

Multiple Choice, and True/False **Answers in red**

Circle the MOST correct answer. Each question is worth one mark.

One octal digit represents 4 binary digits.

True **False**

One hexadecimal digit represents 4 binary digits.

True False

A 6 digit hexadecimal number is commonly used to represent colours on the internet.

True False

A petabyte is 1024 times smaller than a terabyte.

True **False**

Capacity refers to how much data is transferred between two points.

True **False**

Bandwidth refers to how much can be transferred at one time

True False

Speed refers to how often data can be transferred.

True False

The 6 necessary parts of a desktop computer are: CPU, Motherboard, Optical Drive, RAM, Graphics Card, Storage.

True **False**

A network is a collection of physical nodes connected with a data link.

True False

The MAC Address of networking components is set by the router.

True **False**

Moving data from one place to another in memory is called;

- a. Getting
- b. Pushing
- c. Retrieving
- d. Fetching**

The CPU of a computer is responsible for:

- a. Setting the value of data somewhere in memory
- b. Moving data from one place to another in memory
- c. All arithmetic operations
- d. Comparing values
- e. All of the above**
- f. A, C and D only

The 4 parts of the CPU are

- a. The ALU, RAM, Clock and Control Unit
- b. The ALU, Registers, Clock and Control Unit**
- c. The Counter, Starting Value, Ending Value and Step Value
- d. Trick question. There is only one part of a CPU; a hamster running in a wheel

The best description of a computer bus is:

- a. Big, yellow and only operational between September and June
- b. The physical wiring, printed circuits, and connectors on a motherboard
- c. The language in which the computer communicates
- d. All of the above
- e. A and C
- f. A and B
- g. B and C**

Which of the following is NOT an advantage of an HDD over an SSD

- a. An HDD is faster than an SSD**
- b. An HDD is cheaper, per gigabyte, than an SSD
- c. An HDD has higher capacity than an SSD (on the market today)
- d. An HDD lasts longer than an SSD

The interface between a CPU and the motherboard is called a:

- a. SATA interface
- b. Socket interface**
- c. DDR interface
- d. VGA interface

Which of the following is a type of volatile (non-permanent) storage

- a. Hard Disk Drive
- b. RAM**
- c. Solid State Drive
- d. USB Flash Drive

Moore's law states that the number of transistors in an integrated circuit:

- a. Doubles approximately every year.
- b. Triples approximately every two years.
- c. Will max out in the year 2043.
- d. Doubles approximately every two years.**

The benefits of shrinking transistors are:

- a. Lower power consumption.
- b. Increased processing power
- c. Smaller devices.
- d. All of the above**

The term BIOS stands for:

- a. Basic Intuitive Operating System
- b. Basic Input Output System**
- c. Boolean Integrated Output System
- d. Benign Increasingly Obtuse Simulation

In networking, a node is:

- a. A connection, across which data can be transferred
- b. An electronic device that serves as an endpoint for communication.**
- c. Another name for a topology.
- d. The place that assigns the MAC addresses for all networking hardware.

In networking, a data link is:

- a. A connection, across which data can be transferred**
- b. An electronic device that serves as an endpoint for communication.
- c. Another name for a topology.
- d. The place that assigns the MAC addresses for all networking hardware.

What does the MAC in MAC Address stand for?

- a. Material Abstract Control
- b. McBurger And Cheese
- c. Media Access Control**
- d. Monotone Access Control

What does the IP in IP Address stand for?

- a. Internet Procedure
- b. Information Protocol
- c. Invasion Procedure
- d. Internet Protocol**

Which of the following is not a logical operator

- a. AND
- b. OR
- c. NOT
- d. ONCE**

The 4 parts of a counted loop that control how many times it runs are:

- a. The counter, starting value, ending value and step value**
- b. The counter, sink, fridge and cupboard
- c. The input, starting value, condition, step value
- d. The input, starting value, ending value and output

The only two possible values for a boolean expression once you evaluate it are TRUE and FALSE

- a. TRUE**
- b. FALSE

Which of the following is not one of the 4 common variable types in Python?

- a. String
- b. Integer
- c. Floating Point Number
- d. Image

Which of the following truth tables is the correct table for the AND logical operator?

a.

	T	F
T	T	F
F	F	T

c.

	T	F
T	T	F
F	F	F

b.

	T	F
T	F	T
F	T	F

d.

	T	F
T	T	T
F	T	F

Which of the following truth tables is the correct table for the OR logical operator?

a.

	T	F
T	T	F
F	F	T

c.

	T	F
T	T	F
F	F	F

b.

	T	F
T	F	T
F	T	F

d.

	T	F
T	T	T
F	T	F

Which of the following truth tables is the correct table for the NOT logical operator?

a.

	NOT
T	F
F	T

b.

	NOT
T	T
F	T

c.

	NOT
T	F
F	F

d.

	NOT
T	T
F	F

Which of the following truth tables is the correct table for the XOR logical operator?

a.

	T	F
T	T	F
F	F	T

c.

	T	F
T	T	F
F	F	F

b.

	T	F
T	F	T
F	T	F

d.

	T	F
T	T	T
F	T	F

Which statement below best describes both the = and == operator in Python?

- a. = is for variable assignment, == is for comparison of equality
- b. == is for variable assignment, = is for comparison of equality
- c. Both operators are for variable assignment
- d. Both operators are for comparison of equality

Consider the following Python code snippet. Circle the correct output.

```
x = 0
for i in range (0, 10, 1):
    x = x + i

print(x)
```

- a. 45 b. 55 c. 0 d. 362880

Consider the following Python code snippet. Circle the correct output.

```
x = 1
for i in range (0, 10, 1):
    x = x * i

print(x)
```

- a. 45 b. 55 c. 0 d. 362880

Consider the following Python code snippet. Circle the correct output.

```
x = 5
y = 10
if (x * y < 50):
    print(y)
elif (x * y > 50):
    println("x")
else:
    print(x * y)
```

- a. 10 b. x c. 50 d. 5

Consider the following Python code snippet. Circle the correct output.

```
i = (-5) * (-2) + 20;
prefix = ""

if (i > 10):
    prefix = "FOO "
elif (i < 10):
    prefix = "BAR "

print(prefix + str(i))
```

- a. 10 b. BAR 10 c. FOO 30 d. BAR -10

The potential difference in an electric circuit is measured by:

- a. Current
- b. Voltage
- c. Resistance
- d. Watts

The flow of electric charge is measured by:

- a. Current
- b. Voltage
- c. Resistance
- d. Watts

The measure of the difficulty to pass an electrical current:

- a. Current
- b. Voltage
- c. Resistance
- d. Watts

Electrical power is measured by:

- a. Current
- b. Voltage
- c. Resistance
- d. Watts

An electrical conductor is:

- a. An object that resists the flow of electrons.
- b. An object that stops the flow of electrons.
- c. An object that allows the flow of electrons.
- d. An object that changes the directions of the flow of electrons.

An electrical insulator is:

- a. An object that resists the flow of electrons.
- b. An object that stops the flow of electrons.
- c. An object that allows the flow of electrons.
- d. An object that changes the directions of the flow of electrons.

A semiconductor is a material whose conductivity varies based on factors such as temperature or impurities.

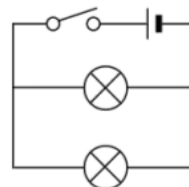
True False

Which of the following statements describes a transistor

- a. Signal amplifier.
- b. Major component of all integrated circuits.
- c. A semiconductor whose job is to switch electrical signals on and off.
- d. When voltages are applied to 2 of the terminals it controls the voltage/current coming from another pair of terminals.
- e. All of the above.
- f. B, C and D only
- g. C and D only.

This electrical diagram is an example of a series circuit:

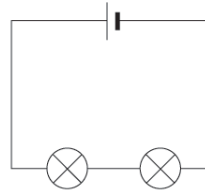
True False



This electrical diagram is an example of a series circuit:

True

False



The SI units for current, potential, power and resistance are:

- a. Coulomb (C), Inductance (H), Watt (W), Resistivity (Ωm)
- b. Ampere (A), Volt (V), Watt (W), Ohm (Ω)
- c. Coulomb (C), Volt (V), Capacitance (F), Ohm (Ω)
- d. Ampere (A), Inductance (H), Capacitance (F), Resistivity (Ωm)

The formula for calculating electrical power, in watts is:

- a. $P = I * V$
- b. $P = I \div V$
- c. $P = V \div I$
- d. $P = R * I$

When working on any electrical/electronic device, which of the following pieces of personal protective equipment is NOT necessary:

- a. Safety Glasses
- b. Grounding Strap
- c. Hard Hat
- d. None of the above

Fill in the Blank and Short Answer

What are the 5 main responsibilities of the CPU?

[5]

1. Set the value of data somewhere in memory
2. Move information from one place to another (fetching)
3. Add/subtract/multiply/divide two numbers
4. Compare two numbers
5. Move to another set of instructions (fetching)

Explain what memory addressing is and demonstrate the difference between how we show RAM addresses and registry addresses on paper.

[3]

Memory addressing is the process of identifying where data is in memory.

We show RAM addresses with the form 0x _____, a 0x followed by a hexadecimal number.

We show registry addresses with the form \$ _____, a \$ followed by a decimal number

Describe the 4 steps that occur when an instruction is executed by the CPU.

[5]

1. Fetch Instructions
2. Execute Instructions
3. Retrieve Data
4. Store Result

The acronym CPU stands for

[2]

C: _____ Central

P: _____ Processing

U: _____ Unit

The acronym RAM stands for

[2]

R: _____ Random

A: _____ Access

M: _____ Memory

What are 2 different types of software. Describe their purpose and give an example.

[4]

Application Software - designed to help users perform tasks on a computer, like word processing, video games, or accounting software.

System Software - responsible for communication between hardware and other pieces of software. Examples include operating systems (Windows), the BIOS, or device drivers.

Development Software - exists only for the purpose of allowing programmers to create new programs or fix old programs. Examples include development environments such as WingIDE and Eclipse.

Malware - Any piece of software that exists to be disruptive in some way. Examples include viruses.

Choose one of the 2 methods for converting decimal numbers to binary numbers and describe the steps. [4]

Repeated Division by 2

OR

Subtracting/Decomposing Powers of 2

1. Divide your current number by 2 without creating a decimal and note the remainder (so 5 divided by 2 is not 2.5, it's 2 with 1 remainder) 2. Repeat step 1 with the quotient until your quotient is 0. 3. The remainder values, in reverse order of calculation give the binary value.	1. Find the highest power of 2 that is smaller than your current value 2. Subtract your power of 2 from the current value 3. If your new value is not a power of 2, decompose your new value (back to step 1) 4. If your new value is a power of 2, write a 1 for every power of 2 that you used and a 0 for every power of 2 you did not use with the largest power on the left and smallest on the right in order.
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What is the purpose of networking?

[2]

To transfer data between two points.

Identify the differences between a LAN, a MAN and a WAN.

[3]

A LAN is a small network designed to be used in a house or business.

A MAN is a medium sized network designed to connect several LAN's together for communication. Usually covers the size of a city or county.

A WAN is a large network designed to connect several MAN's together. WAN networks are usually the size of countries or continents.

What is a modem?

[2]

Short for MOdulator/DEModulator, a modem is used to convert data into electrical signals and back again so that communication can occur over an outside network.

How are network hubs, switches and routers the same? How are they different?

[6]

Similarity: Network hardware such as hubs, switches and routers allow for users to communicate with each other without having to have a direct connection between the two points.

Differences: A **hub** is simple; any data received is broadcast to anyone attached to the hub.

A **switch** is a little more complex; as it sends and receives data, it keeps track of which computer is where so that in future communication, it doesn't have to broadcast ALL data.

A **router** is the most complex; it keeps track whenever a device connects so that it never has to broadcast data to unnecessary devices.

What is a benefit of a static (constant) MAC Address?

[2]

Constant MAC addresses allow for easy identification of a device in the event of malfunction.

Constant MAC addresses allow for simple MAC address filtering on your router

Either of the above sentences is a suitable answer for this question. Others may also exist.

How does Interference/Absorption and Reflection/Shared Signals negatively affect wireless communication? [2]
(Choose 1)

INTERFERENCE - Objects that interfere with a wireless signal cause the signal to be modified or disrupted to the point that it cannot be decoded.

ABSORPTION AND REFLECTION - Communication is difficult because the signal cannot penetrate a surface due to its reflective or absorptive properties, which causes disruptions.

SHARED SIGNALS - Some devices operate on the same frequency as wireless communications, which can then be overpowered, causing disruptions in service.

Explain what variables and types are with respect to programming. Use examples where appropriate. [2]

Variables are containers used to store data.

Types tell us what the data is. Is it a number? A letter? Something else?

Explain one similarity and one difference between counted loops and conditional loops. [2]

SIMILARITY: Both execute a set of instructions multiple times, consecutively.

DIFFERENCE: Counted loops execute a specified number of times, which is known before the loop starts. Conditional loops execute until some criteria (a condition) is false.

Fill in the following truth table. If you wish, you may ask for a copy of the basic AND, OR, NOT and XOR truth tables. [5]

A	B	C	BC	$A + C$	$\overline{(BC)} \oplus \overline{(A + C)}$	$A(\overline{BC}) \oplus \overline{(A + C)}$
T	T	T	T	T	T	T
T	T	F	F	T	F	F
T	F	T	F	T	F	F
T	F	F	F	T	F	F
F	T	T	T	T	T	F
F	T	F	F	F	T	F
F	F	T	F	T	F	F
F	F	F	F	F	F	F

Fill in the following truth table. If you wish, you may ask for a copy of the basic AND, OR, NOT and XOR truth tables. [5]

A	B	C	$A + C$	$B \oplus C$	$\overline{B \oplus C}$	$(A + C) \overline{B \oplus C}$
T	T	T	T	F	T	T
T	T	F	T	T	F	F
T	F	T	T	T	F	F
T	F	F	T	F	T	T

F	T	T	T	F	T	T
F	T	F	F	T	F	F
F	F	T	T	T	F	F
F	F	F	F	F	T	F

Fill in the following truth table. If you wish, you may ask for a copy of the basic AND, OR, NOT and XOR truth tables. [3]

A	B	$B \oplus A$	$\bar{A}$	$B \oplus \bar{A}$
T	T	F	F	F
T	F	T	F	T
F	T	T	T	T
F	F	F	T	F

Fill in the following truth table. If you wish, you may ask for a copy of the basic AND, OR, NOT and XOR truth tables. What do you notice about the columns NOT (A OR B) and (NOT A) AND (NOT B)? [5]

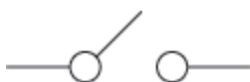
A	B	$A + B$	$\overline{A + B}$	$\bar{A}$	$\bar{B}$	$\bar{A} \bar{B}$
T	T	T	F	F	F	F
T	F	T	F	F	T	F
F	T	T	F	T	F	F
F	F	F	T	T	T	T

(This is called de Morgan's Theorem)

Fill in the following truth table. If you wish, you may ask for a copy of the basic AND, OR, NOT and XOR truth tables. [5]

A	B	C	NOT A	(NOT A) XOR C	B OR C	((NOT A) XOR C) AND (B OR C)
T	T	T	F	T	T	T
T	T	F	F	F	T	F
T	F	T	F	T	T	T
T	F	F	F	F	F	F
F	T	T	T	F	T	F
F	T	F	T	T	T	T
F	F	T	T	F	T	F
F	F	F	T	T	F	F

Label the following electrical components based on their diagram symbols. [6]



SWITCH



LAMP



RESISTOR



LED



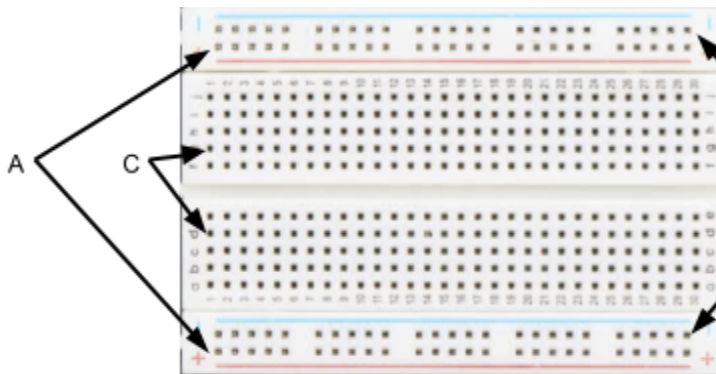
BATTERY



GROUND

Write the correct letter next to the terms on the right:

[3]



- _____ C Terminal Strip
- _____ B DC Power Ground
- _____ A DC Power +

On the above diagram, indicate which holes are electrically connected.

[4]



Problem Solving

Convert the following values from their current base to the given base (decimal to binary or binary to decimal).

a. 142_{10} to binary

[3]

	QUOTIENT	REMAINDER	So, $142_{10} = 10001110_2$
		R	
$142/2$	71	0	
$71/2$	35	1	
$35/2$	17	1	
$17/2$	8	1	
$8/2$	4	0	
$4/2$	2	0	
$2/2$	1	0	
$1/2$	0	1	

b. 01101101_2 to decimal

[3]

128	64	32	16	8	4	2	1
0	1	1	0	1	1	0	1

So, $01101101_2 = 64 + 32 + 8 + 4 + 1 = 109_{10}$

c. 101001_2 into octal

[2]

First, split 101001_2 into 2 octal digits: 101 and 001. Convert each digit separately:

$$101_2 = 4 + 1 = 5$$

$$001_2 = 1$$

$$\text{So, } 101001_2 = 51_8$$

d. 01110100_2 into hexadecimal

[2]

First, split 01110100_2 into 2 hexadecimal digits: 0111 and 0100. Convert each digit separately:

$$0111_2 = 4 + 2 + 1 = 7$$

$$0100_2 = 4$$

$$\text{So, } 01110100_2 = 74_{16}$$

Find all of the errors in the given code. **There is one error on every line of code.**

[10]

```
while True:
    i = raw_input("Enter an integer. 'S' to end.")
    int(i) = i ← Switch the i and int(i) positions
    if (i == "s") or (i == "S"):
        break while
    elif (i % 2 == 0):
        print(i + " is even")
    else:
        print(i + ' is odd')

output print("Thank you!")
```

Below are two program descriptions:

- A. Find the sum of integers entered in by the user. If the user enters an empty number, the program ends and the result is printed to the screen.
- B. Number Guessing Game. Generate a random number, allow the user to guess the number an unlimited number of times.

a. Choose one of the above programs and write the Python code necessary to execute the algorithm [8]

A

```
s = 0

value = raw_input ("Enter a value to be added to
your sum: ")
while (value != ""):
    s += int(value)
    value = raw_input("Enter another value: ")
print ("Your sum is: " + str(s))
```

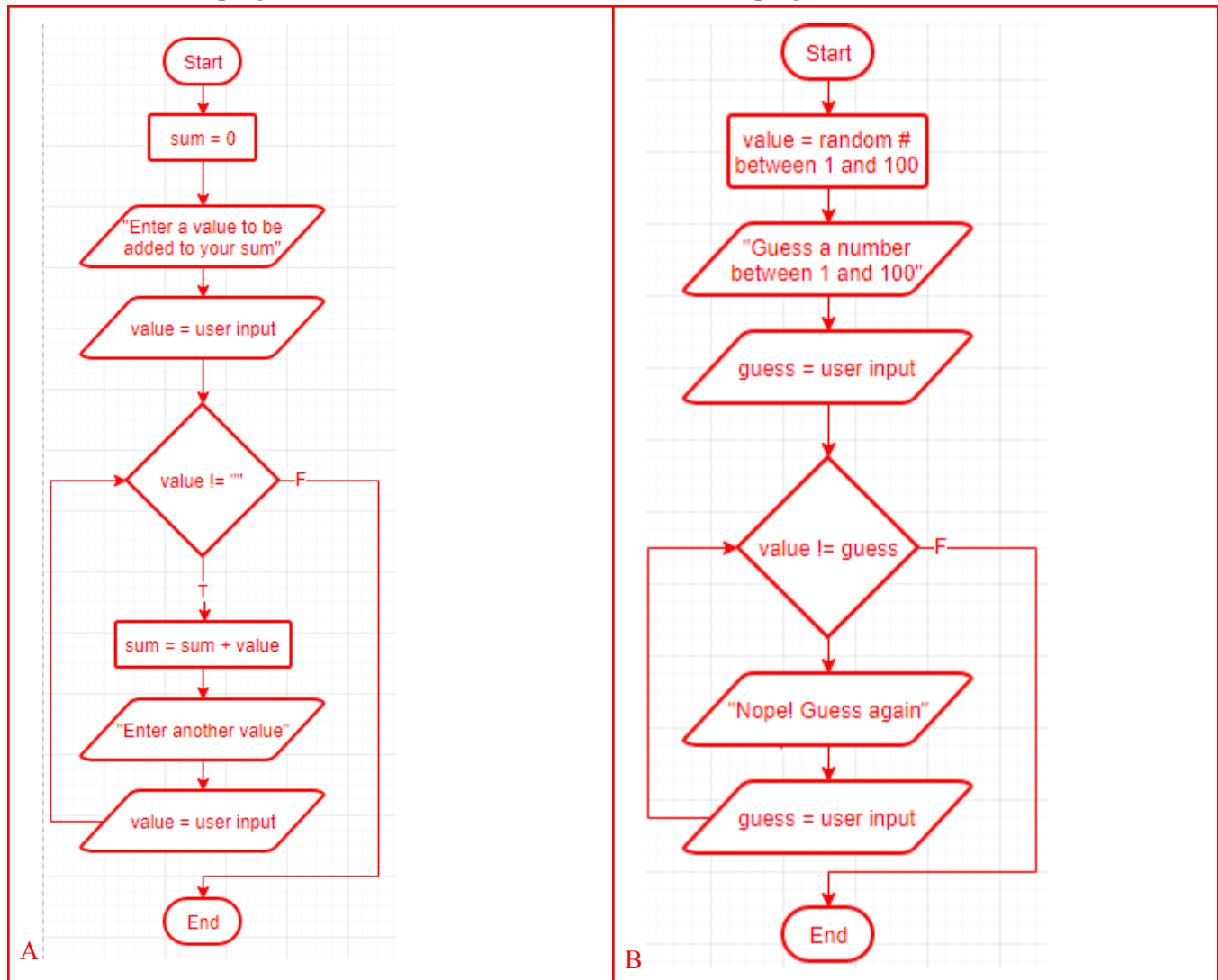
B

```
import random

value = random.randint(1, 100)

guess = raw_input("Guess a number between 1
and 100: ")
while (value != int(guess)):
    guess = raw_input("Nope! Guess again! ")
print ("You got it!")
```

b. Choose the other program and draw the flowchart that describes the program. [8]



Choose 3 network topologies to do the following with:

[6]

Tasks:

Network Topologies:

- Draw a diagram with labelled nodes
- List one advantage and one disadvantage

Point-to-point, Bus, Ring, Star, Mesh

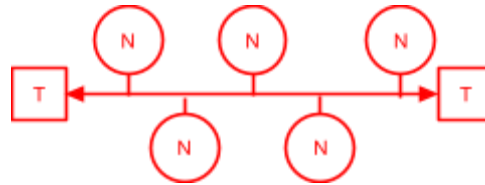
Point-to-Point

- + Cheap
- + Easy to implement
- + Easy to find problems
- + Fast
- Limited in ability
- Easy to disable (only 1 wire)



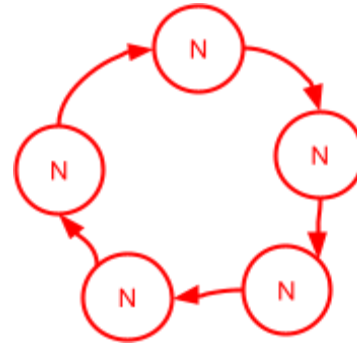
Bus

- + Easy to Implement
- + Cheap
- + Fast
- Extra hardware (Terminators)
- Easy to disable



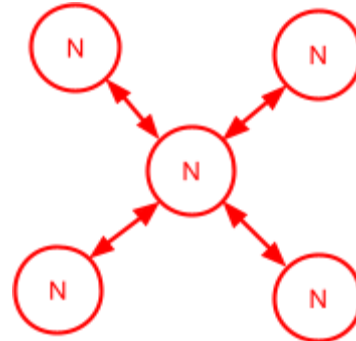
Ring

- + Easy to find problems
- + Cheap
- Easy to disable
- Data can only go in one direction



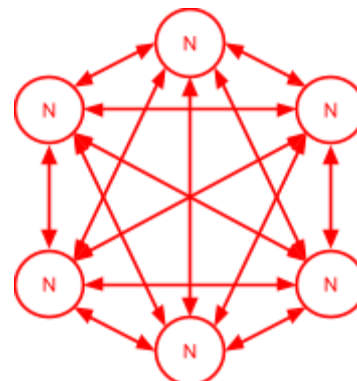
Star

- + Easy to implement
- + Cheap
- + Fast
- Easy to disable



Mesh

- + Very reliable (multiple paths for data)
- + Fast (direct communication)
- Expensive (each computer needs many NIC's)
- Hard to implement



You have only one of each of the following components. Match them up to create as many working computers as you can. Full marks for creating the best performance computers. [12]

BEWARE:

- There may be extra, unnecessary information given
- There may be extra parts leftover, or multiple parts with similar specifications

CPU (A)	Motherboard (A)	RAM (A)
Manufacturer: Intel Speed: 2.8 GHz Cores: 2 Socket: LGA 1155 L3 Cache: 7MB	Manufacturer: Biostar SATA 6GB: 4 Socket: AM3+ Memory Standard: DDR3 Memory Speed: 1333/1600/1866	Manufacturer: PNY Speed: 2133 MHz CAS Latency: 13 Capacity: 8GB Standard: DDR3
RAM (B)	CPU (B)	RAM (C)
Manufacturer: Crucial Speed: 1866 MHz CAS Latency: 13 Capacity: 8GB Standard: DDR3	Manufacturer: Intel Speed: 3.0 GHz Cores: 4 Socket: LGA 1150 L3 Cache: 8MB	Manufacturer: Kingston Speed: 2133 MHz CAS Latency: 13 Capacity: 16GB Standard: DDR4
CPU (C)	Motherboard (B)	CPU (D)
Manufacturer: AMD Speed: 4.0 GHz Cores: 8 Socket: AM3+ L3 Cache: 6MB	Manufacturer: ASUS SATA 6GB: 8 Socket: LGA 1366 Memory Standard: DDR4 Memory Speed: 2800/2666/2400	Manufacturer: AMD Speed: 4.7GHz Cores: 8 Socket: AM3+ L3 Cache: 8MB
Motherboard (C)	RAM (D)	CPU (E)
Manufacturer: ASUS SATA 6GB: 6 Socket: LGA 1155 Memory Standard: DDR4 Memory Speed: 2133/2400/2800	Manufacturer: Axiom Speed: 2666 MHz CAS Latency: 12 Capacity: 16GB Standard: DDR4	Manufacturer: Intel Speed: 3.5 GHz Cores: 4 Socket: LGA 1150 L3 Cache: 8MB
Motherboard (D)	CPU (F)	Motherboard (E)
Manufacturer: MSI SATA 6GB: 6 Socket: FM2+ Memory Standard: DDR3 Memory Speed: 1600/1866/2133	Manufacturer: AMD Speed: 3.7GHz Cores: 4 Socket: FM2+ L3 Cache: 6MB	Manufacturer: GIGABYTE SATA 6GB: 4 Socket: LGA 1150 Memory Standard: DDR4 Memory Speed: 2133/2400/2666

	1	2	3	4	5
Motherboard	A	C	D	E	
CPU	D (or C)	A	F	E (or B)	
RAM	B	C	A	D	

In the case of computer 1 and 4, there is choice of CPU. There is an optimal configuration: A-D-B and E-E-D are optimal and would receive full marks. A-C-B and E-B-D would lose ½ mark each.