating point (decimal) numbers are represented using bits and how they are stored in computer memory.**

A 1 bit indicates a negative number, and a 0 bit indicates a positive number. As you add more numbers, you add one digit to the exponent. Depending on how many spaces the number is from the decimal will tell you how much the exponent is (start at ^2 and add 1 for each time a number is added). For positive numbers (0) the exponent stays at ^2.

**Level 3: Sample Program**

1. 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)

**New code**

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

index = 0

for char in number :

index += 1

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

int(bin)