**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

-1976

* 1. Size of data bus (in bits)

-8 bit microprocessor

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

-Binary:0-8

-Decimal 255

* 1. Size of address bus (in bits)

-16 bits

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

1.88

0 to 64

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

-1978

* 1. Size of data bus (in bits)

-16 bits

* 1. Largest data number (in decimal)

65535

* 1. Size of address bus (in bits)

-20 bits

* 1. Largest memory address (in decimal)

-255

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

-1982

* 1. Size of data bus (in bits)

-16 Bits

* 1. Largest data number (in decimal)

65535

* 1. Size of address bus (in bits)

24Bits

* 1. Largest memory address (in decimal)

-16777215

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)

* A 32-bit operating system is simply an operating system made for a 32-bit CPU, and the same for 64-bit operating systems, respectively. A 64-bit CPU can run a 32-bit OS, but a 32-bit CPU can't run a 64-bit OS\*\*, because it can't handle that many bits
* Source:https://www.quora.com/What-are-the-benefits-of-using-a-64-bit-operating-system-vs-a-32-bit-operating-system
  1. How do these systems differ in memory capacity? (explain using bits)

a 32bit machine the maximum amount of memory usable is around 4GB.

64 Bits machine can use more memory and data than a 32bit machine

* 1. How do these systems differ in hardware requirements?
* gigahertz (GHz) or faster 32-bit (x86) or 64-bit (x64) processor\* 1 gigabyte (GB) RAM (32-bit) or 2 GB RAM (64-bit) 16 GB available hard disk space (32-bit) or 20 GB (64-bit

Source:<https://support.microsoft.com/en-ca/help/10737/windows-7-system-requirements>

1. Research and explain how negative (-) numbers are represented using bits and how they are stored in computer memory.  
   -represent the sign of the number: 0 = positive, 1 = negative

-The one's complement of an N-bit number x is defined as x with all its bits flipped

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

* Eight digits are used to store floating point number
* with 0 for positive numbers and 1 for negative numbers. The following 8 bits represent exponent ( E ). The remaining 23 bits represents fraction ( F ).

Source:<http://www.ntu.edu.sg/home/ehchua/programming/java/datarepresentation.html>

**Level 3: Sample Program**

1. Modify the following sample Python program to print out the digits in:
   1. Binary

number = input("Enter a 0 or 1 Digit:")

index = 0

for char in number :

index += 1

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

* 1. Octal

number = input("Enter a 0-7 number:")

index = 0-7

for char in number :

index +=7

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

* 1. Hexadecimal

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

index = 123456789

for char in number :

index += 4

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

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

index = 0

for char in number :

index += 1

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