

**Higher Computer Systems - Section 1a**

**Name:** \_\_\_\_\_

1. Why are computers described as two-state machines? (2)

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2. Explain why minor fluctuations in voltage levels in a computer have little effect on the binary values being handled. (2)

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3. Change the following into binary - (3)

68 = \_\_\_\_\_

144 = \_\_\_\_\_

209 = \_\_\_\_\_

4. Change the following into decimal - (3)

10110000 =

01100001 =

10101010 =

5. What is the range of numbers which can be stored using the following - (2)

8 bits \_\_\_\_\_ 24 bits \_\_\_\_\_

6. How many numbers can be stored using the following - (2)

8 bits \_\_\_\_\_ 24 bits \_\_\_\_\_

7. Represent the decimal number -73 using 8 bit two's complement. (2)

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8. Represent the decimal number -104 using 8 bit two's complement. (2)

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9. Explain how floating point numbers are stored using a mantissa and an exponent. Use the number 35,000,000 to illustrate your answer. (3)

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## Higher Computer Systems - Section 1b

1. Answer True or False to the following statements - **(5)**

The leftmost place value in a two-complement number is always a negative value \_\_\_\_\_

In the decimal number  $9.3 \times 10^7$ , 9.3 is the exponent and 7 is the mantissa \_\_\_\_\_

The biggest number that can be represented using 10 bits is 2047 \_\_\_\_\_

The number of bits in the mantissa of a floating point number determines its accuracy \_\_\_\_\_

If there are more bits in the exponent of a floating point number, it is possible to represent smaller and larger numbers \_\_\_\_\_

2. The size of a large file is 293,601,280 bits. Convert this into more manageable units. **(3)**

\_\_\_\_\_  
\_\_\_\_\_

3. Calculate exactly how many bytes there are in 1 gigabyte **(3)**

\_\_\_\_\_  
\_\_\_\_\_

## Higher Computer Systems - Section 1c

Name: \_\_\_\_\_

1. What is the purpose of ASCII? (1)

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2. What is meant by the term character set? (1)

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3. Outline the advantages and disadvantages of using the ASCII file format. (2)

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4. Describe how bitmapped graphics are stored. (2)

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5. Explain the need for Unicode (3)

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6. A black and white image is 3 inches by 5 inches with a resolution of 400 dpi. Calculate the storage requirements of the image. (4)

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How many of these images can be stored on a 8 megabyte disk? (3)

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7. How much memory is required to store a 4 inch by 6 inch photograph scanned in 256 colours at a resolution at 300 dpi? (4)

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1. Describe the following terms and how they effect image quality - (4)

Resolution \_\_\_\_\_

\_\_\_\_\_

Bit depth \_\_\_\_\_

\_\_\_\_\_

2. List two situations where compression of images may be necessary (2)

\_\_\_\_\_

\_\_\_\_\_

3. Select True or False for each of the following statements - (6)

Control characters are also known as “printable characters” **True** **False**

When you save a word processing document as an ASCII text file - all the document formatting is lost **True** **False**

A 6 Megapixel digital camera can take pictures containing a maximum of 6 thousand pixels **True** **False**

A black and white image needs 2 bits to store each pixel, one for black and one for white **True** **False**

An ASCII text file can be opened by any word processing application **True** **False**

The word “pixel” stands for PICTure Element **True** **False**

**Higher Computer Systems - Section 2a**

**Name:** \_\_\_\_\_

1. Name the three types of buses found in a CPU and, for each of the buses describe its role. **(6)**

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2. Why is the address bus uni-directional and the data bus bi-directional? **(2)**

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3. Why is the control bus not really a true bus? **(1)**

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4. State the steps of the fetch execute cycle and the buses involved in a Read from memory operation. **(4)**

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## Higher Computer Systems - Section 2b

Name: \_\_\_\_\_

1. For each of the following descriptions of memory choose **Address, Data or Control** (7)

	<b>Bus Type</b>
Carries instruction from the memory to the processor during a fetch operation	_____
Carries instruction about which memory location the processor wants to access	_____
This bus is the only bi-directional bus where the wires work together to form part of the same signal	_____
This is not a true bus but is a collection of discrete lines which work independently	_____
This bus typically defines the word size of the computer	_____
The lines on this bus carry signals that initiate different actions at certain times. The read and write lines are part of this bus	_____
This bus is the only uni-directional bus where the wires word together to form part of the same signal	_____

2. For each of the following statements, circle **True or False** (5)

The term "fetch" means to store instructions and data into memory	<b>True or False</b>
The word length of a computer is defined as the number of wires in the data bus	<b>True or False</b>
The address bus is uni-directional whereas the data bus is bi-directional	<b>True or False</b>
The read line on the control bus is used to initiate the storage of a data item into memory	<b>True or False</b>
A single processor can execute several instructions at one time	<b>True or False</b>

## Higher Computer Systems - Section 2c

Name: \_\_\_\_\_

1. State the purpose of the Arithmetic Logic Unit (2)

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2. State the purpose of the Control Unit (2)

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3. Describe two lines within the Control Unit (2)

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4. State what a Register is used for (2)

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5. Clearly describe the purpose of Cache Memory and give an example when it would be used. (2)

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6. Using your own words, describe Main Memory (3)

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7. Using your own words, describe Backing Storage (3)

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8. State which storage types are the fastest and slowest access (2)

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# Higher Computer Systems - Section 2d

Name: \_\_\_\_\_

1. For each of the following descriptions of memory choose **RAM** or **ROM** (7)

This type of memory can be read from and written to

The contents of this type of memory are NOT lost when the computer is shut down

This is the smallest part of main memory—only a few Megabytes

The contents of this type of memory ARE lost when the computer is shut down

The contents of this type of memory are fixed permanently by the manufacturer. The user cannot change them

This type of memory is used when we are typing and editing a word processing document.

This type of memory would be built into a pre-programmed appliance like a washing machine or a fridge.

RAM or ROM	

2. Match the following control lines to each of the following descriptions - (6)

**NMI      Clock      Write      Interrupt      Reset      Read**

**Description**

Initialises the processor to a pre-determined know state eg when it crashes or freezes

A special interrupt which cannot under any circumstances be ignored - eg a low power warning would on the NMI would force the processor to perform critical shutdown tasks before all power was lost

The signal that tells memory that it has to release data from the location given by the address bus onto the data bus

A line used by peripheral devices to interrupt the processor to let it know that it should stop what it is doing (and keep a note of this) and give services to the peripheral.

A constant pulse that synchronises every processor controlled event

The signal which tells memory that it has to accept data from the data bus and place it in the location given by the address bus

1. Match the following storage types to each of the following descriptions - (4)

**Cache Memory      Backing Storage      Registers      Main Memory**

**Description**

Permanent data storage outwith the CPU to store programs and data when the computer is switched off. Hard disks and pen drives are examples of this type of storage

A small amount of very fast access memory close to or on board the processor itself. It holds the most regularly and recently accessed instructions and data.

Storage locations integrated into the processor itself to handle the variables or values related to instructions as they are being processed

This mainly consists of RAM and is used to hold the programs and data files that the user has loaded up. There is also a small amount of ROM used mainly by the operating system itself

2. Describe the function of the ALU (2)

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3. Why do computers need backing storage when they have internal memory? (2)

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## Higher Computer Systems - Section 2f

Name: \_\_\_\_\_

1. A computer has a 16 bit address bus and an 8 bit data bus. Calculate the maximum addressable memory it can support. (3)

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2. A computer has a 36 bit data bus and an 32 bit address bus. Calculate the maximum addressable memory it can support. (3)

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3. A computer has a 32 bit data bus and an 16 bit address bus. Calculate the maximum addressable memory it can support. (3)

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4. If an address bus has 8 lines, how many memory locations can be accessed? (1)

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5. If an address bus has 16 lines, how many memory locations can be accessed? (1)

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**Higher Computer Systems - Section 2g**

**Name:** \_\_\_\_\_

1. State the four methods used to measure system performance. **(4)**

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2. For each of the above four methods, clearly state how each method measure system performance. **(8)**

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3. Clock speed and memory size are two factors which affect systems performance, name and describe two other methods which will also affect systems performance **(4)**

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4. State two current developments in computer hardware **(2)**

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**Higher Computer Systems - Section 3a**

**Name:** \_\_\_\_\_

1. What is meant by the term “interface”? (2)

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2. Give two examples of data conversion (2)

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3. What is meant by a buffer? (2)

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4. Explain what effect a peripheral with no buffer would have on the performance of the processor (2)

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5. Describe spooling (2)

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6. Describe a situation when spooling is used (2)

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## Higher Computer Systems - Section 3b

Name: \_\_\_\_\_

1. Fill in the blanks using the following words -

(5)

**communicate      data storage      peripherals      interfaces      data conversion**

Any devices that are connected to a CPU are known as \_\_\_\_\_.

\_\_\_\_\_ are required for peripherals to be connected to the CPU. They allow the peripherals and the CPU to \_\_\_\_\_ with each other. The analogue signals used by an input device, such as a mouse, are converted by the interface into the binary signals used by the CPU. This is an example of \_\_\_\_\_. The method used to compensate for the differences in speed between the CPU and the peripherals connected to it is called \_\_\_\_\_.

2. Match the following interface functions to the following descriptions -

(5)

**Protocol Conversion**

**Data Conversion**

**Status & Control**

**Buffering**

**Device Selection**

Indicates readiness of a peripheral to receive/transmit data and orchestrates the timing of data transmissions

Stores data in transit between peripheral and processor in registers or device memory

Ensures data compatibility between the computer bus and peripheral

Recognises the address codes specifying its peripheral as the one that the processor wishes to access via the data bus

Ensure that the correct rules of data transfer are applied

1. Explain parallel transmission, you may wish to use a diagram. **(2)**

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2. State any advantages of parallel transmission **(2)**

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3. State any disadvantages of parallel transmission **(2)**

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4. Explain serial transmission, you may wish to use a diagram. **(2)**

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5. State any advantages of serial transmission **(2)**

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6. State any disadvantages of serial transmission **(2)**

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## Higher Computer Systems - Section 3d

Name: \_\_\_\_\_

1. Match the following interfaces to the following descriptions - (6)

**SATA**

**USB**

**Bluetooth**

**PCI**

**Firewire**

**IDE or ATA**

An internal interface which allows expansion cards like sound cards, TV/video cards and Firewire cards to be fitted directly to the motherboard. Currently supports transfer rates of up to 133 MB/s.

\_\_\_\_\_

The most popular serial interface used for connecting external devices like printers, scanners and digital camera. Uses plug and play and supplies power also. Supports transfer rates of up to 60 MB/s

\_\_\_\_\_

The original standard parallel interface used for connecting internal drives like hard drives and CD/DVD drives. Currently supports transfer rates of up to 133 MB/s

\_\_\_\_\_

A high speed serial interface used for connecting digital video cameras, external hard drives and tape drives. It comes in two versions—supporting rates of up to 50 MB/s and 100 MB/s

\_\_\_\_\_

The new standard serial interface for connecting internal hard drives. Reliable and easy to install. Currently supports transfer rates of up to 300 MB/s

\_\_\_\_\_

A short-range wireless interface technology used for connecting low bandwidth devices such as mice, keyboards and PDAs

\_\_\_\_\_

2. Select True or False for each of the following statements - (6)

Serial transmission involves the transfer of a stream of bits over multiple wires

\_\_\_\_\_

A system bus is an example of parallel data transmission

\_\_\_\_\_

Modern keyboards, printers and scanners are examples of devices that are connected to the CPU using serial cabling technologies

\_\_\_\_\_

Serial data transmissions can suffer from a problem called "skew"

\_\_\_\_\_

Generally speaking, parallel transmission technologies provide faster transfer rates than serial technologies

\_\_\_\_\_

Serial data paths have to be relatively short compared to parallel data paths

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**Higher Computer Systems - Section 4a**

**Name:** \_\_\_\_\_

1. Describe a Local Area Network. You should make reference to its size, method of transmission and likely uses. **(3)**

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2. Describe a Wide Area Network. You should make reference to its size, method of transmission and likely uses. **(3)**

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3. Describe a Mainframe Computer, making reference to its size and who would use it. **(3)**

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4. Describe a client server network. **(2)**

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5. Describe a peer-to-peer network. **(2)**

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6. What is the main advantage of peer-to-peer networks? **(2)**

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## Higher Computer Systems - Section 4b

Name: \_\_\_\_\_

For each “snippet” of a description in the table below, identify whether it is most likely to be a feature of a LAN, a WAN or both.

Description	LAN	WAN	Both
Copper cabling such as twisted pair or coaxial is the transmission media.			
The Internet is the most well know example of this type of network			
Can use email to communicate and collaborate.			
Uses telecommunications links such as phone lines, cable and satellite.			
All the computers in an office connected together.			
Cuts costs by sharing hard drives and printers.			
Supports bandwidths of between 56 kbits per second and 8 Mbit per second			
All the connections and network hardware is owned and controlled by one organisation.			
Provides the means for multiple users to share and access files.			
Fast, reliable and accurate data transmissions.			
Linking together an organisation’s offices in different cities across the world.			

1. For each of the following types of networks state their advantages and disadvantages, make reference to node and channels (8)

Bus \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Ring \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Star \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Mesh \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Fill in the blanks using the following words (8)

**topology**            **bus**            **node**            **star**  
**ring**                **mesh**            **channel**        **routers**

Any device that is connected to a network is called a \_\_\_\_\_. Such devices could include servers, workstations, printers and \_\_\_\_\_. The path over which data is transmitted between one node and another is called a \_\_\_\_\_. The physical layout of configuration of a network is referred to as its \_\_\_\_\_. A topology where each node is connected by its own channel to a central hub that directs network traffic is called a \_\_\_\_\_. A topology where each node is connected to a single shared "broadcast" channel is called a \_\_\_\_\_. A topology that uses lots of channels to connect every node on the network with several other nodes is called a \_\_\_\_\_. A topology where every node is connected on to a on one directional channel that forms a circuit is called a \_\_\_\_\_.

## Higher Computer Systems - Section 4d

Name: \_\_\_\_\_

1. What is a hub? (2)

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2. What is a switch? (2)

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3. State two advantages of switches over hubs. (2)

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4. What is a router? (2)

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5. What is the purpose of Network Interface Card? (2)

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6. Answer true or false to the following statements - (10)

A switch is often called an "intelligent" hub. \_\_\_\_\_

A hub directs data packets selectively to only node it is destined for. \_\_\_\_\_

Hubs and switches are most likely to be used in ring topologies \_\_\_\_\_

Switches broadcast the data packets they receive to all connected nodes \_\_\_\_\_

Hubs can cause network congestion by broadcasting unnecessary at packets. \_\_\_\_\_

Routers are used to direct traffic across the Internet \_\_\_\_\_

A router can be used to break up a large congested network into smaller and more efficient networks \_\_\_\_\_

The purpose of a NIC is to connect a computer to the internet \_\_\_\_\_

Hubs and switches are most likely to be used in a star network topology \_\_\_\_\_

A NIC packages up outgoing data ready for network transfer and extracts data from incoming data packets. \_\_\_\_\_

1. What is a bootstrap loader and what is its function? (2)

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2. State and describe three functions of an operating system. (6)

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3. Describe the key tasks carried out by the memory management when several programs are loaded in RAM (2)

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4. Fill in the blanks using the following words - (8)

**bootstrap loader   hardware   RAM   operating system**

**user   loaded   transparent   applications**

Every time we use a computer, there is a program called the \_\_\_\_\_ constantly running the in background. It is \_\_\_\_\_ on start-up from hard disk into \_\_\_\_\_ by a small program in ROM called the \_\_\_\_\_. The operating system is responsible for managing the \_\_\_\_\_ and communicating with the \_\_\_\_\_. The operating system allows us to run \_\_\_\_\_ and it makes the complexities of how they interact with the hardware \_\_\_\_\_ to us.

1. Name three utility programs. **(3)**

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2. Describe the utility programs you have named in question 1. **(6)**

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3. What is a fragmented disc and what difference will it make to the performance of the computer system? **(2)**

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4. Sammy Surf has been spending a lot of time on the Internet recently. His computer now seems very sluggish and its behaviour is very odd. Suggest with reasons what utility he might use to try to get to the root of the problem. **(3)**

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**Higher Computer Systems - Section 5c**

**Name:** \_\_\_\_\_

1. What is a file virus? **(2)**

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2. What is a boot sector virus? **(2)**

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3. What is a macro virus **(2)**

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4. Name and describe four characteristic actions of viruses **(8)**

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5. Clearly describe the following terms - a computer virus, a worm and Trojan horses **(6)**

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1. Describe the term "Scanning for Signatures" (2)

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2. Describe the term "Checksum Checking" (2)

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3. Describe the term "Heuristic Virus Checking" (2)

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4. Describe the term "Memory Resident Monitoring" (2)

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5. Describe the term "Watching" (2)

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1. Match the type of virus with the following descriptions - (3)

**File Virus      Macro Virus      Boot Sector Virus**

<b>Description</b>	<b>Virus type</b>
Infects data files created from applications like Word and Excel	
Infects program file (ie executable code). Spreads itself by infecting other programs currently loaded in memory.	
Infects the first part of a disk which has a system routine on it to load the operating system at start up. This ensures it always gets executed	

2. Select True or False for each of the following statements - (10)

- A computer virus is a program \_\_\_\_\_
- Viruses are destroyed when the computer is shut down \_\_\_\_\_
- ALL viruses damage your computer \_\_\_\_\_
- ALL viruses replicate \_\_\_\_\_
- A virus is only activated when an infected program is executed or an infected file is open \_\_\_\_\_
- Viruses can only be spread via removable storage media like floppy disks, pen drives and CDs \_\_\_\_\_
- “Logic Bomb” viruses are triggered by specific times or dates \_\_\_\_\_
- A virus “signature” is the method used by the virus author to hide their identify within the virus code \_\_\_\_\_
- “Camouflage” is the term used to describe how “tell-tale” virus code can be disguised \_\_\_\_\_
- Viruses alter the way a computer operates without the permission or knowledge of the user \_\_\_\_\_