

COMPUTER NETWORKS — Exam Cheat Sheet

Class XII Computer Science (083) | Unit 2 complete revision in simple language + solved case studies

1. What a network is, and why

A computer network is two or more computers joined together so that they can share data, software and hardware (like one printer for the whole office).

Benefit	In plain words
Resource sharing	one printer, one scanner, one internet line used by everybody
Data sharing	files move from one computer to another without a pen drive
Communication	email, chat, video conferencing
Cost saving	fewer machines are bought because they are shared
Central storage	all files kept on one server, easy to take a backup

2. Evolution of networking

Name	Year / by whom	What it was
ARPANET	1969, US Department of Defence (ARPA)	the FIRST network, joined four universities so researchers could share files
NSFNET	1980s, National Science Foundation	a bigger, faster network for educational and research work only; no commercial use
INTERNET	1990s onwards	ARPANET + NSFNET + other networks joined together and opened to everybody — the network of networks

- Order to remember : ARPANET → NSFNET → INTERNET.
- Internet is a network of networks. It is public and nobody owns it.
- Interspace is software that lets many users talk, send data and use video in a 3-D environment at the same time.

3. Data communication — the five components

Data communication means sending data from one device to another. Every exchange has exactly five parts, and the examiner can ask you to name them.

Component	What it does	Example
Sender	the device that sends the message	your mobile
Receiver	the device that receives it	your friend's mobile
Message	the data being sent	text, picture, audio, video
Transmission medium	the path the message travels on	cable, radio waves, fibre
Protocol	the set of rules both sides agree to follow	TCP/IP, HTTP

A protocol is simply a set of rules. Without it the two machines would not understand each other, exactly like two people speaking different languages.

4. Measuring the capacity of a medium

Term	Meaning	Measured in
Bandwidth	the CAPACITY of the medium — how much data it can carry at most	Hz, KHz, MHz
Data transfer rate	how much data ACTUALLY travels per second	bps, Kbps, Mbps, Gbps

- Think of a road: bandwidth is how wide the road is, data transfer rate is how many cars actually pass in one second.
- 1 Kbps = 1024 bps, 1 Mbps = 1024 Kbps, 1 Gbps = 1024 Mbps.
- bps is bits per second (small b). Bps with a capital B is BYTES per second. 1 byte = 8 bits.

5. IP address

- An IP address is the unique number given to every device on a network, like a house address for a computer. Two devices on the same network can never have the same IP address.
- IPv4 — four numbers separated by dots, each from 0 to 255, for example 192.168.1.1. It is 32 bits long.

- IPv6 — the newer version, 128 bits, written in eight groups of hexadecimal digits. It was needed because IPv4 addresses ran out.
- MAC address is different: it is fixed inside the network card by the manufacturer and never changes, while the IP address can change.

6. Switching techniques

Point	Circuit switching	Packet switching
How it works	a complete physical path is fixed FIRST, then data travels	data is broken into small packets that travel by any free route
Path	same path for the whole conversation	packets may take different paths
Used by	old telephone system	the Internet
Wastage	path stays reserved even when nobody speaks	no wastage, line is shared
Order of arrival	always in order	may arrive out of order and are rearranged at the receiver

7. Transmission media

Wired (guided) media

Medium	Simple description	Good points	Weak points
Twisted pair cable	two copper wires twisted around each other; the LAN cable in your lab	cheapest, easy to install, easy to join	carries data the shortest distance, most affected by noise
Co-axial cable	a copper core with a metal mesh around it; the old cable-TV wire	carries data further than twisted pair, better against noise	costlier, thick and hard to bend
Optical fibre cable	a thin glass thread that carries data as LIGHT	fastest, longest distance, no electrical interference at all, most secure	most expensive, breaks easily, needs expert installation

If a question asks for the fastest or the best wired link between two far-off campuses, the answer is always **OPTICAL FIBRE**.

Wireless (unguided) media

Medium	Travels	Used for	Special point
Radio waves	in all directions, can pass through walls	FM radio, cordless phone, Wi-Fi	no line of sight needed; cheap
Micro waves	in a straight line only	mobile towers, TV transmission	sender and receiver must face each other (line of sight); tall towers needed
Infrared waves	short distance, straight line	TV remote, computer mouse	cannot pass through walls, so it is safe from outsiders

8. Network devices

Device	What it does, in one line
Modem	MOdulator DEModulator — converts the computer's digital signal into analog to travel on a phone line, and back again
Ethernet card (NIC)	the card inside the computer that lets it join a network; it holds the MAC address
RJ45	the plastic connector at the end of a LAN cable — like a plug
Repeater	makes a weak signal strong again; needed when the cable run is longer than about 100 metres
Hub	joins computers in one block, but sends the data to EVERY computer — slow and not secure
Switch	joins computers in one block and sends the data ONLY to the right computer — faster and secure
Router	joins two DIFFERENT networks and chooses the best path for the data
Gateway	joins two networks that work on different protocols; it acts as an entry and exit point
WiFi card	lets a computer join a network without any wire
Firewall	hardware or software that checks all traffic and blocks whatever is unsafe — the answer to any DATA SECURITY question

Asked as	Answer
device inside each block / building	SWITCH (hub is accepted, but switch is better)

Asked as	Answer
device between two blocks that are far apart	REPEATER
device to join the campus to another city / to the internet	ROUTER or GATEWAY
device / software for data security	FIREWALL
device to connect using a telephone line	MODEM

9. Types of networks

Type	Full form	Area covered	Example
PAN	Personal Area Network	a few metres, around one person	mobile joined to a smart watch by Bluetooth
LAN	Local Area Network	one room, one building, one campus	the computer lab, one office block
MAN	Metropolitan Area Network	one city	cable TV network, all ATMs of a bank in a city
WAN	Wide Area Network	country to country, the whole world	the Internet, a Mumbai office joined to a Delhi office

Exam shortcut: inside ONE campus = LAN. Between TWO cities = WAN. Within ONE city = MAN. Around one person = PAN.

10. Network topologies

Topology means the shape in which the computers are arranged and joined.

Topology	How it looks	Good points	Weak points
BUS	all computers joined to ONE long main cable (called the backbone)	needs the least cable, cheapest, easy to add a computer	if the main cable breaks, the WHOLE network stops; hard to find the fault
STAR	every computer joined by its own cable to a central hub or switch	fault in one cable affects only that computer, easy to find the fault, easy to add a computer	needs the most cable; if the central hub fails the whole network stops
TREE	several star networks joined together to one main backbone cable	suits big networks spread over several blocks, easy to expand	costly, and if the backbone fails everything below it stops

- In case study questions the expected cable layout is almost always STAR — the block holding the server sits in the middle and every other block is joined to it.
- If the question says 'connect economically / with the least cable', you may also join the blocks along the shortest distances (a bus or tree layout) and say so.

11. Protocols — learn this table by heart

Protocol	Full form	Used for
HTTP	HyperText Transfer Protocol	opening web pages on the WWW
HTTPS	HyperText Transfer Protocol Secure	the same, but the data is encrypted — used by banks and shopping sites
FTP	File Transfer Protocol	uploading and downloading files between two computers
PPP	Point to Point Protocol	joining two computers directly, usually over a telephone line
SMTP	Simple Mail Transfer Protocol	SENDING an email
POP3	Post Office Protocol version 3	RECEIVING or downloading an email from the mail server
TCP/IP	Transmission Control Protocol / Internet Protocol	the basic protocol of the Internet. TCP breaks data into packets and rebuilds them, IP handles the addressing and routing
TELNET	Terminal Network	working on a far-away computer as if you were sitting in front of it (remote login)
VoIP	Voice over Internet Protocol	making phone and video calls over the Internet instead of a telephone line

- SMTP Sends, POP3 Picks up. That one line saves the two marks students lose most often.
- Any question about video conferencing, internet calling or online face to face talk = VoIP.

12. Web services

Term	In simple words
WWW (World Wide Web)	the huge collection of linked web pages kept on computers all over the world. It is a SERVICE that runs on the Internet — the Internet and the WWW are not the same thing
HTML	HyperText Markup Language — the language used to WRITE a web page, using tags like <p> and <h1>. It decides how the page LOOKS
XML	eXtensible Markup Language — used to STORE and CARRY data. Here you make your own tags, and it describes what the data MEANS, not how it looks
Domain name	the easy name of a website, for example cbse.nic.in, used because nobody can remember an IP address
DNS	Domain Name System — the service that converts the domain name into its IP address
URL	Uniform Resource Locator — the full address of one page, for example https://www.cbse.nic.in/index.html
Website	a group of related web pages kept together under one domain name
Web page	one single document of a website
Home page	the first page that opens when a website is visited
Web browser	the software on YOUR computer used to view web pages — Chrome, Firefox, Edge
Web server	the computer where the website is actually stored and from where it is delivered
Web hosting	renting space on a web server so that your website stays available on the Internet

Point	HTML	XML
Made for	displaying data	storing and carrying data
Tags	fixed, already defined	you create your own
Case sensitive	no	yes
Closing tag	not always needed	compulsory

13. How to answer the 5-mark case study

Nearly every board paper has one. The five parts are almost always the same, so learn the rule for each.

The question asks	The rule you apply	What you write
Best place for the SERVER	the block with the MAXIMUM number of computers	name that block + 'because it has the maximum number of computers, so network traffic will be least'
Cable layout	draw a STAR with the server block in the centre	a labelled diagram joining the server block to every other block
Device inside each block	one device for all computers of one block	SWITCH (or hub) in every block
Where to put a REPEATER	look for any distance MORE THAN 100 metres	on that line; if all distances are under 100 m, write 'repeater is not required'
Fastest wired link to another city	long distance, high speed	OPTICAL FIBRE cable
Data security		FIREWALL
Face to face online talk		VIDEO CONFERENCING, and the protocol is VoIP
Type of network	same campus = LAN, two cities = WAN	name it and give the reason in four words

Always write the JUSTIFICATION. 'Server in ADMIN block' alone gets half the mark; 'because it has the maximum number of computers (110), so traffic will be least' gets the full mark.

SOLVED CASE STUDIES — from your question paper set

The three questions below are exactly the ones in your document, answered in the simplest possible language, with the reason written out for every part.

QUESTION 1 — Fun Media Services Ltd.

An event planning company is opening its India campus in MUMBAI with the head office in DELHI. The Mumbai campus has four blocks : ADMIN, DECORATORS, FOOD and MEDIA.

Distances between the blocks

From — To	Distance
ADMIN to DECORATORS	90 m

From — To	Distance
ADMIN to MEDIA	75 m
ADMIN to FOOD	50 m
DECORATORS to FOOD	65 m
DECORATORS to MEDIA	50 m
FOOD to MEDIA	45 m
DELHI Head Office to MUMBAI Campus	1475 km

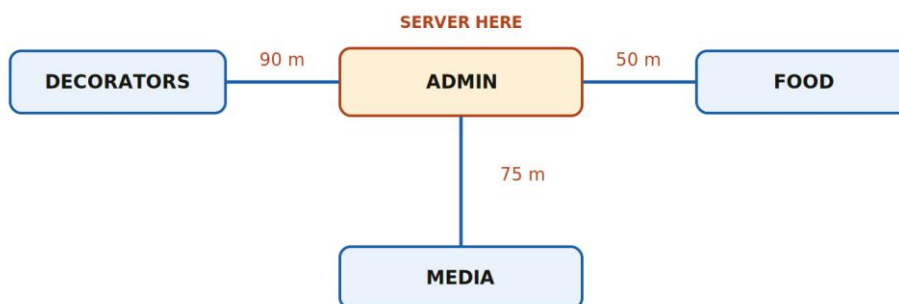
Number of computers

Building	Computers
ADMIN	110
DECORATORS	75
MEDIA	12
FOOD	20

(i) Best place for the server, with justification

ADMIN block. It has 110 computers, which is the highest of the four blocks. Keeping the server where most of the computers are means most of the requests are answered inside the same block, so the network traffic and the waiting time are the least.

(ii) Cable layout inside the Mumbai campus



Star topology. Every distance is below 100 m, so no repeater is needed anywhere.

Star topology, with the ADMIN block (the server block) in the centre and one cable going from it to each of the other three blocks. If the examiner asks for the most economical layout instead, join ADMIN to FOOD (50 m), FOOD to MEDIA (45 m) and MEDIA to DECORATORS (50 m), which uses only 145 m of cable.

(iii) Device to connect all the computers inside each building

A SWITCH in every building. A switch sends the data only to the computer it is meant for, so it is faster and safer than a hub. (A hub is also accepted, but always prefer the switch.)

(iv) For online face to face communication between Mumbai ADMIN and Delhi Head Office

Option (c) VIDEO CONFERENCING. Cable TV is one way only, and email and text chat are not face to face.

(v) Type of network

Case	Network	Reason
(a) Mumbai campus joined to the Delhi Head Office	WAN	the two are 1475 km apart, in two different cities
(b) The computers inside the Mumbai campus	LAN	all of them are inside one campus, within a few hundred metres

- Note : no repeater is needed anywhere in this campus, because the longest distance is 90 m, which is under 100 m.

QUESTION 2 — XYZNova Inc.

A new campus in HYDERABAD with the headquarters in BENGALURU. The campus has four buildings : HR, FINANCE, IT and LOGISTICS.

Distances and number of computers

From — To	Distance	Block	Computers
HR to FINANCE	50 m	HR	60

From — To	Distance	Block	Computers
HR to IT	175 m	FINANCE	40
HR to LOGISTICS	90 m	IT	90
FINANCE to IT	60 m	LOGISTICS	35
FINANCE to LOGISTICS	70 m		
IT to LOGISTICS	60 m		

(I) Best place for the server, with justification

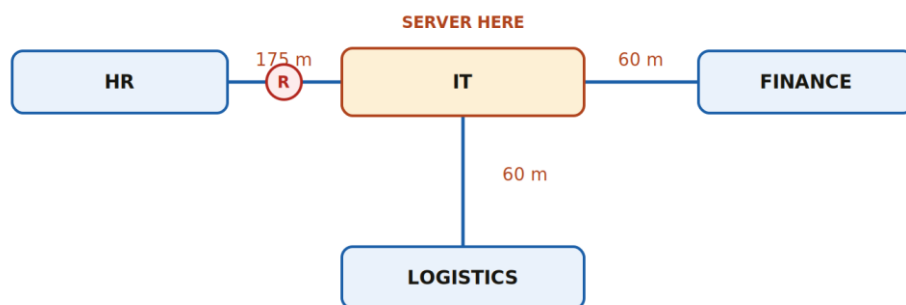
The IT block. It has 90 computers, the maximum in the campus, so putting the server there keeps the network traffic to a minimum.

(II) Placement of the devices

(a) REPEATER — on the line between IT and HR. That distance is 175 metres, which is more than 100 metres, so the signal becomes weak on the way and a repeater is needed to make it strong again. No other line needs one.

(b) SWITCH — one in each of the four buildings, to join all the computers inside that building.

(III) Cable layout



Star topology. R = REPEATER, needed on the IT to HR line because 175 m is more than 100 m.

(IV) High speed wired link to the head office

OPTICAL FIBRE CABLE. It gives the highest speed, carries data over very long distances without the signal becoming weak, and is not disturbed by any electrical interference.

(V) A. What is the use of VoIP?

VoIP stands for Voice over Internet Protocol. It lets people make voice and video calls over the Internet instead of using a traditional telephone line, which makes long distance calls far cheaper.

B. Which type of network joins the Hyderabad campus to the Bengaluru headquarters?

WAN, because the two are in different cities, very far apart.

QUESTION 3 — MakeInIndia Corporation

An IT training company in Uttarakhand is setting up its first campus at KASHIPUR with three blocks : APP DEVELOPMENT, WEB DESIGNING and MOVIE EDITING. Another campus is at MUSSOORIE.

Distances and number of computers

From — To	Distance	Block	Computers
App development to Web designing	28 m	App development	75
App development to Movie editing	55 m	Web designing	50
Web designing to Movie editing	32 m	Movie editing	80
Kashipur Campus to Mussoorie Campus	232 km		

(i) Best block to house the server, with justification

The MOVIE EDITING block. It has 80 computers, the maximum among the three blocks, so the server placed there gives the best and fastest connectivity and the least traffic on the network.

(ii) Device or software for data security

A FIREWALL. It sits between the campus network and the outside world, checks every message going in and out, and blocks anything unsafe.

(iii) Best wired medium and the cable layout

ETHERNET CABLE (twisted pair) is enough inside the campus, because all three blocks are within 55 metres of each other and this is the cheapest wired option. The layout is a star with the server block in the centre.



Star topology. All distances are under 100 m, so no repeater is needed.

(iv) Placement of the devices

(a) SWITCH or HUB — one in every block, so that the computers inside that block are joined to each other.

(b) REPEATER — not required anywhere. The longest distance in the campus is 55 metres, which is well under 100 metres, so the signal never becomes weak.

(v) Protocol for video conferencing between Kashipur and Mussoorie

VoIP (Voice over Internet Protocol).

Last minute one liners

- Server goes in the block with the MOST computers — always give this reason.
- Repeater only when a distance is more than 100 m. Otherwise write clearly : 'repeater not required'.
- Switch inside a block, router or gateway between two networks, firewall for security, modem for a telephone line.
- Optical fibre for long distance and high speed; twisted pair (Ethernet) for short distance and low cost.
- Same campus = LAN, same city = MAN, different cities = WAN, around one person = PAN.
- Video conferencing for face to face online talk, and the protocol behind it is VoIP.
- SMTP sends mail, POP3 receives mail, FTP transfers files, TELNET is remote login, HTTPS is the secure web.
- ARPANET first, then NSFNET, then INTERNET.
- Bandwidth is the capacity of the medium, data transfer rate is the actual speed.
- Draw the star layout neatly and label every block and every distance — the diagram carries its own mark.