



Computer Science

Grade 12 -Term 1 – Revision Notes

2017 - 2018



Unit 1

Word	Meaning
Bit	A bit (short for binary digit) is the smallest unit of data in a computer. A bit has a single binary value, either 0 or 1.
Byte	A byte is the smallest unit of memory in a computer. Some computers use larger bytes but they are always multiples of 8 (e.g. 16-bit systems, 32-bit systems, 64-bit systems).
Register	A register is a group of bits.
Pixel	A tiny dot on the screen, one of many from which an image is made up of.
MAC Address	A unique code assigned to the network card on your device.

Number systems: A binary digit is commonly referred to as a BIT. 8 bits are usually referred to as a BYTE.

Number system	Numbers	Base
Binary	0,1	2
Denary or Decimal	0,1,2,3,4,5,6,7,8,9	10
Hexadecimal	01,2,3,4,5,6,7,8,9,A,B,C, D,E,F	16

Computer Memory Sizes

Some computers use larger bytes but they are always multiples of 8 e.g. 16-bit systems, 32-bit systems, 64 -bit systems).

Name of memory Size	Number of bits	Equivalent denary value
1 kilobyte (1 KB)	2 ¹⁰	1024 bytes
1 megabyte (1 MB)	2 ²⁰	1 048 576 bytes
1 gigabyte (1 GB)	2 ³⁰	1 073 741 824 bytes
1 terabyte (1 TB)	2 ⁴⁰	1 099 511 627 776 bytes
1 petabyte (1PB)	2 ⁵⁰	1 125 889 906 842 624 bytes

Binary Number Facts

- The binary system consists of 1s and 0s only.
- A switch in the ON position can be shown by 1, a switch in the OFF position can be represented by 0.
- We call each of the 1s or 0s a bit.
- All computing devices, including smart phones, are based on the binary base 2 system.
- Computers use binary codes to represent and interpret letters, numbers and special characters with bits.
- A commonly used code is the American Standard Code for Information Interchange (ASCII).
- With ASCII, each character is represented by eight bits, each group of eight bits is known as a byte.
- Codes can be used to represent almost any type of information digitally e.g. computer data, graphics, photos, voice, video and music.

Decimal Number Facts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10. These are natural numbers expressed in what can be described as the denary, decimal or base-10 system of numbers.

Hexadecimal Number Facts

The hexadecimal numeral system, also known as just hex, is a numeral system made up of 16 symbols (base 16).

Some examples of where hex is used include:

- colour references
- assembly language programs
- error messages

Hexadecimal and Media Access Control (MAC)

A Media Access Control (MAC) address refers to a number which uniquely identifies a device on the internet.

A unique code assigned to the network card on your device.

The MAC address refers to the network interface card (NIC) which is part of the device.

The MAC address does not change, so that a particular device can always be identified no matter where it is.

A MAC address is usually made up of 48 bits which are shown as six groups of hexadecimal digits.



Number Conversions

**You should know the number conversions from one number system to another.
You can follow any method for conversion.
NO tables will be provided for the exam.**

[Binary to Denary](#)

[Denary to Hexadecimal](#)

[Denary to Binary](#)

[Denary to Hexadecimal](#)

[Hexadecimal to Binary](#)

[Hexadecimal to Denary](#)

Unit 5 – Routing Concepts

Word	Meaning
Router	A router connects one network to another network.
OS	The low-level software that supports a computer's basic functions, such as scheduling tasks and controlling devices.
RAM	Random-access memory is a form of computer data storage which stores frequently used program instructions to increase the general speed of a system.
ROM	Read-only memory (ROM) is a type of non-volatile memory used in computers and other electronic devices. Once data has been written onto a ROM chip, it cannot be removed and can only be read.
Volatile Memory	Volatile memory 'forgets' when it loses power.
Non- Volatile Memory	Non-volatile memory 'remembers' without power.

Few concepts about Routers

- Networks are used to access web pages, take using IP telephones, take part in video conferences, gaming, shopping online and more
- Ethernet switches functions at the data link layer, the layer 2 of network and forwards frames between devices.
- If the source IP and destination IP addresses are on different networks, the Ethernet frame must be sent to a router.
- A router connects one network to another network.
- The router is responsible for the delivery of packets across different networks.
- The router uses its routing table to determine the best path to use to forward a packet.
- When a host sends a packet to a device on a different IP network, the packet is forwarded to the default gateway
- The router is responsible for the routing of traffic between networks.

Few concepts about Routers

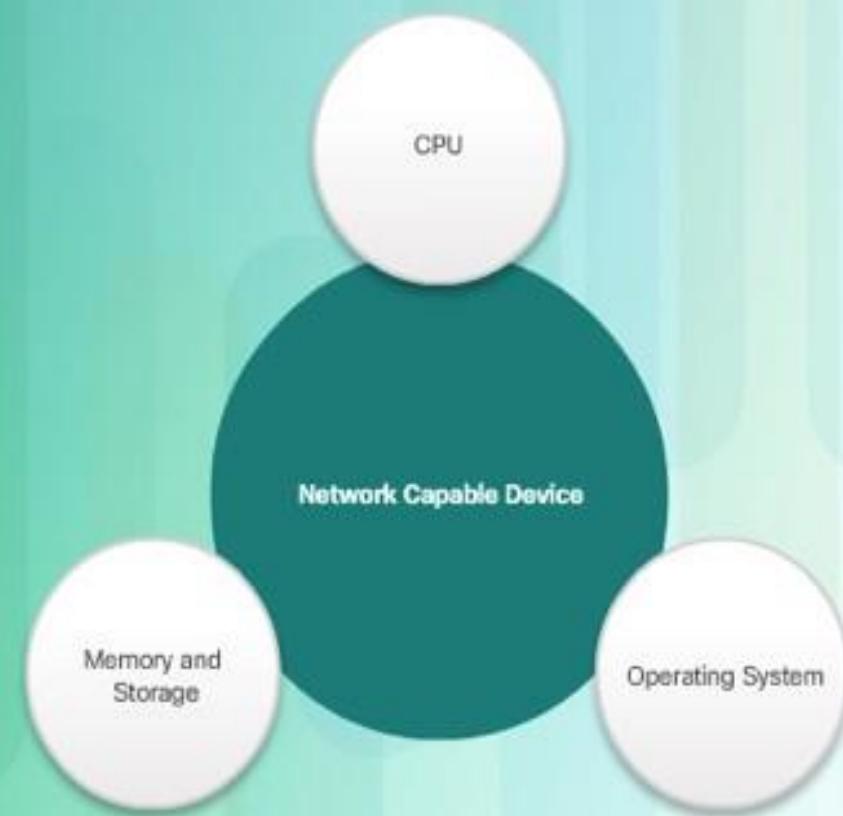
- Routers have specialized ports and network interface cards to interconnect devices to other networks.
- A router connects multiple networks, which means that it has multiple interfaces that each belong to a different IP network.
- Each network that a router connects to typically requires a separate interface.
- These interfaces are used to connect a combination of both local-area networks (LANs) and wide-area networks (WANs).
- The router has a routing table. The routing table is a table which is a record of all the networks the computer knows about.
- If the router does not know about a network, it will pass the packet to the default gateway, which is another router.
- Routers use static routes and dynamic routing protocols to learn about remote networks and build their routing tables.



Routers are computers

A router is essentially a specialised computer.

Components of a Network Capable Device



It needs a CPU and memory to temporarily and permanently store data to run operating system instructions, such as system initialization, routing functions and switching functions.

Memory

Computer memory is classified in two ways:

- *volatile*
- *non-volatile*

Volatile	Non-Volatile
Loses its contents when power is turned off	Does not lose its contents when the power is turned off
Volatile memory is faster	Non-Volatile is usually slower than volatile memory
Example: RAM	Example: ROM, hard drive, USB

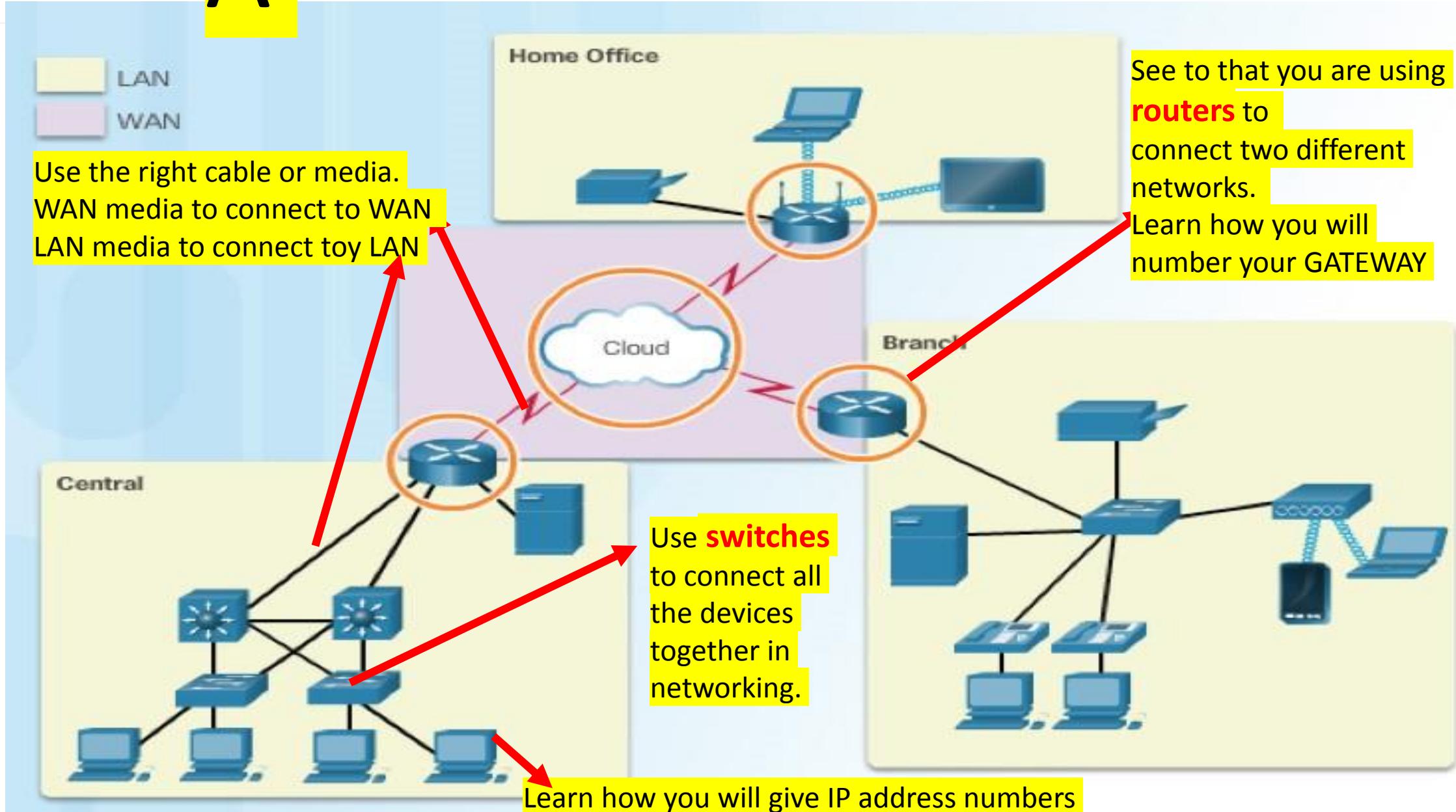
Router Memory

Memory	Description
Random Access → JOBS→ Memory (RAM)	volatile memory that provides temporary storage for different applications and processes such as: <ul style="list-style-type: none">•running an IOS•running configuration files•IP routing tables•packet buffers
Read Only Memory → JOBS→ (ROM)	non-volatile memory that provides permanent storage for: <ul style="list-style-type: none">•boot instructions•basic diagnostic software•limited IOS in case router cannot load the full IOS
Non-Volatile Random Access Memory (NRAM) → JOBS→	non-volatile memory that gives permanent storage for the start-up configuration file
Flash → JOBS→	non-volatile memory that provides permanent memory for: <ul style="list-style-type: none">•IOS•other system-related files



A

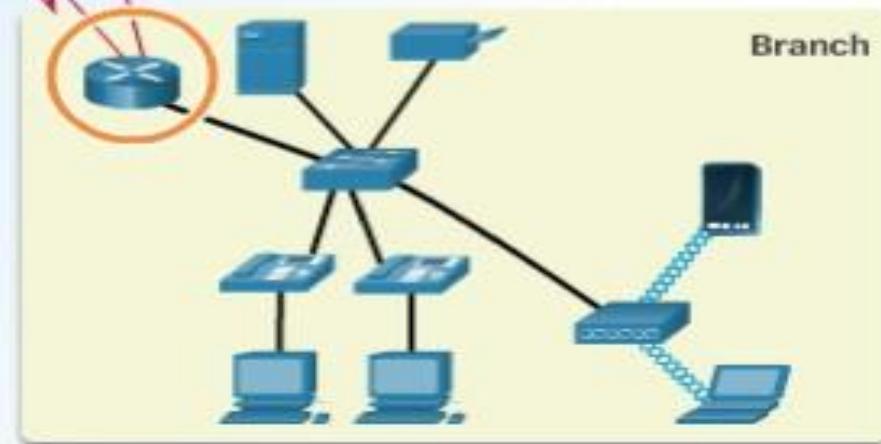
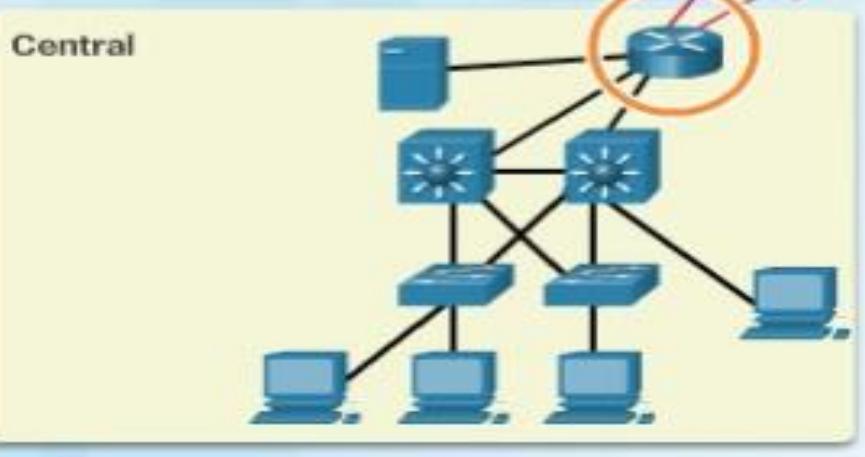
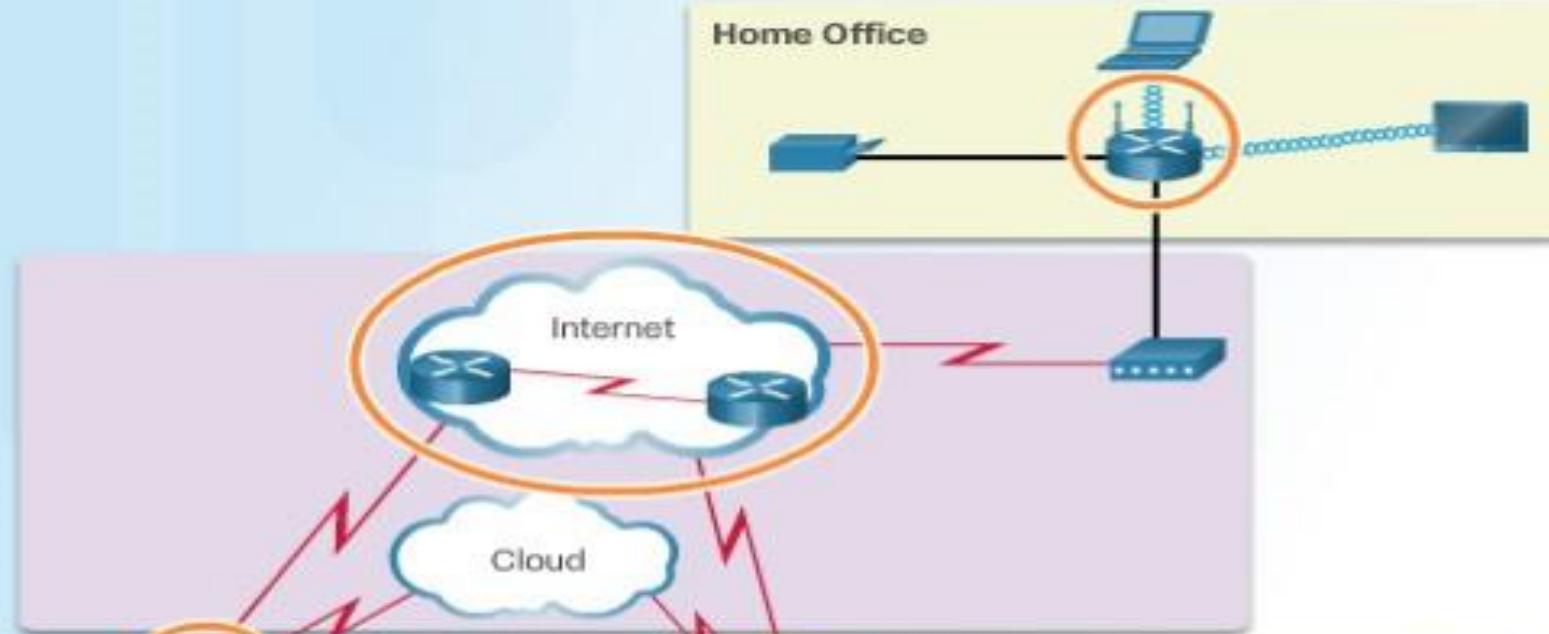
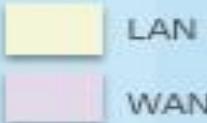
You can refer figure A or B for connecting different networks





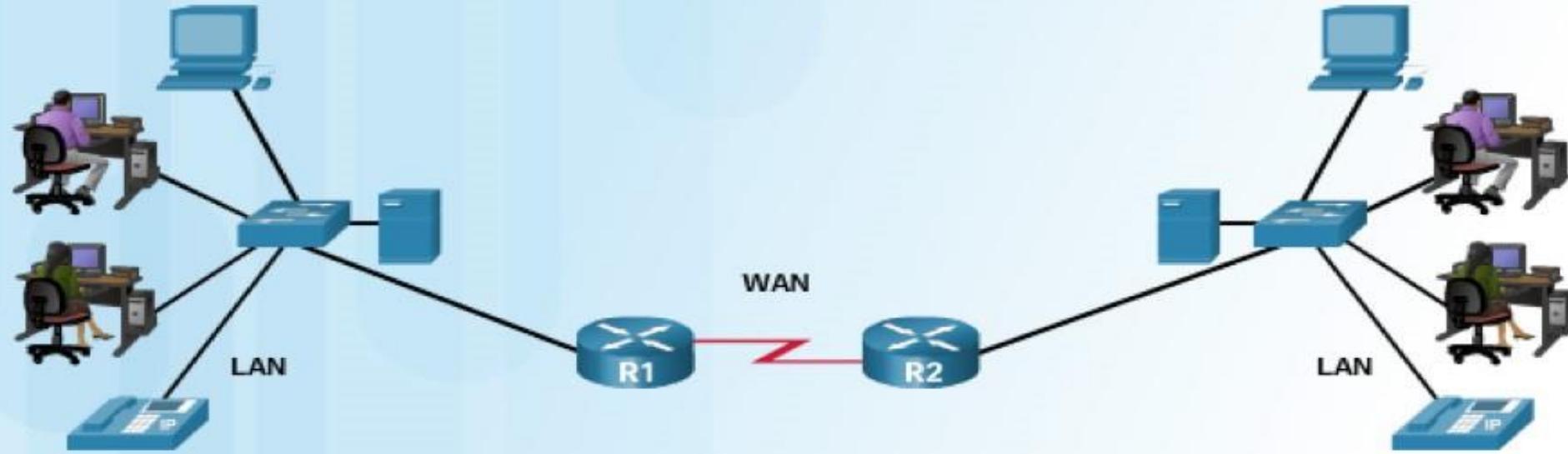
You can refer figure A or B for connecting different networks

The Router Connection





Routers Connect



Routers direct packets to their proper destination. Routers connect different media.



LAN and WAN

LAN	WAN
Local Area Network	Wide Area Network
LANs are commonly Ethernet networks that contain devices, such as PCs, printers, and servers.	WANs are used to connect networks over a large geographical area. For example, a WAN connection is commonly used to connect a LAN to the internet service provider (ISP) network.

CLI – command line interface. Enterprise level means it is made for a large organisation such as a school, not like your home router. As this is an enterprise level router it does not have an interface that can be used with a mouse. It is all text based. Console access is when you physically connect to a console.

An Interface that has a nice, easy-to-use screen which can be navigated with a mouse is called a GUI interface – Graphical User Interface.

A time-to-live (TTL) is a value in an Internet Protocol (IP) packet that tells a network router whether or not the packet has been in the network too long and should be thrown away.

The TTL is set in an eight-binary digit field in the packet header by the sending host.

When forwarding an IP packet, routers are required to decrease the TTL by at least one.

If a packet's TTL has reached zero, the router detecting it discards the packet and sends a message back to the sending host.



The routing table search results in one of three path determinations:

- **Directly connected network** - The destination IP address of the packet is a host address on the same network as the interface of the router.
- **Remote network** - Remote networks can only be reached by forwarding packets to another router.
- **No route determined** - If the destination IP address of the packet does not belong to either a connected or remote network, the router determines if there is a Gateway of Last Resort available.

Few Examination Tips

- You are given 35 minutes to complete the exam.
- Allocate time according to the sections.
- Read the questions carefully.
- Look for key words in the question like define, explain, list, describe. Answer accordingly.
- Do not forget to Label your drawings.
- See the marks allotted and answer accordingly.
- Do not leave any answer blank. Try to attempt all questions.

ALL THE BEST ☺