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Day 3
English notes

Topics 21-30

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1,000 TOPICS IN 100 DAYS

Day 3
Complete bilingual reader

10 topics · English and Telugu · 20 MCQs · Topic 27 replaced with AI

Topics 21–30

Revised owner-review edition
9 October 2026

Topic 21 · Gandhi's thought: truth, non-violence and satyagraha

ENGLISH

1. Concept in one line

In Gandhi's thought truth (satya) is the end, non-violence (ahimsa) is the means, and satyagraha, "holding on to truth", is the way of resisting a wrong by suffering oneself instead of using force. The examination asks how the word satyagraha was born, how it differs from passive resistance, and which books and writers are linked with these ideas.

2. Revision notes

2.1 The three ideas at a glance

Idea	What it means	Gandhi's own words
Truth (satya)	That which is. Truth in thought, in speech and in action. It is the end to be reached	"it is more correct to say that Truth is God, than to say that God is Truth" (From Yeravda Mandir)
Non-violence (ahimsa)	Not only not hurting. In its positive form it is love, even for the wrongdoer. It is the means	"Ahimsa is the means; Truth is the end" (From Yeravda Mandir)
Satyagraha	Holding on to truth. Truth-force, love-force or soul-force, used to resist a wrong by taking suffering on oneself	"the Force which is born of Truth and Love or non-violence" (Satyagraha in South Africa)

How they hang together: truth is the goal, ahimsa is the only road to it, and satyagraha is the two put to work against injustice.

2.2 Truth (satya)

- Gandhi derives the word from "sat": "The word Satya (Truth) is derived from Sat, which means 'being'." So he calls Sat or Truth perhaps the most important name of God.
- **"Truth is God".** In Young India of 31 December 1931 he explained that he used to say "God is Truth", and that "two years ago, I went a step further and said that Truth is God". His reason: even atheists, who deny God, do not deny truth.
- In the Introduction to his Autobiography (dated 26 November 1925) he writes that "truth is the sovereign principle" and that he worships "God as Truth only". Absolute Truth is God; until he reaches it he must hold by "the relative truth" as he sees it.
- The search for truth needs humility and tapas, which he explains as self-suffering.

- The last chapter of the Autobiography, "Farewell", says "there is no other God than Truth" and that the only means of realising Truth is ahimsa.

2.3 Non-violence (ahimsa)

- Ahimsa is the principle of not causing harm to other living things. It is found in Jainism, Hinduism and Buddhism, and Jainism observes it most strictly. Gandhi carried it into politics as satyagraha.
- **More than not killing.** "Not to hurt any living thing is no doubt a part of ahimsa. But it is its least expression." Evil thoughts, undue haste, lying, hatred and wishing ill of anyone also break it.
- **An active force.** "In its positive form Ahimsa means the largest love, the greatest charity." It means doing good even to the evil-doer. It does not mean putting up with the wrong: the active state of ahimsa requires one to resist the wrongdoer by dissociating oneself from him.
- **Non-violence of the brave.** In "The Doctrine of the Sword" (Young India, 11 August 1920) Gandhi wrote that where the only choice is between cowardice and violence he would advise violence. But he held non-violence to be "infinitely superior to violence". "Strength does not come from physical capacity. It comes from an indomitable will." Elsewhere he wrote "Non-violence and cowardice go ill together" (Harijan, 15 July 1939).
- **Ahimsa and truth.** He compares them to the two sides of a smooth, unstamped metal disc. Yet ahimsa is the means and truth is the end, and since the means is always within our reach, ahimsa is "our supreme duty".

2.4 Satyagraha: how the idea and the word were born

- **The idea came first.** On 11 September 1906 the Indians of the Transvaal met at the Empire Theatre, Johannesburg, to oppose a draft Ordinance that made them register afresh and give finger-impressions. Gandhi calls it the "Black Act". Sheth Haji Habib said that the resolution against the Ordinance must be passed with God as witness. All present then took an oath, with God as witness, not to submit to the Ordinance if it became law.
- Gandhi at first called the movement "passive resistance". In the Autobiography he says: "The principle called Satyagraha came into being before that name was invented."
- **The word.** As the English phrase caused confusion, a small prize was announced in Indian Opinion, his weekly in South Africa, for the best name. Maganlal Gandhi suggested "Sadagraha", meaning "firmness in a good cause", and won the prize. Gandhi changed it to "Satyagraha" to make the idea clearer.
- **Meaning.** Satya is truth and agraha is firmness. "Truth (Satya) implies love, and firmness (agraha) engenders and therefore serves as a synonym for force." Its root meaning is "holding on to truth".
- So satyagraha was first forged in South Africa (NCERT). Gandhi was there from 1893 to 1914 and returned to India in January 1915.

2.5 Satyagraha is not passive resistance

Point	Passive resistance (as commonly understood)	Satyagraha (Gandhi)
Whose weapon	Regarded as a weapon of the weak	"a weapon of the strongest"
Feeling towards the opponent	May go with hatred; no scope for love	Hatred has no place; the opponent is to be won over by patience and sympathy
Use of force	Not ruled out; passive resistance can end in violence	Physical force is forbidden even when circumstances favour it
Who suffers	The aim may be to harass the other side	The satyagrahi suffers in his own person; there is no idea of injuring the opponent
Nature	Often looked upon as a preparation for the use of force	Soul-force: truth and love

Note: in Hind Swaraj (1909) the English text still uses the phrase "passive resistance" for his own method, and defines it as "a method of securing rights by personal suffering; it is the reverse of resistance by arms".

2.6 Means and ends

- For Gandhi the means and the end cannot be separated. In Hind Swaraj (chapter "Brute Force") he says: "The means may be likened to a seed, the end to a tree", and "We reap exactly as we sow."
- In Young India (17 July 1924) he wrote that "means are after all everything" and "As the means so the end".
- So a good aim does not excuse violence or untruth: "fair means alone can produce fair results" (Hind Swaraj).

2.7 The satyagrahi: qualities and rules

- **In Hind Swaraj (chapter "Passive Resistance"):** those who take up this path "have to observe perfect chastity, adopt poverty, follow truth, and cultivate fearlessness".
- **Rules for the individual (Young India, 27 February 1930):** harbour no anger; suffer the anger of the opponent; put up with assaults and never retaliate; submit voluntarily to arrest; never insult the opponent; neither salute nor insult the Union Jack; protect officials from insult or attack, even at the risk of life.
- **Qualifications (Harijan, 25 March 1939):** a living faith in God; truth and non-violence as a creed; a chaste life and readiness to give up life and possessions for the cause; habitual wearing of khadi and spinning; no intoxicants; willing obedience to discipline; obedience to jail rules unless they are specially made to hurt self-respect.

- A satyagrahi exhausts all other means first, is always ready for peace, and aims "to convert, not to coerce, the wrong-doer".

2.8 Methods of satyagraha

Method	What it means	Gandhi's condition or remark
Non-cooperation	Withdrawing cooperation from the State	"not a passive state" but "an intensely active state"; it must be non-violent and free of malice
Civil disobedience	"civil breach of unmoral statutory enactments"	Only for those who willingly obey the laws in general; the penalty is accepted; it must be open and non-violent
Fasting	A fast to awaken conscience	A "potent weapon" and the last one to be used; of no use without a living faith in God; he admitted that fasts can become coercive
Hartal	Closing shops and stopping work for a day	In 1919 he asked India to suspend business and observe the day as one of fasting and prayer; the all-India hartal was held on 6 April 1919
Hijrat	Leaving one's home area in protest	Explained in the glossary of one volume of his Selected Works as "exodus or going away from one's native land"; commended by him for certain circumstances
Other forms	Boycott, picketing, non-payment of taxes	All must stay non-violent

Gandhi called non-cooperation and civil disobedience branches of satyagraha.

2.9 Where the ideas came from

Source	What Gandhi says about it
Home and childhood	Born in the Vaishnava faith. Jain monks often visited his father. He learnt "a toleration for all faiths". A Gujarati stanza taught him to return good for evil
Bhagavad Gita	First read in England with two Theosophist brothers, who were reading Edwin Arnold's translation "The Song Celestial". Later it became his "dictionary of daily reference"; the words aparigraha (non-possession) and samabhava (equability) gripped him
Sermon on the Mount (New Testament)	It "went straight to my heart"; he compared its teaching "resist not evil" with the Gita
Raychandbhai (Rajchandra)	A poet and partner in a jewellers' firm, and a Jain thinker. He influenced Gandhi by "living contact" and was his refuge in moments of spiritual crisis

Source	What Gandhi says about it
Leo Tolstoy	"The Kingdom of God is Within You" "overwhelmed" him and left an abiding impression. The satyagrahis' settlement in South Africa was named Tolstoy Farm
John Ruskin	"Unto This Last", given by H.S.L. Polak and read on the train from Johannesburg to Durban. He later translated it into Gujarati as "Sarvodaya"
Henry David Thoreau	Gandhi read the essay on civil disobedience "in 1907, or later" and took the phrase "civil disobedience" from its title to explain the struggle to English readers. In 1935 he wrote that it was "wrong" to say he derived the idea from Thoreau, because the resistance was well advanced before he got the essay

Gandhi names three "moderns" who left a deep impress on his life: "Raychandbhai by his living contact; Tolstoy by his book, The Kingdom of God is Within You; and Ruskin by his Unto this Last."

2.10 Key writings for these ideas

Work	When and how	What to read it for
Hind Swaraj (Indian Home Rule)	Written in Gujarati in November 1909 on the ship Kildonan Castle, on the voyage from London to South Africa. First published in Indian Opinion. A dialogue between a Reader and an Editor. The Bombay Government prohibited it in 1910; Gandhi replied by publishing his English translation	Soul-force against brute force; means and ends; the qualities of a passive resister
Satyagraha in South Africa	Written in Gujarati. The first thirty chapters were written in Yeravda jail. Preface dated 2 April 1924. English translation by Valji Govindji Desai (1928)	The pledge of 1906; the coining of the word; satyagraha against passive resistance
An Autobiography or The Story of My Experiments with Truth	Written in Gujarati in weekly parts for Navajivan between 1925 and 1929. English translation by Mahadev Desai, first printed in Young India; in book form in two volumes, 1927 and 1929	Truth as the sovereign principle; the influences on him; "The Birth of Satyagraha"
From Yeravda Mandir	Weekly letters in Gujarati from Yeravda Central Prison in 1930 to the Satyagraha Ashram. Published in 1932	"Truth is God"; ahimsa as the means
Young India	English weekly. Gandhi became its editor in 1919; Navajivan was its Gujarati companion	"The Doctrine of the Sword" (1920); the rules of 1930; "Truth is God" (1931)
Harijan	English weekly begun in February 1933, with Gujarati and Hindi editions	Qualifications of a satyagrahi (1939); fasting

His first satyagrahas in India (Champaran in 1917, Kheda and Ahmedabad in 1918), his years in South Africa, and his ideas of swaraj, sarvodaya, trusteeship, Nai Talim and the constructive programme are covered on other days.

3. Extra section: a timeline of the ideas and the writings

Year or date	What happened
Student years in England	Reads the Gita with two Theosophist brothers who were using Edwin Arnold's translation; reads the Sermon on the Mount
1893	Goes to South Africa
Early years in South Africa	Reads Tolstoy's "The Kingdom of God is Within You"; writes to Raychandbhai about his religious doubts
1903	Indian Opinion begins
1904	Reads Ruskin's "Unto This Last" on the train from Johannesburg to Durban; Indian Opinion and its press move to Phoenix
11 September 1906	Meeting at the Empire Theatre, Johannesburg: the pledge not to submit to the Ordinance. The name "Satyagraha" was fixed only later, through a prize in Indian Opinion: Maganlal Gandhi's "Sadagraha" became "Satyagraha"
September 1907	Extracts from Thoreau's essay on civil disobedience appear in Indian Opinion
November 1909	Writes Hind Swaraj on the Kildonan Castle
January 1915	Returns to India
1919	Hartal of 6 April against the Rowlatt Act; becomes editor of Young India and Navajivan
11 August 1920	"The Doctrine of the Sword" in Young India
2 April 1924	Preface to "Satyagraha in South Africa"
26 November 1925	Introduction to the Autobiography, signed at the Ashram, Sabarmati
27 February 1930	Rules for satyagrahis in Young India
1930	Letters from Yeravda Central Prison, later published as "From Yeravda Mandir" (1932)
31 December 1931	Young India prints his explanation of "Truth is God"
February 1933	Harijan begins

Year or date	What happened
25 March 1939	Qualifications of a satyagrahi in Harijan

4. Three common exam traps

1. **"Satyagraha is another name for passive resistance."** Gandhi himself separated the two. Passive resistance was seen as a weapon of the weak, could go with hatred and could end in violence. Satyagraha is a weapon of the strong, has no place for hatred and never allows physical force. Remember that Hind Swaraj (1909) still uses the English phrase "passive resistance" for his own method.
2. **"Gandhi coined the word at the 1906 meeting."** The pledge of 11 September 1906 gave birth to the method, but the name came later, through a prize in Indian Opinion. Maganlal Gandhi suggested "Sadagraha"; Gandhi changed it to "Satyagraha".
3. **Mixing up the authors.** "Unto This Last" is by Ruskin and became "Sarvodaya". "The Kingdom of God is Within You" is by Tolstoy. Thoreau wrote the essay on civil disobedience, but Gandhi denied that he took the idea from him: he said he took the phrase "civil disobedience" from its title to explain the struggle to English readers. Raychandbhai influenced him by personal contact, not through a book.

5. MCQs with answers and explanations

Q1. Consider the following statements about Gandhi's idea of satyagraha:

1. The word "Satyagraha" is Gandhi's modification of "Sadagraha", a word suggested by Maganlal Gandhi.
2. Gandhi described satyagraha as a weapon of the weak.
3. In "Hind Swaraj", Gandhi likens the means to a seed and the end to a tree.

Which of the statements given above is/are correct?

- (1) 1 only
- (2) 2 and 3 only
- (3) 3 only
- (4) 1 and 3 only

Q1. Answer: (4) 1 and 3 only

- Statement 1 is correct: A prize was announced in Indian Opinion for a name for the struggle. Maganlal Gandhi suggested "Sadagraha" and won it. Gandhi changed the word to "Satyagraha" to make the idea clearer.

- Statement 2 is wrong: Gandhi called satyagraha "a weapon of the strongest". It was passive resistance that was regarded as a weapon of the weak, and this is one of the points on which he separated the two.
- Statement 3 is correct: In the chapter "Brute Force" of Hind Swaraj he says "The means may be likened to a seed, the end to a tree."
- Why the other options are wrong: (1) leaves out statement 3, which is correct. (2) includes statement 2, which is wrong, and leaves out statement 1, which is correct. (3) leaves out statement 1, which is correct.

Q2. Match List I (Person) with List II (Link with Gandhi's thought):

List I (Person)	List II (Link with Gandhi's thought)
A. John Ruskin	1. Wrote "The Kingdom of God is Within You", a book that Gandhi said "overwhelmed" him
B. Leo Tolstoy	2. Wrote the essay on civil disobedience; Gandhi took the phrase "civil disobedience" from its title to explain his struggle to English readers
C. Henry David Thoreau	3. A poet and partner in a jewellers' firm who influenced Gandhi by "living contact"
D. Raychandbhai	4. Wrote "Unto This Last", which Gandhi later translated into Gujarati as "Sarvodaya"

- (1) A-1, B-4, C-2, D-3
- (2) A-4, B-1, C-2, D-3
- (3) A-4, B-1, C-3, D-2
- (4) A-1, B-4, C-3, D-2

Q2. Answer: (2) A-4, B-1, C-2, D-3

- Why it is correct: Ruskin wrote "Unto This Last", which Gandhi read on the train from Johannesburg to Durban and later translated into Gujarati as "Sarvodaya" (A-4). Tolstoy wrote "The Kingdom of God is Within You", which Gandhi says "overwhelmed" him (B-1). Thoreau wrote the essay on civil disobedience; Gandhi took the phrase "civil disobedience" from its title to explain the struggle to English readers (C-2). Raychandbhai, a poet and partner in a jewellers' firm, influenced him by "living contact" (D-3).
- Why (1) is wrong: It swaps the books of Ruskin and Tolstoy. "Unto This Last" is by Ruskin; "The Kingdom of God is Within You" is by Tolstoy.
- Why (3) is wrong: It swaps Thoreau and Raychandbhai. Thoreau was the essayist; Raychandbhai was the poet whom Gandhi knew in person.
- Why (4) is wrong: It makes both swaps: the books of Ruskin and Tolstoy, as in (1), and Thoreau and Raychandbhai, as in (3).

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Topic 22 · Vijayanagara Empire: dynasties and Krishnadevaraya

ENGLISH

1. Concept in one line

The Vijayanagara empire, founded in 1336 on the Tungabhadra by the brothers Harihara and Bukka, was ruled in turn by four dynasties (Sangama, Saluva, Tuluva and Aravidu) and reached its height under Krishnadevaraya (1509 to 1529). The examination asks you to place each ruler in the right dynasty and to put Krishnadevaraya's campaigns, opponents and dates in the right order.

2. Revision notes

2.1 The founding, 1336

- **What is agreed:** according to tradition and inscriptions, two brothers, Harihara and Bukka, founded the empire in 1336. NCERT prints the year in its timeline as "1336?" to show that it is not certain. The brothers were two of the five sons of Sangama, so the first dynasty is called the Sangama dynasty.
- **Capital:** Vijayanagara, the "city of victory", on the south bank of the Tungabhadra, opposite Anegondi. Its ruins are at Hampi in Karnataka. The rulers called themselves *rayas*, and contemporaries called the empire the *Karnataka samrajyamu*.
- **What is not settled:** where the brothers came from. One account, followed by K.A. Nilakanta Sastri, says that they first served the Kakatiya king Prataparudra of Warangal and then the ruler of Kampili; that they were taken to Delhi as prisoners when Kampili fell in 1327; that the Sultan sent them back to govern Kampili; and that they then set up an independent Hindu kingdom. Another view holds that they were Kannada officers of the Hoysala king Ballala III. Tradition links the founding with the sage Vidyaranya, but historians are not sure how large his part was. For the examination, remember what is agreed: the founders, the year, the river and the name Sangama.
- **The northern rival:** the Bahmani sultanate was founded in 1347. From then on the two powers fought mainly over the Raichur doab, the land between the Krishna and the Tungabhadra, with its forts of Raichur and Mudgal.
- **Three "lords":** in the language of the time the rayas were *narapati* (lord of men), the Deccan sultans were *ashvapati* (lord of horses) and the kings of Orissa (present-day Odisha) were *gajapati* (lord of elephants).

2.2 The four dynasties at a glance

Dynasty	Period	First ruler	Important rulers	How the line ended
Sangama	1336 to 1485	Harihara I	Bukka I, Harihara II, Devaraya I, Devaraya II	The kings after 1446 were weak. Saluva Narasimha, the governor of Chandragiri, took the throne
Saluva	1485 to 1503 (Sastri: 1486 to 1505)	Saluva Narasimha	Saluva Narasimha; his son Immadi Narasimha, a king in name under the regent Narasa Nayaka	The regent's son Vira Narasimha had Immadi Narasimha put to death and became king
Tuluva	1503 to 1570 (Sastri: from 1505)	Vira Narasimha	Krishnadevaraya, Achyutaraya, Sadasiva	Sadasiva was a king only in name. After the defeat of 1565, Tirumala of the Aravidu family was crowned in 1570
Aravidu	1570 to the middle of the 17th century (NCERT: till the end of the 17th century)	Tirumala	Sriranga I, Venkata II, Venkata III, Sriranga III	Bijapur and Golconda overran what was left. Sriranga III was the last ruler

- **Order to remember:** Sangama, Saluva, Tuluva, Aravidu.
- **How NCERT puts it:** the Sangamas ruled till 1485 and the Saluvas till 1503, when the Tuluvas replaced them; by 1542 control at the centre had shifted to the Aravidu family. The reason is that Rama Raya of the Aravidu family held the real power from 1542, though the Tuluva king Sadasiva kept the crown. NCERT adds that the Aravidu family "remained in power till the end of the seventeenth century". The table and 2.7, which follow Sastri, say instead that Bijapur and Golconda had overrun the remaining lands by the middle of that century, in the time of the last ruler, Sriranga III.
- **About the dates:** the reign dates of the kings in these notes follow Sastri's *A History of South India*; the table also shows the years NCERT gives for the change of dynasty (1485 and 1503). Other books differ, mostly by a year or two and by more for a few early kings, so learn the order of the rulers and the decade, not only the exact year.

2.3 The Sangama rulers (1336 to 1485)

- **Harihara I (1336 to about 1357):** the first king. After the death of Ballala III the Hoysala kingdom was absorbed.
- **Bukka I (about 1357 to 1377):** joint ruler with Harihara I from 1346. His son Kumara Kampana ended the sultanate of Madurai (about 1370); the poem *Madhura Vijayam* by Kampana's wife Gangadevi describes the campaign. Bukka sent an embassy to China in 1374.

- **Harihara II (1377 to 1404):** took Goa and other ports of the west coast. Between 1382 and 1385 the Reddis of Kondavidu lost Kurnool, Nellore and parts of Guntur to Vijayanagara.
- **Devaraya I (1406 to 1422):** after Harihara II died in 1404 his sons fought over the succession, and Devaraya I, one of them, won. He was crowned on 5 November 1406. He lost his first war with Firuz Shah Bahmani and gave him a daughter in marriage, but defeated him in 1419. He built a dam on the Tungabhadra with a long channel to bring water into the city. The Italian traveller Nicolo Conti came in his time, about 1420.
- **Devaraya II (about 1422 to 1446):** under him the Sangama kingdom reached its greatest extent. His title was *Gajabetekara* ("hunter of elephants"). He annexed the Reddi kingdom of Kondavidu (about 1428), which took the frontier to the Krishna. He took Muslims into his army and had his soldiers trained in archery. His war of 1443 in the Raichur doab brought no lasting gain. Abdur Razzaq, the envoy from Persia, visited in his reign, and the Telugu poet Srinatha was honoured at his court.
- **After 1446:** Mallikarjuna and Virupaksha II were weak. Kapilesvara Gajapati of Orissa took Rajahmundry, Kondavidu and Udayagiri, and the Bahmani minister Mahmud Gawan took Goa.

2.4 The Saluvas and the rise of the Tuluvas

- **Saluva Narasimha:** governor of Chandragiri, with inscriptions from 1456. He won back Udayagiri from the Gajapati in 1470 and held Kondavidu and Masulipatam by 1477. When Virupaksha II was murdered in 1485, Narasimha's general Narasa Nayaka seized the capital and Narasimha became king. Later he lost Udayagiri again, to Purushottama Gajapati. He died about 1491.
- **Narasa Nayaka (a Tuluva):** regent for Narasimha's young son Immadi Narasimha, and the real ruler from about 1491 to 1503.
- **Vira Narasimha:** the eldest son of Narasa Nayaka. He followed his father as regent in 1503, had Immadi Narasimha put to death in 1505 and took the crown. This began the Tuluva dynasty. He died in 1509, still fighting the rebel chief of Ummattur, and his half-brother Krishnadevaraya followed him.

2.5 Krishnadevaraya (1509 to 1529)

- **Who he was:** a Tuluva king, the son of Narasa Nayaka and Nagala Devi and the half-brother of Vira Narasimha. His earliest inscription is dated 26 July 1509. His chief minister was Saluva Timma (Timmarusu).
- **What he faced in 1509:** the rebel chief of Ummattur in the Mysore country; the Gajapati king Prataparudra of Orissa, who held the coastal districts in the north-east; the new sultanate of Bijapur; and the Portuguese, newly arrived on the west coast.

No.	Years	Opponent	What happened
1	1509	Bahmani Sultan Mahmud II and his nobles	Their yearly raid was defeated at Diwani. Krishnadevaraya pursued them and defeated them again at Kovilkonda
2	About 1510 to 1512	Gangaraya, chief of Ummattur	Ummattur and Sivasamudram were taken. Gangaraya drowned in the Kaveri. Srirangapattana became the capital of a new province
3	1512	Bijapur and the Bahmani court	Raichur was taken and the Raichur doab acquired. Gulbarga and Bidar were captured, and the imprisoned Sultan Mahmud II was put back on his throne
4	1513 onwards	Prataparudra, Gajapati king of Orissa	Udayagiri fell in 1514 after a siege of about a year and a half. Kondavidu fell next, and then Vijayawada and Kondapalli. The army went on through Rajahmundry to Potnuru-Simhadri (the Simhachalam area), where a pillar of victory was set up, and then towards Cuttack
5	1520	Ismail Adil Shah of Bijapur	Bijapur had retaken Raichur. Krishnadevaraya won the battle of Raichur on 19 May 1520 and recovered the fort
6	1523	Bijapur	He invaded Bijapur, razed the fort of Gulbarga and placed a son of Mahmud II on the Bahmani throne

- **Peace with the Gajapati:** Prataparudra sued for peace and gave his daughter in marriage to Krishnadevaraya, who returned all the territory north of the Krishna. The river became the boundary between the two kingdoms.
- **The Portuguese:** Governor Albuquerque sought his friendship and promised to sell Arab and Persian horses to Vijayanagara and not to Bijapur. Albuquerque captured Goa from Bijapur in 1510. Krishnadevaraya allowed the Portuguese to build a fort at Bhatkal. Portuguese musketeers under Christovao de Figueiredo helped him to take the fort of Raichur in 1520, and a Portuguese engineer worked on his irrigation works near the capital.
- **Titles:** after putting the Bahmani sultan back on his throne he took the title "establisher of the Yavana kingdom" (*Yavana-rajya-sthapanacharya*). Later tradition calls him *Andhra Bhoja* and *Kannada Rajya Rama Ramana*.
- **As ruler and patron:** he often led his army in person and visited his wounded soldiers. The Portuguese visitor Domingo Paes described him as gallant and perfect in all things. He brought an image of Krishna from Udayagiri, set it up at the capital and built the Krishnaswami temple. He added a gopura to the Virupaksha temple, founded the suburb of Nagalapura, named after his mother, and made gifts at Tirupati, Srisailam, Amaravati and Ahobilam. He wrote the Telugu work *Amuktamalyada*, and the poet Allasani Peddana adorned his court. (Administration, the travellers' accounts, and art and literature are separate topics on other days.)

- **Last years:** about 1524 he had his young son Tirumala crowned (not to be confused with the later Tirumala of the Aravidu family, Rama Raya's brother), but the boy soon died. Poison was suspected, and the minister Saluva Timma and his family were imprisoned and blinded. Krishnadevaraya died in 1529 after naming his half-brother Achyutaraya as his successor.

2.6 From 1529 to the battle of 1565

- **Achyutaraya (1529 to 1542):** the half-brother of Krishnadevaraya, who had kept him confined at Chandragiri. He was crowned at Tirupati and again at Kalahasti. Bijapur retook Raichur and Mudgal at once. He had to share power with Rama Raya.
- **Sadasiva (from 1542-43):** a nephew of Achyutaraya and a king only in name. The real ruler was **Rama Raya** (Aliya Rama Raya) of the Aravidu family, the son-in-law of Krishnadevaraya, helped by his brothers Tirumala and Venkatadri. Rama Raya played the Deccan sultanates off against one another.
- **The battle of 1565:** the sultans at last joined hands. NCERT names Bijapur, Ahmadnagar and Golconda; Sastri and Britannica add Bidar. On 23 January 1565 (Sastri's date) Rama Raya led the army in person, was captured and was beheaded. Tirumala fled with the king and the treasure. The city was sacked and was abandoned within a few years.
- **The name of the battle:** the allied armies gathered at Talikota, but the fighting took place on the south bank of the Krishna, closer to the villages of Rakshasi and Tangadi than to Talikota. So the battle is called both Talikota and Rakshasi-Tangadi; NCERT gives both names.

2.7 The Aravidu period: Penukonda and Chandragiri

- **Tirumala** made Penukonda, in south-western Andhra Pradesh, his headquarters. He was crowned in 1570, which begins the Aravidu dynasty, the fourth and last. He placed his three sons over the Telugu country (at Penukonda), the Kannada country (at Srirangapattana) and the Tamil country (at Chandragiri).
- **Sriranga I (1572 to 1585)** lost ground to Bijapur and Golconda.
- **Venkata II (1586 to 1614)** revived the kingdom for nearly thirty years. He recovered Gutti and Gandikota, drove the Golconda forces back across the Krishna, and put down revolts at Nandyal and Vellore. The court moved from Penukonda to Chandragiri, near Tirupati (about 1592), and later to Vellore.
- **After 1614** a war of succession weakened the kingdom. In the time of Venkata III (1630 to 1642) the English moved their factory to Madras (1639-40). Sriranga III, who came to the throne in 1642, was the last ruler; by the middle of the century Bijapur and Golconda had overrun the remaining lands.

3. Extra section: chronology of the turning points, and the Andhra places to remember

Year	Event
1336	Harihara and Bukka found Vijayanagara (the traditional date)
1347	The Bahmani sultanate is founded; the long contest for the Raichur doab begins
About 1370	Kumara Kampana ends the sultanate of Madurai
1406	Devaraya I is crowned
About 1428	Devaraya II annexes the Reddi kingdom of Kondavidu
1435	The Gajapati kingdom of Orissa is established (NCERT)
1443	Devaraya II's war in the Raichur doab
1485	The Sangama line ends; Saluva Narasimha takes the throne
1505 (NCERT: 1503)	Immadi Narasimha is put to death; Vira Narasimha's Tuluva dynasty is in place
1509	Krishnadevaraya becomes king
1510	The Portuguese take Goa
1512	Krishnadevaraya acquires the Raichur doab
1514	Udayagiri falls to Krishnadevaraya
1520	Battle of Raichur (19 May)
1529	Krishnadevaraya dies; Achyutaraya succeeds
1542-43	Sadasiva is made king; Rama Raya holds the real power
1565	Battle of Rakshasi-Tangadi (Talikota); Vijayanagara city is sacked
1570	Tirumala is crowned at Penukonda; the Aravidu dynasty begins
1586 to 1614	Venkata II; the court moves to Chandragiri and later to Vellore
1639-40	The English move their factory to Madras, in the time of Venkata III
1642	Sriranga III, the last ruler, comes to the throne

Andhra places in this topic:

- **Chandragiri (near Tirupati):** seat of Saluva Narasimha before he became king; Achyutaraya was kept here before his accession; seat of one of Tirumala's sons; the Aravidu capital after Penukonda.
- **Udayagiri (Nellore country):** headquarters of a Sangama province; it changed hands several times between Vijayanagara and the Gajapatis; Krishnadevaraya took it in 1514.
- **Kondavidu:** capital of the Reddi kingdom; annexed by Devaraya II about 1428; in Gajapati hands by 1454; taken by Krishnadevaraya after Udayagiri. It was the chief Gajapati city south of the Krishna.
- **Vijayawada and Kondapalli:** Krishnadevaraya made Vijayawada his base and took Kondapalli after a siege.
- **Rajahmundry and Simhachalam:** places in present-day Andhra Pradesh that his army reached in the Kalinga campaign.
- **Tirupati, Kalahasti, Srisailam, Ahobilam and Amaravati:** temples visited and endowed by Krishnadevaraya; he gave thanks at Tirupati in July 1514, after Udayagiri fell. Achyutaraya was crowned at Tirupati and Kalahasti.
- **Penukonda:** headquarters of a Sangama province; capital after 1565; it withstood more than one siege by the sultans' armies.
- **Gutti, Gandikota and Nandyal:** recovered or subdued by Venkata II.
- **Adoni and Kurnool:** given by Vira Narasimha as a fief to Ramaraja of the Aravidu family, an ancestor of Rama Raya.

4. Three common exam traps

1. **Similar names, different dynasties.** Saluva Narasimha founded the Saluva dynasty, and his son Immadi Narasimha was its last king. Narasa Nayaka was a Tuluva but only a regent. His son Vira Narasimha was the first Tuluva king. Krishnadevaraya is a Tuluva, not a Sangama. Rama Raya belonged to the Aravidu family but was never crowned; the Aravidu dynasty begins with his brother Tirumala in 1570.
2. **The battle of 1565.** Krishnadevaraya had died in 1529, thirty-six years earlier. The king in 1565 was Sadasiva, but the army was led by Rama Raya. Talikota and Rakshasi-Tangadi are two names for the same battle. The empire did not end that day: the Aravidu kings ruled on from Penukonda, Chandragiri and Vellore for about eighty years more.
3. **Two Prataparudras and two fights for Raichur.** The Prataparudra whom Krishnadevaraya fought was the Gajapati king of Orissa, not the Kakatiya king of Warangal. Krishnadevaraya took Raichur in 1512 and won the battle of Raichur in 1520; both were against Bijapur, not against the Gajapati. The Portuguese were his allies at Raichur, not his enemies. After the Gajapati war he gave back the land north of the Krishna.

5. MCQs with answers and explanations

Q1. Match List I (Dynasty of Vijayanagara) with List II (Ruler who belonged to it):

List I (Dynasty of Vijayanagara)	List II (Ruler who belonged to it)
A. Sangama	1. Vira Narasimha
B. Saluva	2. Venkata II
C. Tuluva	3. Devaraya II
D. Aravidu	4. Immadi Narasimha

- (1) A-3, B-4, C-1, D-2
- (2) A-3, B-1, C-4, D-2
- (3) A-2, B-1, C-4, D-3
- (4) A-4, B-3, C-1, D-2

Q1. Answer: (1) A-3, B-4, C-1, D-2

- Why it is correct: Devaraya II (about 1422 to 1446) was a Sangama king (A-3). Immadi Narasimha was the son of Saluva Narasimha and the last Saluva king (B-4). Vira Narasimha, the son of the regent Narasa Nayaka, was the first Tuluva king (C-1). Venkata II (1586 to 1614) was an Aravidu king, in whose time the court was at Chandragiri and later at Vellore (D-2).
- Why (2) is wrong: It swaps the two Narasimhas. Vira Narasimha removed Immadi Narasimha, the Saluva king, and began the Tuluva line.
- Why (3) is wrong: It swaps the two Narasimhas and also swaps the first and the last dynasties. Devaraya II is a Sangama of the 15th century; Venkata II is an Aravidu who ruled after the battle of 1565.
- Why (4) is wrong: It puts Immadi Narasimha among the Sangamas and Devaraya II among the Saluvas. Immadi Narasimha was a Saluva; Devaraya II was a Sangama.

Q2. Consider the following statements about Krishnadevaraya:

1. The battle of Raichur in 1520 was fought against the Gajapati king of Orissa.
2. His campaign against the chief of Ummattur came before his capture of Udayagiri.
3. Under the peace made with the Gajapati king, he kept the territory he had conquered north of the river Krishna.
4. One of his titles meant "establisher of the Yavana kingdom".

Which of the statements given above is/are correct?

- (1) 2 and 4 only
- (2) 1 and 2 only
- (3) 3 and 4 only
- (4) 1 and 3 only

Q2. Answer: (1) 2 and 4 only

- Statement 1 is wrong: The battle of Raichur (19 May 1520) was fought against Ismail Adil Shah of Bijapur, who had retaken the fort. The Gajapati war was a separate campaign on the east coast.
- Statement 2 is correct: The campaign against Gangaraya of Ummattur ran from about 1510 to 1512. The siege of Udayagiri began in 1513 and the fort fell in 1514.
- Statement 3 is wrong: When the Gajapati king Prataparudra made peace and gave his daughter in marriage, Krishnadevaraya returned all the territory north of the Krishna. The river became the boundary.
- Statement 4 is correct: After putting the Bahmani Sultan Mahmud II back on his throne he took the title "establisher of the Yavana kingdom" (*Yavana-rajya-sthapanacharya*).
- Why the other options are wrong: (2) and (4) include statement 1, which is wrong. (3) and (4) include statement 3, which is wrong.

6. Sources

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Topic 23 · Government of India Act 1935 and the Indian Independence Act 1947

ENGLISH

1. Concept in one line

The Government of India Act 1935 planned an all-India federation and gave the provinces autonomy, and the Indian Independence Act 1947 ended British rule by setting up two Dominions that ran on an adapted 1935 Act until their own constitutions were ready. The examination asks which provision belongs to which Act, which parts of the 1935 Act actually came into force, and what the Constitution of India kept from it.

2. Revision notes

2.1 How the 1935 Act came about

- The Simon Commission (formally the Indian Statutory Commission; seven members, all British) was appointed in November 1927 and reported in 1930. It said that dyarchy in the provinces should go.
- Three Round Table Conferences met in London between November 1930 and December 1932. The British Government set out its proposals in a White Paper (March 1933), a Joint Select Committee of Parliament under Lord Linlithgow examined them (1933 to 1934), and the Bill received the Royal Assent on 2 August 1935.
- As first passed, the Act also covered Burma. In December 1935 Parliament had it reprinted as two Acts: the Government of India Act 1935 and the Government of Burma Act 1935. The reprinted Government of India Act has 321 sections in 14 Parts, and 10 Schedules.
- The Acts of 1858 to 1919 were covered on Day 2 (Topic 12).

2.2 The 1935 Act: what it provided and what became of it

Subject	What the Act provided	What actually happened
All-India Federation (Part II)	A "Federation of India" of the Governors' Provinces, the Chief Commissioners' Provinces and those Indian States (princely states) whose Rulers joined by signing an Instrument of Accession. It could be proclaimed only after each House of Parliament had presented an address to the King, and only when the States that had acceded were entitled to at least 52 of the 104 States' seats in the Council of State and had at least half the total population of the States.	It never came into being. The required number of Rulers did not accede, and the plan was put off when the Second World War began in 1939. Part II never came into force.
Dyarchy at the Centre	Defence, external affairs, ecclesiastical affairs and the tribal areas were kept for the Governor-General acting in his discretion, helped by not more than three counsellors. The other federal subjects went to a council of ministers of not more than ten. The Governor-General also had "special responsibilities", such as peace and tranquillity, financial stability and credit, minorities, the services and the rights of the Indian States.	It never worked, because it depended on the Federation. Until 1947 the Centre was run by the Governor-General in Council and the Indian Legislature, under provisions of the old Government of India Act (as amended in 1919) that Part XIII and the Ninth Schedule kept alive.
Federal Legislature	Two Chambers. Council of State: 156 members for British India and up to 104 for the States; a permanent body, with one-third retiring every third year. Federal Assembly: 250 members for British India and up to 125 for the States; a five-year term. British India's members of the Council of State were, in the main, to be directly elected, while most of those of the Federal Assembly were to be elected by members of the Provincial Legislative Assemblies. The States' members were to be chosen by the Rulers.	Never formed.

Subject	What the Act provided	What actually happened
Provincial autonomy (Part III)	Eleven Governors' Provinces. Dyarchy in the provinces was ended. A council of ministers was "to aid and advise the Governor", except where he had to act in his discretion (section 50). The Governor had special responsibilities (section 52), could make ordinances and Governor's Acts, and could take over the government by Proclamation if it could not be carried on under the Act (section 93).	In force from 1 April 1937. Elections under the Act were held in 1937. According to NCERT, the Congress came to power in eight of the 11 provinces. NCERT's chapter on Partition gives other figures: the Congress won an absolute majority in five of the 11 provinces and formed governments in seven. So five is the count of absolute majorities, while seven and eight are both NCERT's counts of Congress governments. If a question gives seven or eight, weigh it against the other options before rejecting it.
Three legislative lists (Seventh Schedule)	Federal Legislative List (59 entries), Provincial Legislative List (54 entries) and Concurrent Legislative List (36 entries). Residuary powers went to neither side: under section 104 the Governor-General, acting in his discretion, could empower either the Federal Legislature or a Provincial Legislature to make a law on a subject found in none of the lists.	In force from 1937, with the Indian Legislature using the federal powers.
Provincial Legislatures	Two Chambers (Legislative Council and Legislative Assembly) in six provinces: Madras, Bombay, Bengal, the United Provinces, Bihar and Assam. One Chamber (Legislative Assembly) in the other five: the Punjab, the Central Provinces and Berar, the North West Frontier Province, Orissa and Sind. Assembly: five years. Council: a permanent body, with one-third retiring every third year.	In force from 1937.
Federal Court	A Chief Justice of India and not more than six other judges, holding office till the age of 65, sitting in Delhi. Original jurisdiction in disputes between the Federation, the Provinces and the federated States. Appeals from High Courts on a substantial question of law about the interpretation of the Act. Advisory opinions on a reference by the Governor-General. An appeal lay from it to the Privy Council in London.	Set up before any federation, as section 318 allowed. It worked from 1937 (it came into being on 1 October 1937) to 1950. Sir Maurice Gwyer was the first Chief Justice.

Subject	What the Act provided	What actually happened
Reserve Bank of India	The Act did not create the Bank. The Bank was set up under the Reserve Bank of India Act 1934 and began work on 1 April 1935, four months before the Royal Assent. The 1935 Act only fitted it into the new scheme: the Governor-General, in his discretion, appointed and removed its Governor and Deputy Governors (section 152), and no Bill touching coinage, currency or the Bank could be introduced without his previous sanction (section 153).	The Bank was already working when the Act was passed.
Public Service Commissions	A Public Service Commission for the Federation and one for each Province. Two or more Provinces could agree to share one (section 264).	The existing Public Service Commission, first established on 1 October 1926, became the Federal Public Service Commission on 1 April 1937. The Act provided the framework for Provincial Commissions.
Franchise	The vote depended on property, tax and education qualifications. There was no adult franchise. Two figures are given for the size of the electorate, and their bases differ. NCERT puts the electorate at no more than 10 to 15 per cent of the adult population. Keith and Britannica give about 14 per cent of the total population. One is a share of the adults and the other a share of all the people, so do not mix the two. When a question follows NCERT, give "10 to 15 per cent of the adult population". Besides these two, polity guidebooks give "about 10 per cent of the total population"; like the 14 per cent figure, it is a share of all the people.	Used in the 1937 elections.
Separate electorates	Kept, on the lines of the Communal Award of August 1932: separate electorates for Muslims, Sikhs, Indian Christians, Anglo-Indians and Europeans. The Scheduled Castes (the Act's term for the depressed classes) did not get separate electorates. Under the Poona Pact of September 1932 they got reserved seats among the general seats. Seats were also set apart for women, labour, landholders, and commerce and industry.	Used in the 1937 elections.
Council of India	The Council of India, which had advised the Secretary of State for India since 1858, was dissolved. In its place he was to have three to six advisers (section 278).	Done in 1937.

Subject	What the Act provided	What actually happened
Burma and Aden	"Burma shall cease to be part of India" (section 46). Aden too ceased to be part of British India (section 288).	Burma was separated on 1 April 1937.
New provinces	Sind was separated from Bombay, and Orissa from Bihar and Orissa, with areas added from Madras and the Central Provinces. Both became Governors' Provinces. Bihar and Orissa was renamed Bihar (section 289).	Both were formed on 1 April 1936.

Two more points. The Act kept the British Parliament's power to legislate for British India (section 110). It repealed the old Government of India Act but saved the Preamble of the 1919 Act (section 321).

2.3 What the Constitution of India took from the 1935 Act

- Dr B.R. Ambedkar told the Constituent Assembly on 4 November 1948 that the Assembly had directed that in certain matters the provisions of the 1935 Act should be followed. Much of the administrative detail of the Constitution comes from the Act.
- The framework is the same; the British controls are gone. Compare:

1935 Act	Constitution of India
Three lists in the Seventh Schedule: Federal, Provincial, Concurrent	Three lists in the Seventh Schedule: Union, State, Concurrent (Article 246)
Residuary powers: allotted by the Governor-General in his discretion (section 104)	Residuary powers: Parliament alone (Article 248). This is a change, not a borrowing
A council of ministers "to aid and advise the Governor", except where he acts in his discretion (section 50)	Almost the same words in Article 163
A Public Service Commission for the Federation and for each Province (section 264)	A Public Service Commission for the Union and for each State (Article 315)
Federal Court	Supreme Court, inaugurated on 28 January 1950 in the same chamber where the Federal Court sat
Governor's Proclamation when the government of a Province cannot be carried on under the Act (section 93)	Article 356, on failure of constitutional machinery in a State

- Article 395 of the Constitution repealed both the Indian Independence Act 1947 and the Government of India Act 1935 (with the Acts amending it), but not the Abolition of Privy Council Jurisdiction Act 1949.

- The work of the Constituent Assembly is covered on other days.

2.4 The Indian Independence Act 1947

- On 20 February 1947 the British Government said that it would hand over power by June 1948.
- The plan of 3 June 1947 (the Mountbatten Plan), which Prime Minister Attlee laid before the House of Commons that day, brought the date forward to 1947 and accepted partition. Its points: the Legislative Assemblies of Bengal and the Punjab, each sitting in two parts, would vote on partition; the Sind Assembly would choose which Constituent Assembly to join; there would be a referendum in the North West Frontier Province and one in the Sylhet district of Assam; Boundary Commissions would mark the new lines; power would pass on a Dominion status basis. The plan dealt only with British India. Policy towards the Indian States was left unchanged.
- The Act put this plan into law. Royal Assent: 18 July 1947. It has 20 sections and three Schedules. It took effect on 15 August 1947, which the Act calls "the appointed day".

Subject	What the Act provided
Two Dominions (section 1)	From 15 August 1947 "two independent Dominions", India and Pakistan. The same date applies to both.
Territories (sections 2 to 4)	Pakistan: East Bengal, West Punjab, Sind and British Baluchistan, and the North West Frontier Province if its referendum so decided. Bengal and the Punjab were each divided into two new provinces. Boundaries were to follow the award of a boundary commission appointed by the Governor-General.
Governor-General (section 5)	One for each Dominion, appointed by His Majesty, to represent him for the government of the Dominion. The same person could be Governor-General of both. In the event Lord Mountbatten held the office in India and M.A. Jinnah in Pakistan.
Powers of the legislatures (section 6)	The Legislature of each Dominion got full power to make laws. Its laws could not be struck down for conflict with English law or an Act of the British Parliament. No Act of the British Parliament passed on or after 15 August 1947 would apply to a Dominion unless the Dominion's own law extended it. The Governor-General assents to laws in His Majesty's name. Disallowance of laws and reservation of Bills for His Majesty's pleasure ended.
End of British responsibility (section 7)	His Majesty's Government in the United Kingdom has no responsibility for the government of the territories that were British India.
Princely states (sections 7 and 2)	His Majesty's suzerainty (paramountcy) over the Indian States lapsed, and with it all treaties and agreements with the Rulers. Treaties with the tribal areas lapsed too. The Act did not allot any State to a Dominion and did not require any State to accede. It only said that nothing prevented a State from acceding to either Dominion.

Subject	What the Act provided
"Emperor of India" (section 7)	Parliament gave its assent to dropping the words "Indiae Imperator" and "Emperor of India" from the Royal Style and Titles. The King dropped them by a Royal Proclamation of 22 June 1948.
Constituent Assemblies (section 8)	The powers of the Legislature of each Dominion were to be exercised, in the first instance, by its Constituent Assembly. For India this was the Assembly that first sat on 9 December 1946. So the Assembly was both the constitution-making body and the legislature. The Act set no time limit for making a constitution.
Interim constitution (sections 8 and 9)	Until the Constituent Assembly provided otherwise, each Dominion and its provinces were to be governed "as nearly as may be in accordance with the Government of India Act, 1935". The changes: no common central government, no British control, no acting by the Governor-General or a Governor in his discretion or individual judgment, and no reservation or disallowance of provincial laws. The Governor-General could adapt the 1935 Act by order, up to 31 March 1948.
Secretary of State for India (sections 10 and 14)	His power to make appointments to the services ended, and the service conditions of officers and judges already serving were protected. His advisers were done away with. Only winding-up work, such as payments and debt, stayed with a Secretary of State or another Minister. As a result the India Office was abolished on 15 August 1947 and many of its staff moved to the Commonwealth Relations Office.

The integration of the princely states is covered on another day.

2.5 The two Acts compared

Point	Government of India Act 1935	Indian Independence Act 1947
Royal Assent	2 August 1935	18 July 1947
In force	Provincial part from 1 April 1937; the Federation never	15 August 1947
Size	321 sections, 10 Schedules	20 sections, 3 Schedules
Aim	A federation of provinces and princely states under the Crown, with autonomy for the provinces	Two independent Dominions and the end of British responsibility for India
Power of the British Parliament	Kept (section 110)	No later British Act applies unless the Dominion extends it
Governor-General	Wide powers in his discretion and individual judgment, and special responsibilities	One for each Dominion; discretion and individual judgment ended
Central legislature	A Federal Legislature of two Chambers, never formed	The Constituent Assembly of each Dominion acts as its Legislature

Point	Government of India Act 1935	Indian Independence Act 1947
Princely states	Could join the Federation by Instrument of Accession	Suzerainty lapsed; accession to either Dominion not prevented
Secretary of State for India	Council of India dissolved; three to six advisers	Advisers ended; India Office abolished
Repeal in India	Article 395 of the Constitution	Article 395 of the Constitution

3. Extra section: chronology, 1927 to 1950

Date	Event
November 1927	Simon Commission appointed
1930	Simon Commission reports; first Round Table Conference opens in London on 12 November
August 1932	Communal Award
September 1932	Poona Pact: reserved seats for the depressed classes in place of separate electorates
March 1933	White Paper; the Joint Select Committee under Lord Linlithgow follows
1 April 1935	Reserve Bank of India begins work under the Act of 1934
2 August 1935	Royal Assent to the Government of India Act
1 April 1936	Sind and Orissa become separate provinces
1 April 1937	Part III in force: provincial autonomy begins; Burma separated
1 October 1937	Federal Court comes into being
1939	Second World War begins; the federation plan is put off
9 December 1946	First sitting of the Constituent Assembly
20 February 1947	British Government says power will be handed over by June 1948
3 June 1947	Mountbatten Plan
18 July 1947	Royal Assent to the Indian Independence Act
15 August 1947	The two Dominions are set up; the India Office is abolished
22 June 1948	Royal Proclamation drops the title "Emperor of India"

Date	Event
26 January 1950	Constitution of India in force; Article 395 repeals both Acts
28 January 1950	Supreme Court inaugurated in place of the Federal Court

4. Three common exam traps

1. **Not all of the 1935 Act came into force.** Provincial autonomy began on 1 April 1937. The all-India federation and dyarchy at the Centre never began, because the Rulers did not accede in the required number. Till 1947 the Centre ran under provisions of the earlier Act. Yet the Federal Court, with "Federal" in its name, did start in 1937. Questions present the federation as if it had worked.
2. **Loose lines about the 1935 Act.** Residuary powers were not given to the Centre or to the provinces: the Governor-General decided in his discretion. Under the Constitution they are with Parliament. Two Chambers were given to six of the 11 provinces, not to all. The Reserve Bank was set up under its own Act of 1934, not by the 1935 Act. Yet polity guidebooks list "provided for the establishment of a Reserve Bank of India to control the currency and credit of the country" among the features of the 1935 Act, so if a question gives this as a feature, weigh it against the other options before rejecting it. The Scheduled Castes got reserved seats, not separate electorates.
3. **What the 1947 Act did, and did not do.** Royal Assent came on 18 July 1947, but the Act's date for both Dominions is 15 August 1947. The Act let British suzerainty over the princely states lapse; it did not hand that suzerainty to India or Pakistan and did not force any State to join either. It gave Parliament's assent to dropping the title "Emperor of India"; the title was dropped only in June 1948. It allowed one Governor-General for both Dominions, but each got its own.

5. MCQs with answers and explanations

Q1. Consider the following statements about the Government of India Act 1935:

1. It provided for two Chambers in the Provincial Legislatures of six Provinces.
2. It vested the residuary powers of legislation in the Federal Legislature.
3. It provided that Burma shall cease to be part of India.

Which of the statements given above is/are correct?

- (1) 1 only
- (2) 3 only
- (3) 1 and 3 only
- (4) 1, 2 and 3

Q1. Answer: (3) 1 and 3 only

- Statement 1 is correct: Section 60 gave two Chambers, a Legislative Council and a Legislative Assembly, to Madras, Bombay, Bengal, the United Provinces, Bihar and Assam. The other five Governors' Provinces had one Chamber.
- Statement 2 is wrong: The Act gave the residuary powers to neither legislature. Under section 104 the Governor-General, acting in his discretion, could empower either the Federal Legislature or a Provincial Legislature to make a law on a subject found in none of the three lists. It is the Constitution of India that gives residuary powers to Parliament (Article 248).
- Statement 3 is correct: Section 46 says "Burma shall cease to be part of India". The separation took effect on 1 April 1937.
- Why the other options are wrong: (1) leaves out statement 3, which is correct. (2) leaves out statement 1, which is correct. (4) includes statement 2, which is wrong.

Q2. Which one of the following was NOT provided for by the Indian Independence Act 1947?

- (1) Lapse of His Majesty's suzerainty over the Indian States
- (2) A Governor-General for each Dominion, appointed by His Majesty
- (3) Exercise of the powers of each Dominion's Legislature by its Constituent Assembly
- (4) Allotment of each Indian State to one of the two Dominions

Q2. Answer: (4) Allotment of each Indian State to one of the two Dominions

- Why it is correct: The Act did not allot any Indian State to India or Pakistan and did not require any State to accede. Section 7 only let His Majesty's suzerainty over the States lapse, and section 2 said that nothing prevented a State from acceding to either Dominion. The plan of 3 June 1947 itself dealt only with British India.
- Why (1) is wrong: Section 7 says in terms that the suzerainty of His Majesty over the Indian States lapses, along with the treaties and agreements with their Rulers.

- Why (2) is wrong: Section 5 provides a Governor-General for each of the new Dominions, appointed by His Majesty. The same person could hold both offices, but that was only permitted, not required.
- Why (3) is wrong: Section 8 says the powers of the Legislature of each Dominion are to be exercised, in the first instance, by the Constituent Assembly of that Dominion.

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Topic 24 · Money: functions, measures of money supply and the money multiplier

ENGLISH

1. Concept in one line

Money is whatever is generally accepted in payment; the RBI counts it in four measures, M1 to M4, and the money multiplier shows how many rupees of money supply stand on each rupee of reserve money. The examination asks what goes into each measure, which measure carries which name, and how the multiplier is worked out.

2. Revision notes

2.1 Barter and the functions of money

Barter is the exchange of goods for goods, without money. It works only when there is a **double coincidence of wants**: each person must have what the other wants. Money removes this need.

Function	What it means	The problem of barter that it solves
Medium of exchange	Goods are sold for money, and money buys other goods. NCERT calls this the "first and foremost" role of money	A seller need not search for a buyer who also has the exact good the seller wants
Unit of account (measure of value)	The value of all goods and services is expressed in money units, as prices	Without it, each good has to be valued in terms of every other good
Store of value	Wealth can be kept as money and spent later. This works only if the value of money is reasonably stable	Wealth kept as goods is hard to carry forward: rice is perishable and needs storage space
Standard of deferred payment	Loans and other payments due in the future are fixed in money	Barter has no common standard for a debt that is to be repaid later

NCERT names the first three functions. Many textbooks add the fourth. It goes back to W.S. Jevons (1875), who listed four functions and called this one the "standard of value".

2.2 Kinds of money

- **Commodity money:** the thing used as money has value of its own, as a gold or silver coin has.
- **Fiat money:** today's currency notes and coins. They have no such value of their own; they are money because the government has made them so.

- **Legal tender:** currency recognised by law for discharging a debt or obligation, subject to applicable conditions and limits. RBI banknotes are legal tender unless their legal-tender status has been withdrawn. The Government of India issues coins and the Rs 1 note; other banknotes are issued by the RBI. Coins of Re 1 and above are legal tender up to Rs 1,000 in a single transaction; 50-paise coins up to Rs 10. Acceptance beyond these coin limits is voluntary.
- **Bank deposits:** demand deposits (payable on demand, used through cheques) are money, but they are not legal tender. A cheque can be refused.
- **Money supply** is a stock: the total stock of money in circulation among the public at a point of time. In India it is currency plus deposits held by the public.

2.3 The four measures: M1, M2, M3, M4

The RBI publishes four alternative measures of money supply. They come from the RBI's Second Working Group on Money Supply (1977).

Measure	What it contains	Name	Remember
M1	Currency with the public + demand deposits with banks + "other" deposits with the RBI	Narrow money	The most liquid measure. NCERT writes it simply as M1 = CU + DD
M2	M1 + savings deposits with Post Office savings banks	Narrow money	Adds post office savings, not bank time deposits
M3	M1 + time deposits with banks	Broad money	The most commonly used measure; also called "aggregate monetary resources"
M4	M3 + total deposits with Post Office savings organisations (excluding National Savings Certificates)	Broad money	The least liquid measure

- Liquidity falls step by step from M1 to M4.
- **Currency with the public** = currency in circulation minus cash held by banks. Currency in circulation is made up of notes in circulation, rupee coins and small coins. In the RBI's table, notes in circulation include central bank digital currency (CBDC).
- **"Net" deposits:** only deposits of the public are counted. Deposits that one bank keeps with another bank are left out.
- **"Other" deposits with the RBI** are a small item: deposits of foreign central banks, multilateral institutions and financial institutions, and sundry deposits.
- M3 is built on M1, not on M2. So post office savings deposits are in M2 and M4, but not in M3.
- The name "aggregate monetary resources" comes from the RBI's First Working Group (1961), which gave it to money supply with the public plus time deposits with banks.

2.4 Reserve money (high-powered money, M0)

Reserve money is the base money of the system: the currency in circulation and the deposits held with the RBI. It is also called high-powered money or the monetary base, and is written M0. NCERT says it is called so because it acts as the basis for credit creation.

Reserve money = currency in circulation + bankers' deposits with the RBI + "other" deposits with the RBI.

Bankers' deposits are the balances that banks keep in their current accounts with the RBI, mainly to meet the cash reserve requirement.

Item	In reserve money (M0)?	In M1?	In M3?
Currency with the public	Yes	Yes	Yes
Cash held by banks	Yes	No	No
Bankers' deposits with the RBI	Yes	No	No
"Other" deposits with the RBI	Yes	Yes	Yes
Demand deposits with banks	No	Yes	Yes
Time deposits with banks	No	No	Yes

2.5 The newer RBI aggregates

The RBI's Working Group on Money Supply: Analytics and Methodology of Compilation (Chairman: Dr Y.V. Reddy; report of June 1998) proposed a new set of monetary aggregates and three liquidity aggregates.

Aggregate	What it contains
NM1	The same components as M1
NM2	NM1 + short-term time deposits of residents (contractual maturity up to one year)
NM3	NM2 + long-term time deposits of residents + call/term funding that the banking system obtains from financial institutions
L1	NM3 + all deposits with Post Office savings banks (excluding National Savings Certificates)
L2	L1 + term deposits with financial institutions + term borrowings by them + certificates of deposit issued by them
L3	L2 + public deposits of non-banking financial companies

- Two changes of idea: post office deposits moved out of "money" into the liquidity aggregates, and deposits are counted on a residency basis. NM2 and NM3 do not include FCNR(B) deposits.

- The RBI Bulletin of September 2026 prints both sets: M1 to M4 in "Money Stock Measures", NM1 to NM3 in "Monetary Survey", and L1 to L3 in "Liquidity Aggregates". L1 and L2 are compiled monthly and L3 quarterly.
- In examinations, "M1, M2, M3, M4" means the older set in 2.3, which NCERT teaches, unless the question itself says "new monetary aggregates" or "liquidity aggregates".

2.6 The money multiplier

Money multiplier = money supply (broad money, M3) ÷ reserve money (M0). It tells how many rupees of money supply stand on one rupee of reserve money. RBI annual reports have shown it, under "select monetary ratios", as the "M3 multiplier".

Two ratios decide it:

- **Currency-deposit ratio (cdr):** currency held by the public ÷ deposits. It depends on the habits of the public.
- **Reserve-deposit ratio (rdr):** reserves of banks (cash with banks plus their deposits with the RBI) ÷ deposits. It depends on the cash reserve ratio (CRR) fixed by the RBI and on any extra reserves that banks choose to keep.

The following is a simplified textbook model: M = currency with the public + deposits and H = currency with the public + bank reserves. It leaves aside "other" deposits with the RBI; define deposits consistently in both ratios. The observed M3/M0 ratio uses the RBI's full statistical aggregates. The textbook formula follows in three lines. An earlier edition of the NCERT textbook derived it in these very steps; the present edition (reprint 2026-27) works out only the simple multiplier given below.

- Money supply = currency + deposits = (1 + cdr) × deposits
- Reserve money = currency + reserves = (cdr + rdr) × deposits
- **Money multiplier = (1 + cdr) ÷ (cdr + rdr)**

In this model, with other conditions unchanged and rdr below 1, a rise in cdr or rdr lowers the multiplier. A CRR cut raises it if it reduces the effective reserve-deposit ratio; the actual change also depends on public and bank behaviour.

Point	Simple deposit multiplier	Money multiplier
Formula	1 ÷ reserve ratio	In the simplified model: (1 + cdr) ÷ (cdr + rdr). The RBI statistical ratio is M3 ÷ reserve money, using full RBI definitions
What it assumes	The public holds no currency and banks keep no extra reserves	The public keeps part of its money as currency
What it links	Bank reserves to deposits	Reserve money to money supply (currency plus deposits)

Point	Simple deposit multiplier	Money multiplier
Size, using the same reserve ratio between 0 and 1	An upper limit within the model	Smaller if cdr is positive; equal if cdr = 0. The model multiplier remains above 1 when rdr is below 1

NCERT's example of the simple multiplier: with a CRR of 20 per cent, reserves of Rs 100 support deposits of Rs 500, so the multiplier is 1 ÷ 0.2 = 5. NCERT then asks what happens if the reserve ratio is raised to 25 per cent: the multiplier becomes 1 ÷ 0.25 = 4, so the same reserves support deposits of only Rs 400, and loans of only Rs 300.

2.7 The RBI's figures for 31 March and 15 September 2026

Item (Rs lakh crore)	31 March 2026	15 September 2026
Currency with the public	40.65	42.10
Demand deposits with banks	38.45	34.91
"Other" deposits with the RBI	1.32	1.23
M1 (made up of the three items above)	80.43	78.25
Time deposits with banks	234.11	252.42
M3	314.53	330.67
Reserve money	51.08	52.72
Money multiplier (M3 ÷ reserve money)	About 6.2	About 6.3

- The rows from currency with the public to reserve money are the RBI's own figures, as printed in Rs crore in its Weekly Statistical Supplement of 2 October 2026 and its Bulletin of September 2026. The RBI releases them every fortnight, so later figures will differ. The M1 and M3 totals are the RBI's totals, rounded from Rs crore; they are not added up from the rounded parts shown here. Only M1 for 15 September 2026 is added up here, from the RBI's three figures in Rs crore, and then rounded.
- The money multiplier row is not printed in these RBI tables. It is worked out here by dividing M3 by reserve money: 314.53 ÷ 51.08 and 330.67 ÷ 52.72.
- Each figure is rounded separately, so in both columns the parts may differ from a total by 1 in the last digit. In the March column, 40.65 + 38.45 + 1.32 gives 80.42, while M1 is 80.43; and 80.43 + 234.11 gives 314.54, while M3 is 314.53. In the September column, 42.10 + 34.91 + 1.23 gives 78.24, while M1 is 78.25.
- On 15 September 2026, time deposits were about three-fourths of M3. Reserve money was made up of currency in circulation (Rs 43.03 lakh crore), bankers' deposits with the RBI (Rs 8.46 lakh crore) and "other" deposits (Rs 1.23 lakh crore).

Covered on other days: the RBI's functions and its monetary policy tools (CRR, SLR, repo rate, open market operations); the money market; inflation.

3. Extra section: worked example, from reserve money to money supply

This is an illustration with invented round numbers. It is not real data for any country or year. Amounts are in Rs crore.

Given: reserve money (H) = 1,200; currency-deposit ratio (cdr) = 0.2; reserve-deposit ratio (rdr) = 0.1.

Step	What we find	Working	Result
1	Money multiplier	(1 + 0.2) ÷ (0.2 + 0.1) = 1.2 ÷ 0.3	4
2	Money supply	4 × 1,200	4,800
3	Deposits	1,200 ÷ (0.2 + 0.1)	4,000
4	Currency with the public	0.2 × 4,000	800
5	Reserves of banks	0.1 × 4,000	400
6	Check on reserve money	800 + 400	1,200
7	Check on money supply	800 + 4,000	4,800

Now change one thing at a time, keeping reserve money at 1,200:

Case	cdr	rdr	Multiplier	Money supply
Starting case	0.2	0.1	1.2 ÷ 0.3 = 4	4,800
The public holds more currency	0.4	0.1	1.4 ÷ 0.5 = 2.8	3,360
Banks hold more reserves	0.2	0.2	1.2 ÷ 0.4 = 3	3,600
The public holds no currency (simple deposit multiplier)	0	0.1	1 ÷ 0.1 = 10	12,000

What the example shows: a rise in either ratio lowers the multiplier, and the simple deposit multiplier (10) is far above the multiplier that allows for currency (4).

4. Three common exam traps

1. **Mixing up M2 and M3.** M2 = M1 + savings deposits with Post Office savings banks. M3 = M1 + time deposits with banks. M3 is built on M1, not on M2. M1 and M2 are narrow money; M3 and M4 are broad money. "Aggregate monetary resources" is M3, and the most liquid measure is M1.
2. **Mixing up reserve money and money supply.** Bankers' deposits with the RBI and the cash held by banks are in reserve money, but not in M1 or M3. Demand deposits with banks are in M1 and M3, but not in reserve money. Also, a demand deposit is money, but it is not legal tender.
3. **Taking 1 ÷ CRR as "the" money multiplier.** That is the simple deposit multiplier, which assumes that the public holds no currency. In RBI statistics, the broad-money multiplier is M3 ÷ reserve money. In the simplified model above, it is (1 + cdr) ÷ (cdr + rdr). For the same reserve ratio between 0 and 1, positive currency holding makes the model multiplier smaller than 1 ÷ rdr; with cdr = 0 they are equal. Do not turn the ratio upside down. With rdr below 1 and other conditions unchanged, a rise in cdr or rdr lowers the model multiplier.

5. MCQs with answers and explanations

Q1. Consider the following statements about the RBI's measures of money supply (M1 to M4) and reserve money:

1. Savings deposits with Post Office savings banks are included in M1.
2. Bankers' deposits with the RBI are a component of reserve money.
3. M1 is also known as "aggregate monetary resources".

Which of the statements given above is/are correct?

- (1) 1 only
- (2) 2 only
- (3) 1 and 3 only
- (4) 2 and 3 only

Q1. Answer: (2) 2 only

- Statement 1 is wrong: M1 is currency with the public, demand deposits with banks and "other" deposits with the RBI. Savings deposits with Post Office savings banks come in only at M2 (M2 = M1 + these deposits).
- Statement 2 is correct: reserve money = currency in circulation + bankers' deposits with the RBI + "other" deposits with the RBI.
- Statement 3 is wrong: "aggregate monetary resources" is the other name of M3, the broad money measure. M1 is narrow money.

- Why the other options are wrong: (1) and (3) include statement 1, which is wrong, and leave out statement 2, which is correct. (4) includes statement 3, which is wrong.

Q2. In a hypothetical economy, the public holds currency equal to 25 per cent of its bank deposits, and banks keep reserves equal to 15 per cent of deposits. High-powered money, or reserve money (currency with the public plus reserves of banks), is Rs 8,000 crore. What is the money supply (currency with the public plus deposits)?

- (1) Rs 10,000 crore
- (2) Rs 20,000 crore
- (3) Rs 23,000 crore
- (4) Rs 25,000 crore

Q2. Answer: (4) Rs 25,000 crore

- Worked solution: cdr = 0.25 and rdr = 0.15. Money multiplier = (1 + cdr) ÷ (cdr + rdr) = 1.25 ÷ 0.40 = 3.125. Money supply = 3.125 × 8,000 = Rs 25,000 crore.
- Check: deposits = 8,000 ÷ 0.40 = 20,000; currency = 0.25 × 20,000 = 5,000; reserves = 0.15 × 20,000 = 3,000. Currency plus reserves = 8,000, which is the high-powered money given. Currency plus deposits = 25,000.
- Why (1) is wrong: Rs 10,000 crore comes from multiplying 8,000 by (1 + cdr) = 1.25 alone, without dividing by (cdr + rdr).
- Why (2) is wrong: Rs 20,000 crore is 8,000 ÷ 0.40, which is only the deposits. The currency with the public (Rs 5,000 crore) has not been added.
- Why (3) is wrong: Rs 23,000 crore comes from putting rdr in place of cdr in the top of the formula: (1 + 0.15) ÷ 0.40 = 2.875, and 2.875 × 8,000 = 23,000.
- A caution: the simple deposit multiplier, 1 ÷ 0.15, would give about Rs 53,333 crore. That figure is not among the options, and it is wrong here because the public holds part of its money as currency.

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Topic 25 · Insolation and the heat budget

ENGLISH

1. Concept in one line

Insolation is incoming solar radiation, mainly shortwave energy. The heat budget accounts for incoming and outgoing energy; in the idealised equilibrium model, the earth-atmosphere system returns as much energy to space as it absorbs. The examination asks for the factors that make insolation vary and for the figures of the budget out of 100 units.

2. Revision notes

2.1 Insolation and the solar constant

- The earth receives almost all its energy from the sun. This incoming solar radiation reaches the earth in short wavelengths and is called **insolation** (NCERT).
- The earth is nearly spherical, so solar rays meet different places at different angles: close to perpendicular near the subsolar point and more obliquely farther away. The earth intercepts only a very small portion of the sun's energy.
- On an average the earth receives 1.94 calories per sq. cm per minute at the top of its atmosphere (NCERT).
- **Solar constant:** the energy received from the sun per unit of time per unit of area, on a surface at right angles to the sun's rays, at the earth's mean distance from the sun. NCERT's 1.94 calories works out to about 1,353 W/m². NASA's Earth Fact Sheet (updated in November 2024) gives 1,361 W/m². Averaged over the whole globe, day and night, it comes to about 340 W/m², one-fourth of the 1,361 W/m².

Point	Perihelion	Aphelion
Meaning	The earth is nearest to the sun	The earth is farthest from the sun
Date in NCERT	3 January	4 July
Distance in NCERT	147 million km (14.7 crore km)	152 million km (15.2 crore km)
NASA figure	147.095 million km	152.100 million km
Date in 2026 (US Naval Observatory)	3 January	6 July
Date in 2027 (US Naval Observatory)	3 January	5 July

Point	Perihelion	Aphelion
Season in the northern hemisphere	Winter	Summer

- The exact date shifts a little from year to year: in the years 2024 to 2029 perihelion falls between 2 and 5 January and aphelion between 3 and 6 July. For the examination, remember NCERT's 3 January and 4 July.
- **Why the effect is small:** the two distances differ by only about 5 million km (about 3 per cent). The sunlight received at aphelion is about 6.5 per cent less than at perihelion. NCERT says this variation is masked by other factors, such as the distribution of land and sea and the atmospheric circulation, so it has no great effect on daily weather.
- Seasons are caused by the tilt of the axis, not by distance. The northern hemisphere has its summer when the earth is farthest from the sun.

2.2 Why insolation varies: NCERT's five factors

Factor (NCERT)	How it works
1. Rotation of the earth on its axis	It gives day and night, so a place receives insolation only during its daytime
2. Angle of inclination of the sun's rays	It depends on latitude: the higher the latitude, the smaller the angle. Vertical rays cover a smaller area than slant rays, so they give more energy per unit area. Slant rays also pass through a greater depth of atmosphere, so more is absorbed, scattered and diffused
3. Length of the day	The longer the day, the more insolation is received
4. Transparency of the atmosphere	Thick clouds, dust and water vapour cut down the insolation that reaches the surface; a clear sky lets more through
5. Configuration of land (its aspect)	A slope that faces the sun receives more. In the northern hemisphere, south-facing slopes receive more

- NCERT adds that the last two factors have less influence.
- **Tilt of the axis:** the earth's axis makes an angle of 66½° with the plane of its orbit round the sun. That is, it is tilted 23½° from the perpendicular to that plane. NCERT says this has a greater influence on the insolation received at different latitudes. The tilt is what makes the angle of the rays and the length of the day change through the year.

2.3 How insolation is spread over the earth's surface

NCERT gives five points:

- Insolation at the surface varies from about 320 W/m² in the tropics to about 70 W/m² at the poles.
- Maximum insolation is received over the subtropical deserts, where cloudiness is the least.

- The equator receives comparatively less insolation than the tropics. Here "the tropics" means the areas near the Tropic of Cancer and the Tropic of Capricorn, not the whole tropical zone.
- At the same latitude, insolation is generally more over the continents than over the oceans.
- In winter, the middle and higher latitudes receive less radiation than in summer.

2.4 What happens to solar radiation in the atmosphere

The atmosphere is largely transparent to short wave solar radiation (NCERT). Even so, three things happen to the radiation on its way down.

Process	What happens	Point to remember
Absorption	Gases and dust take in part of the radiation	In the troposphere, water vapour, ozone and other gases absorb much of the near infrared radiation (NCERT)
Scattering	Very small suspended particles in the troposphere scatter visible light, both to space and towards the earth's surface	This process adds colour to the sky (NCERT)
Reflection	The tops of clouds and snow and ice-covered areas turn the radiation back towards space	The reflected share is called the albedo

- **Why the sky is blue:** sunlight is scattered in all directions by the gases and particles in the air. Blue light travels as shorter waves, so it is scattered more than the other colours (NASA).
- **Why the rising and setting sun is red:** near the horizon sunlight passes through much more air. Even more of the blue light is scattered away, and the reds and yellows pass straight through to the eye (NASA).
- Scattering by particles much smaller than the wavelength of the light is called Rayleigh scattering, after Lord Rayleigh (1871). It varies inversely as the fourth power of the wavelength, so shorter waves are scattered far more strongly (Britannica).

2.5 Albedo

- Albedo is the fraction of the light falling on a body or surface that is reflected by it (Britannica).
- NCERT: the reflected amount of radiation, 35 units out of 100, is called the albedo of the earth. Present-day reference figures are lower, about 0.29 (Britannica; NASA's Earth Fact Sheet gives 0.294).
- Bright surfaces have a high albedo. Sea ice reflects 50 to 70 per cent of the incoming solar energy, while the dark open ocean reflects only about 6 per cent. Snow reflects even more than sea ice does: sea ice with a cover of snow on it reflects as much as 90 per cent (NSIDC).

2.6 How the atmosphere is heated and cooled

- Insolation heats the earth's surface. The heated earth becomes a radiating body and radiates energy to the atmosphere in long wave form. This is **terrestrial radiation** (NCERT).
- The long wave radiation is absorbed by the atmospheric gases, particularly carbon dioxide and the other greenhouse gases. So the atmosphere is heated from below, indirectly, by the earth's radiation.
- The atmosphere in turn radiates and transmits heat to space. This is how it cools.

Process	How the heat moves	NCERT points
Conduction	From the warmer earth to the cooler air in contact with it	It takes place when two bodies of unequal temperature are in contact; energy flows from the warmer to the cooler body. It is important in heating the lower layers of the atmosphere
Convection	Vertically: the air in contact with the earth rises on heating, in the form of currents	It carries the heat of the surface upwards. It is confined only to the troposphere
Advection	Horizontally, with the movement of air	Horizontal movement of air is relatively more important than vertical movement. In the middle latitudes most of the day and night variation in daily weather is caused by advection alone. The "loo" of northern India in summer is an outcome of advection

2.7 The heat budget of the earth (NCERT, out of 100 units)

Take the insolation received at the top of the atmosphere as 100 units.

Item	Units	What it stands for
Insolation at the top of the atmosphere	100	The whole of the incoming solar radiation
Reflected back to space	35	The albedo of the earth: 27 units from the tops of clouds, 2 units from snow and ice-covered areas, and the remaining 6 units from the top of the atmosphere
Absorbed within the atmosphere	14	Insolation absorbed on its way down
Absorbed by the earth's surface	51	Insolation that heats the land and the sea
Radiated by the surface directly to space	17	One part of the 51 units of terrestrial radiation

Item	Units	What it stands for
Passed from the surface to the atmosphere	34	The other part of the 51 units: 6 absorbed directly by the atmosphere, 9 through convection and turbulence, 19 through latent heat of condensation
Radiated by the atmosphere to space	48	14 from insolation + 34 from the surface
Total returned to space in long waves	65	17 + 48, which balances the 65 units absorbed (14 + 51)

- Check the arithmetic: 35 + 14 + 51 = 100. 17 + 34 = 51. 6 + 9 + 19 = 34. 14 + 34 = 48. 17 + 48 = 65. 35 + 65 = 100.
- NCERT's text names only the 27 units and the 2 units of the 35. The NIOS geography lesson gives the remaining 6 units as reflected back from the top of the atmosphere.
- This is the idealised equilibrium heat budget. If absorbed energy exceeds outgoing energy, the climate system gains heat; if outgoing energy exceeds absorption, it cools. NASA CERES observations show that the real Earth can have an energy imbalance. Learn NCERT's balanced numerical model without treating it as a claim that global warming cannot occur.
- Other accounts use different figures. NASA's Earth Observatory, for example, gives about 29 units reflected, 23 absorbed by the atmosphere and 48 absorbed by the surface. In the examination, use NCERT's figures.

2.8 Net radiation balance by latitude

- The budget balances for the earth as a whole. It does not balance at each latitude.
- NCERT: there is a surplus of net radiation balance between 40 degrees north and 40 degrees south, and the regions near the poles have a deficit.
- The surplus heat of the tropics is redistributed polewards. Winds and ocean currents carry it.
- As a result the tropics do not get progressively heated up, and the high latitudes do not get permanently frozen (NCERT).
- Distribution of temperature, isotherms and inversion of temperature form a separate topic. Pressure belts and winds come on other days.

3. Extra section: the heat budget worked out as three accounts

Every account must balance. If one does not, a figure has been remembered wrongly.

Account	Gains (units)	Losses (units)	Balance
Earth's surface	51 absorbed from insolation	17 radiated directly to space + 34 passed to the atmosphere = 51	51 against 51

Account	Gains (units)	Losses (units)	Balance
Atmosphere	14 absorbed from insolation + 34 from the surface = 48	48 radiated to space	48 against 48
Earth and atmosphere together, as seen from space	100 received from the sun	35 reflected + 17 from the surface + 48 from the atmosphere = 100	100 against 100

What the figures tell us:

- Of every 100 units, 35 never heat the earth at all. Only 65 units are absorbed.
- The surface absorbs 51 units of insolation and the atmosphere only 14. The surface takes more than three and a half times as much as the air above it.
- Of the 48 units that the atmosphere takes in, 34 come from the surface and only 14 come directly from the sun. This is why the atmosphere is said to be heated from below.
- Of the 34 units that the surface passes to the atmosphere, only 6 go as radiation that the air absorbs. The other 28 go through convection and turbulence (9) and latent heat of condensation (19). Latent heat is the largest single item.
- Of the 65 units that leave in long waves, 48 leave from the atmosphere and 17 leave straight from the surface.

4. Three common exam traps

1. **"The earth is nearest to the sun in summer."** It is the other way round for the northern hemisphere. Perihelion (147 million km) comes on 3 January, in the northern winter, and aphelion (152 million km) on 4 July, in the northern summer. Seasons come from the tilt of the axis. Note also the angle: the axis makes 66½° with the plane of the orbit, and 23½° with the perpendicular to it.
2. **"The equator receives the maximum insolation."** NCERT says the maximum is received over the subtropical deserts, where cloudiness is the least, and that the equator receives comparatively less than the tropics, meaning the areas near the Tropics of Cancer and Capricorn. At the same latitude the continents receive more than the oceans.
3. **Mixing up the budget figures.** 35 units are reflected, not absorbed. 14 units are what the atmosphere absorbs from insolation; 34 units are what it receives from the surface. 17 units go from the surface straight to space; 48 units go from the atmosphere. The atmosphere is heated mainly from below, by the energy the earth's surface passes to it (34 units, all of which NCERT groups under terrestrial radiation), and less by absorbing incoming solar radiation directly (14 units).

5. MCQs with answers and explanations

Q1. Consider the following statements about insolation:

1. The earth is farther from the sun in early July than it is in early January.
2. At the earth's surface, the subtropical deserts receive more insolation than the equatorial belt.
3. At the same latitude, insolation is generally more over the continents than over the oceans.

Which of the statements given above is/are correct?

- (1) 1 and 2 only
- (2) 2 and 3 only
- (3) 1 and 3 only
- (4) 1, 2 and 3

Q1. Answer: (4) 1, 2 and 3

- Statement 1 is correct: the earth is farthest from the sun (aphelion, 152 million km) on 4 July and nearest to it (perihelion, 147 million km) on 3 January. So it is farther away in early July.
- Statement 2 is correct: NCERT says maximum insolation is received over the subtropical deserts, where cloudiness is the least, and that the equator receives comparatively less insolation than the tropics, meaning the areas near the Tropics of Cancer and Capricorn.
- Statement 3 is correct: NCERT says that, generally, at the same latitude the insolation is more over the continents than over the oceans.
- Why the other options are wrong: (1) leaves out statement 3, which is correct. (2) leaves out statement 1, which is correct. (3) leaves out statement 2, which is correct.

Q2. In the heat budget of the earth as NCERT sets it out, the atmosphere receives units from two sides: some it absorbs from the incoming solar radiation, and some are passed to it from the earth's surface. About what percentage of the total units that the atmosphere receives from these two sides comes from the earth's surface?

- (1) 22 per cent
- (2) 34 per cent
- (3) 71 per cent
- (4) 74 per cent

Q2. Answer: (3) 71 per cent

- Worked solution: The atmosphere receives heat from two sides. From insolation on its way down it absorbs 14 units. From the earth's surface it receives 34 units (6 absorbed directly + 9 through convection and turbulence + 19 through latent heat of condensation). Total received by the atmosphere = 14 + 34 = 48 units.
- Share that comes from the surface = 34 ÷ 48 = 17/24 = 0.708, that is, about 71 per cent.

- Check: the share that comes directly from insolation is 14 ÷ 48, about 29 per cent, and 71 + 29 = 100.
- Why (1) is wrong: 22 per cent is 14 ÷ 65. It takes the 14 units that the atmosphere absorbs from insolation as a share of the 65 units absorbed by the earth and the atmosphere together. That is neither the right numerator nor the right denominator.
- Why (2) is wrong: 34 per cent reads the 34 units as a share of the 100 units of insolation. The question asks for the share of the total that the atmosphere receives from the two sides, which is 48 units.
- Why (4) is wrong: 74 per cent is 48 ÷ 65. That is the atmosphere's share of the long wave radiation that finally leaves for space, not the surface's share of the units received by the atmosphere.

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Topic 26 · Ecosystem: components, food chains and food webs

ENGLISH

1. Concept in one line

An ecosystem is a functional unit of nature in which living organisms interact with one another and with their physical surroundings. The examination asks about its components, the grazing and detritus food chains, food webs, trophic levels and the ten per cent law.

2. Revision notes

2.1 What an ecosystem is

- **NCERT definition:** a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.
- The term "ecosystem" was first proposed in 1935 by the British ecologist Sir Arthur G. Tansley.
- An ecosystem can be as small as a pond or as large as a forest or a sea. Many ecologists treat the whole biosphere as one global ecosystem.
- Two basic categories: **terrestrial** (forest, grassland, desert) and **aquatic** (pond, lake, wetland, river, estuary). Biomes and the types of ecosystems are covered on another day.

2.2 Components: abiotic and biotic

Component	What it is	Examples
Abiotic (non-living)	The physical and chemical surroundings	Air, water and soil; sunlight, temperature, rainfall, wind; minerals
Producers (autotrophs)	Make their own food from simple inorganic substances, mostly by photosynthesis	Green plants; phytoplankton and algae in a pond; certain bacteria
Primary consumers (herbivores)	Feed directly on producers	Insects, birds and mammals on land; molluscs in water; goat, rabbit
Secondary consumers (primary carnivores)	Feed on herbivores	A snake that eats rabbits
Tertiary consumers (secondary carnivores)	Feed on primary carnivores	An eagle that eats snakes

Component	What it is	Examples
Decomposers (saprotrophs)	Secrete digestive enzymes on dead and waste material, break it into simple inorganic materials and absorb them	Mainly fungi and bacteria
Detritivores	Break detritus into smaller particles	Earthworm

- Producers, consumers and decomposers together make up the **biotic** component.
- All consumers and decomposers are **heterotrophs**: they depend on plants, directly or indirectly, for food.
- Consumers are also classed as herbivores, carnivores, omnivores and parasites. NCERT's examples of **omnivores** are cockroaches and crows.
- The last consumer in a chain, which no other species kills for food, is the **top carnivore**.
- A few producers do not need light. Bacteria near deep-sea hydrothermal vents make food from chemicals (chemosynthesis). The ecosystem around these vents is the deep-sea hydrothermal ecosystem. NCERT says the sun is the only source of energy for all ecosystems except this one.
- In strict use, detritivores are animals that swallow pieces of dead matter, while decomposers digest it outside their bodies and absorb the products. Many books use the two words loosely for each other.

2.3 Structure: the words examiners use

The interaction of biotic and abiotic components gives each ecosystem a physical structure.

Term	Meaning	Note
Species composition	Identification and enumeration of the plant and animal species of an ecosystem	Tells which species are present
Stratification	Vertical distribution of different species occupying different levels	In a forest: trees in the top layer, shrubs in the second, herbs and grasses in the bottom layer
Trophic level	The place of an organism in the food chain, fixed by its source of food	Producers form the first level
Standing crop	The mass of living material at each trophic level at a particular time	Measured, for a unit area, either as the mass of the living organisms (biomass) or as their number. Biomass is given as fresh or dry weight; dry weight is more accurate

Term	Meaning	Note
Detritus	Dead plant remains and dead remains of animals, including faecal matter	The raw material for decomposition

2.4 How the ecosystem functions as a unit: four aspects

The NCERT chapter names four aspects under which the components of an ecosystem function as a unit.

- **Productivity:** the rate at which biomass is produced. Gross primary productivity (GPP) is the rate of production of organic matter during photosynthesis. Net primary productivity (NPP) is GPP minus respiration losses.
- **Decomposition:** the breakdown of detritus through fragmentation, leaching, catabolism, humification and mineralisation.
- **Energy flow:** energy moves one way, from the sun to producers and then to consumers, and is lost as heat at each step.
- **Nutrient cycling:** the storage and movement of nutrient elements through the components of the ecosystem. Nutrients are used again and again; energy is not.

Ecological pyramids, ecological succession and biogeochemical cycles are separate topics on other days.

2.5 Food chains: grazing and detritus

A food chain is the sequence of transfers of matter and energy, in the form of food, from organism to organism.

Feature	Grazing food chain (GFC)	Detritus food chain (DFC)
Begins with	Producers (living green plants)	Dead organic matter (detritus)
First users of the food	Herbivores	Decomposers (mainly fungi and bacteria) and detritivores
Example	Grass → goat → man (NCERT); phytoplankton → zooplankton → small fish → large fish	Dead leaves → earthworm → bird
Major conduit for energy flow in	Aquatic ecosystems	Terrestrial ecosystems, where a much larger fraction of energy flows through the DFC than through the GFC

- **Why the difference:** on land, most of the plant matter produced is not eaten alive. It dies and is broken down by decomposers. In water, herbivores eat a much larger share of the plant biomass.

- The two chains are linked. Some organisms of the DFC are prey to animals of the GFC, and some animals, such as cockroaches and crows, are omnivores.
- The death of an organism is the beginning of the detritus food chain.
- Britannica also names a **parasite chain**, in which a smaller organism feeds on part of a larger host.

2.6 Food webs and stability

- A **food web** is the natural interconnection of food chains. Britannica describes it as a complex network of interconnecting and overlapping food chains.
- It forms because each organism is generally eaten by two or more other kinds of organisms, which are in turn eaten by several others.
- **Why it gives stability:** a consumer in a web has more than one food. If one prey becomes scarce, the predator can shift to another, so the loss of one link is less likely to break the whole system than it would be in a single chain. In general, the greater the variety of species in an ecosystem, the more stable it is likely to be.

2.7 Trophic levels and why chains are short

- Order of levels: producers (first), herbivores or primary consumers (second), primary carnivores (third), secondary carnivores (fourth). Britannica places decomposers on a separate trophic level.
- A trophic level is a **functional level, not a species**. A given species may occupy more than one trophic level in the same ecosystem at the same time. A sparrow is a primary consumer when it eats seeds, fruits and peas, and a secondary consumer when it eats insects and worms.
- **How little energy enters:** less than 50 per cent of incident solar radiation is photosynthetically active radiation (PAR), and plants capture only 2 to 10 per cent of the PAR (Class XII NCERT). Class X NCERT gives another figure, which measures something else: green plants capture about 1 per cent of the energy of the sunlight that falls on their leaves. So 2 to 10 per cent is a share of the PAR alone, while about 1 per cent is a share of all the sunlight falling on the leaves.
- **Ten per cent law:** only 10 per cent of the energy is transferred to each trophic level from the lower trophic level. The rule is credited to Raymond Lindeman (1942). It is an average; real figures vary.
- **Result:** the energy left falls so fast that food chains generally have only three or four steps (Class X NCERT), and do not normally have more than four or five trophic levels (Britannica).
- **Biological magnification** runs the other way. Non-degradable chemicals such as pesticides accumulate progressively at each trophic level, so their concentration is highest at the top of the chain.

2.8 Natural and man-made ecosystems

- **Natural ecosystems:** forests, ponds and lakes. They work without being set up or managed by people.
- **Man-made (artificial) ecosystems:** gardens, crop fields and aquariums. People create and maintain them.

3. Extra section: a pond worked out as an ecosystem, and three names to remember

NCERT uses a shallow pond to show every part of an ecosystem at work.

Aspect	In the pond
Abiotic component	The water with all the dissolved inorganic and organic substances, and the rich soil deposit at the bottom
What sets the pace	The solar input, the cycle of temperature, day-length and other climatic conditions regulate the rate of function of the whole pond
Producers	Phytoplankton, some algae, and the floating, submerged and marginal plants
Consumers	Zooplankton, and the free-swimming and bottom-dwelling animals
Decomposers	Fungi, bacteria and flagellates, most abundant at the bottom of the pond
Function 1	Autotrophs convert inorganic material into organic material, using the radiant energy of the sun
Function 2	Heterotrophs consume the autotrophs
Function 3	Dead matter is decomposed and mineralised, and the minerals are released for reuse by the autotrophs
Energy	Moves in one direction, towards the higher trophic levels, and is dissipated and lost as heat to the environment

Three names to remember:

Year	Person	Contribution
1927	Charles Elton	His book *Animal Ecology* developed food-chain and food-cycle ideas; remember the book–author–year association
1935	Sir Arthur G. Tansley	Proposed the term "ecosystem", in a paper in the journal *Ecology*

Year	Person	Contribution
1942	Raymond Lindeman	His paper "The trophic-dynamic aspect of ecology", in *Ecology*, analysed energy transfer among trophic levels; the school-level ten per cent rule is conventionally associated with him

4. Three common exam traps

1. **Which chain carries more energy, and where.** The grazing food chain is the major conduit for energy flow in an aquatic ecosystem. In a terrestrial ecosystem a much larger fraction of energy flows through the detritus food chain. Candidates often reverse the two, or assume that the grazing chain is the main one everywhere.
2. **Standing crop against productivity.** Standing crop is an amount at one moment: the mass of living material at a trophic level at a particular time. Productivity is a rate: the rate at which biomass is produced. Candidates often treat the two as the same thing.
3. **The energy figures, and the direction of the trend.** Ten per cent is the share of energy that passes to the next trophic level, not the share that is lost. The "1 per cent" figure is something else: the share of sunlight falling on leaves that green plants capture. Energy decreases at each higher trophic level, but the concentration of non-degradable chemicals increases (biological magnification).

5. MCQs with answers and explanations

Q1. Match List I (Group of organisms) with List II (How the group gets its food):

List I (Group of organisms)	List II (How the group gets its food)
A. Detritivores	1. Feed on herbivores
B. Saprotrophs	2. Secrete digestive enzymes on dead and waste material and absorb the simple products
C. Primary consumers	3. Break dead plant and animal remains into smaller particles
D. Primary carnivores	4. Feed directly on producers

- (1) A-2, B-3, C-4, D-1
- (2) A-3, B-2, C-1, D-4
- (3) A-3, B-2, C-4, D-1
- (4) A-2, B-3, C-1, D-4

Q1. Answer: (3) A-3, B-2, C-4, D-1

- Why it is correct: Detritivores, such as the earthworm, break detritus (dead plant and animal remains) into smaller particles (A-3). Saprotrophs is another name for decomposers, mainly fungi and bacteria; they secrete digestive enzymes on dead and waste material and absorb the simple products (B-2). Primary consumers are herbivores and feed directly on producers (C-4). Primary carnivores feed on herbivores, so they are secondary consumers (D-1).
- Why (1) is wrong: It swaps detritivores and saprotrophs. Enzyme secretion and absorption is the work of saprotrophs; detritivores break the remains into smaller particles.
- Why (2) is wrong: It swaps primary consumers and primary carnivores. A primary consumer eats producers; a primary carnivore eats herbivores.
- Why (4) is wrong: It makes both swaps, so all four pairs are wrong.

Q2. Consider the following statements about food chains and trophic levels:

1. A detritus food chain begins with dead organic matter.
2. In a terrestrial ecosystem, a much larger fraction of energy flows through the grazing food chain than through the detritus food chain.
3. The same species can occupy more than one trophic level in an ecosystem at the same time.
4. Under the ten per cent law, only 10 per cent of the energy is transferred to each trophic level from the lower trophic level.

Which of the statements given above is/are correct?

- (1) 1, 3 and 4 only
- (2) 1, 2 and 3 only
- (3) 2, 3 and 4 only
- (4) 1 and 4 only

Q2. Answer: (1) 1, 3 and 4 only

- Statement 1 is correct: The detritus food chain begins with dead organic matter (detritus). The grazing food chain begins with producers.
- Statement 2 is wrong: It reverses the fact. In a terrestrial ecosystem a much larger fraction of energy flows through the detritus food chain than through the grazing food chain. The grazing food chain is the major conduit in an aquatic ecosystem.
- Statement 3 is correct: A trophic level is a functional level, not a species. A sparrow is a primary consumer when it eats seeds, fruits and peas, and a secondary consumer when it eats insects and worms.
- Statement 4 is correct: This is how NCERT states the ten per cent law. Because so little energy passes on, food chains have only a few steps.
- Why the other options are wrong: (2) and (3) both include statement 2, which is wrong. (4) leaves out statement 3, which is correct.

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Topic 27 · Artificial intelligence and machine learning: concepts, applications and limitations

ENGLISH

1. Concept in one line

Artificial intelligence (AI) enables machines to infer outputs such as predictions, recommendations or generated content from inputs; machine learning (ML) is a major approach in which a model learns patterns from data. AI, ML and deep learning are related terms, not interchangeable names. [S1-S3]

2. Revision notes

2.1 AI, machine learning and deep learning

Term	Central idea	Important distinction
Artificial intelligence	Systems performing tasks such as reasoning, perception, language processing and decision support	AI includes knowledge/rule-based approaches as well as learning-based approaches
Machine learning	Algorithms use data to fit a model that can make predictions or generate outputs	ML is within AI; every rule-based AI system need not learn from examples
Deep learning	ML using artificial neural networks with multiple hidden layers	Deep learning is within ML; all ML does not require deep neural networks
Artificial neural network	Connected computational units transform inputs through weighted connections	It is a mathematical model, not a literal human brain

Remember the nesting: Deep learning is within machine learning; machine learning is within AI. A decision tree can be an ML model without being a deep neural network. An expert system can apply a knowledge base and inference rules without training a model from examples. Not every automatic device is necessarily AI: a timer can simply follow a fixed schedule. [S1, S2, S4]

Rule-based and learning-based: In a rule-based expert system, specialists supply knowledge and rules. In ML, a training algorithm adjusts a model using examples. A practical system may combine both. Avoid the absolute claim that AI always learns continuously after deployment. [S1, S3]

2.2 How machines learn: distinguish the signal

Learning approach	What guides learning?	Teaching example
Supervised learning	Examples paired with target labels or values	Leaf photographs labelled healthy or diseased
Unsupervised learning	Structure in data without supplied target labels for the task	Grouping farms by similar soil and rainfall profiles
Reinforcement learning	Rewards from actions and their consequences in an environment	Learning a sequence of moves in a game to improve cumulative reward

Supervised learning has two common tasks: classification predicts a category, such as healthy/diseased; regression predicts a numerical quantity, such as expected yield in tonnes. A numerical label used as a category code does not turn classification into regression. [S3, S5]

Clustering is not classification: clustering discovers groups from similarity rather than learning predefined target classes. A person may interpret or name the groups afterwards. [S6]

Reinforcement learning is not simply "learning without data." It uses experience, observations and reward feedback. The reward can reflect a sequence of decisions, rather than a correct label supplied for every input. Human designers still choose objectives and constraints. [S7]

Self-supervised learning: learning targets are constructed from the data itself, such as predicting a hidden portion of text. It reduces reliance on manually labelled examples. Modern systems can combine training approaches; these labels do not describe watertight product categories. [S4]

2.3 From data to a useful prediction

1. **Define the task:** decide what should be predicted and where the system will be used.
2. **Prepare data:** collect suitable examples, check quality and protect sensitive information. In supervised learning, features are inputs and the label is the target.
3. **Train:** use training data to adjust the model's parameters. A loss measures a mismatch relevant to the learning objective.
4. **Validate and test:** use separate data to tune choices and assess performance on examples not used to fit the model. A test result is evidence about the tested setting, not a universal guarantee.
5. **Infer:** apply the trained model to new inputs. Inference does not necessarily change model parameters.
6. **Monitor:** check errors and changes in the real world; update or retrain when appropriate. Retraining is a separate process, not an automatic property of every system. [S5, S8, S9]

Overfitting: a model fits the training examples too closely and performs poorly on new examples. **Generalisation** means useful performance beyond the examples used to fit it. More data alone does not cure poor labels, unrepresentative sampling or a changed deployment setting. [S8]

2.4 Generative AI, language and vision

Capability	What it does	Example
Computer vision	Analyses visual inputs	Recognising a crop-leaf pattern or locating a defect in an image
Natural language processing (NLP)	Processes human language	Translation, extracting information or analysing text
Speech recognition	Converts spoken input into a textual representation	A spoken request transcribed into text
Generative AI	Produces content such as text, images, audio or code	Drafting a summary or creating an illustration

A large language model (LLM) is a language-focused model trained on large amounts of data; many generate text by predicting successive tokens. Tokens may be words, word parts or other units. Generated text is not automatically a retrieved, verified fact. Generative systems can use supervised, self-supervised and reinforcement methods at different stages. **"Generative" describes an output capability, not a fourth mutually exclusive learning signal.** [S3, S4, S10]

2.5 Applications: identify the actual task

Area	Useful application	What to watch
Healthcare	Assist interpretation of medical images, research and clinical decision support	Clinical validation, representative patient data and qualified human responsibility remain essential
Agriculture	Image-based crop disease identification; yield or irrigation-support models	Crop, region, image quality and field conditions affect reliability
Manufacturing	Visual defect detection and predictive maintenance	A camera records images; the model analyses patterns; a robot performs physical actions
Language and public services	Translation, speech-to-text and sorting requests	Language coverage, errors, accessibility and appropriate review
Finance and commerce	Detect unusual transactions or recommend products	An anomaly is a warning signal, not proof of fraud

Indian example: ICAR-IASRI has promoted AI-DISC, an AI-based crop disease identification application. Learn its function rather than inferring that an image diagnosis is always correct. The other examples above explain capabilities; they do not claim that a specific government has deployed every application. [S11-S14]

Another Indian application: Garbhini-GA2, developed by THSTI and IIT Madras, estimates gestational age in the second and third trimesters for the Indian population. APPSC 2024 asked about this specific application and its developers; this does not establish how frequently AI is tested. [S16]

2.6 Benefits, risks and safeguards

AI can examine large volumes of data, recognise patterns and support faster, more consistent routine work. Its value depends on the problem, data, evaluation and how people use it. Accuracy alone is not the whole meaning of trustworthiness. [S9]

Risk	Meaning	Useful safeguard
Bias and unfair outcomes	Data, design or deployment can disadvantage particular groups	Representative evaluation, checking outcomes across groups and corrective action
Hallucination or confabulation	A generated answer can be plausible but false	Verify important claims against reliable evidence
Privacy and security	Sensitive data can be exposed or systems manipulated	Data minimisation, access controls and security testing
Limited explainability	It may be difficult to explain a particular output	Suitable explanations, documentation and auditability
Automation bias	A person may trust a machine suggestion too readily	Meaningful human review, training and routes to challenge errors

A human-in-the-loop label alone does not guarantee safety. The reviewer needs time, competence, evidence and authority to act. High overall accuracy may also hide serious errors in a minority group or rare class. Models should be assessed for the actual use and its consequences. [S9, S10, S12, S15]

3. Quick application test

Suppose a system is trained using leaf images labelled by plant specialists. It later receives an unlabelled leaf photograph and predicts a disease category. The learning is **supervised**, the task is **classification**, and the later prediction is **inference**. If instead the system groups unlabelled leaf images by similarity, the task is **clustering**. If it generates a written explanation, that is a **generative output**; the explanation still needs checking. These are teaching scenarios, not claims about one particular app.

4. Exam traps

1. **All AI = ML = deep learning:** false; understand the nesting and the rule-based exception.
2. **A numerical output is always regression:** a number can code a category. Ask whether the target is a quantity or a class.
3. **Unsupervised learning has no data:** false; it lacks supplied target labels for the task.
4. **Training and inference are identical:** false; fitting a model differs from applying it.
5. **A fluent answer, high accuracy or human reviewer guarantees correctness:** none is a sufficient guarantee.

5. MCQs with answers and explanations

Q1. Consider the following statements:

1. Deep learning is a subset of machine learning, which is a subset of artificial intelligence.
2. Every artificial intelligence system must be trained on labelled examples before it can operate.
3. A rule-based expert system can use a knowledge base and inference rules without learning its rules from training examples.

Which of the statements given above are correct?

- (1) 1 and 2 only
- (2) 1 and 3 only
- (3) 2 and 3 only
- (4) 1, 2 and 3

Q1. Answer: (2) 1 and 3 only

- **Statement 1 is correct:** deep neural-network methods form a part of ML; ML is one major approach within AI.
- **Statement 2 is incorrect:** rule-based AI need not learn from examples. Even within ML, unsupervised and reinforcement approaches do not require the same labelled input-target dataset used in supervised learning.
- **Statement 3 is correct:** a knowledge-based expert system may apply rules supplied by specialists.
- **Option check:** (1) includes false statement 2 and omits true statement 3; (3) includes false statement 2 and omits true statement 1; (4) incorrectly includes statement 2. Only (2) gives exactly the two correct statements. [S1-S3]

Q2. Match each task in List I with the best description in List II:

List I: Task	List II: Description
A. Train on labelled leaf images to predict healthy/diseased	1. Unsupervised clustering
B. Group unlabelled farms by similar soil and rainfall profiles	2. Supervised regression
C. Learn game moves through actions and reward feedback	3. Supervised classification
D. Train on past input-output examples to predict crop yield in tonnes	4. Reinforcement learning

- (1) A-3, B-2, C-4, D-1
- (2) A-1, B-3, C-4, D-2
- (3) A-3, B-1, C-4, D-2
- (4) A-3, B-1, C-2, D-4

Q2. Answer: (3) A-3, B-1, C-4, D-2

- **A-3:** labelled examples and a category target indicate supervised classification.
- **B-1:** similarity-based grouping without supplied target classes is unsupervised clustering.
- **C-4:** actions, consequences and reward feedback identify reinforcement learning.
- **D-2:** a target quantity such as yield in tonnes indicates supervised regression.
- **Option check:** (1) swaps clustering and regression; (2) swaps classification and clustering; (4) swaps reinforcement learning and regression. Only (3) matches all four tasks. [S3, S5-S7]

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Topic 28 · Coding-decoding: letter shift codes

ENGLISH

1. Concept in one line

In a letter shift code every letter of a word is replaced by the letter that lies a number of places ahead of it or behind it in the English alphabet, or by its opposite letter; the rule of the code fixes that number, which may be the same for every letter or may change from one letter of the word to the next. The examination gives one word with its code and asks you to find the rule, and then to code or decode another word by the same rule.

2. Revision notes

2.1 What a coding-decoding question asks

- Coding means writing a word in a changed form by a fixed rule. Decoding means getting the original word back from the changed form.
- The rule is not stated. The question gives one word and its code. You find the rule by comparing the two, letter by letter.
- A coding question: "In a certain code this word is written like this. How is that word written?"
- A decoding question: "Which word is written like this in the same code?"
- A shift is the number of places by which a letter is moved along the alphabet. A "+" shift moves the letter forward, towards Z. A "-" shift moves it backward, towards A.
- In every code of this topic the code has as many letters as the word, and each letter of the code comes from one letter of the word.
- You need three tools: the positions of the letters, the opposite letters, and going round the alphabet.
- Not covered here, because other days cover them: codes that turn letters into numbers or use sums of positions; substitution and word codes; coding by comparing sentences; coding with symbols and conditions.

2.2 Tool 1: the position of each letter

The English alphabet has 26 letters. Number them in order, from A = 1 to Z = 26. This number is the position of the letter.

Letters	Positions	Last letter of the row
A B C D E	1 2 3 4 5	E = 5
F G H I J	6 7 8 9 10	J = 10

Letters	Positions	Last letter of the row
K L M N O	11 12 13 14 15	O = 15
P Q R S T	16 17 18 19 20	T = 20
U V W X Y	21 22 23 24 25	Y = 25
Z	26	Z = 26

- **EJOTY.** E = 5, J = 10, O = 15, T = 20, Y = 25. Count from the nearest of these five. S is one place before T, so S = 19. V is two places after T, so V = 22.
- **CFILORUX.** These letters stand at the multiples of 3: C = 3, F = 6, I = 9, L = 12, O = 15, R = 18, U = 21, X = 24.
- **Two halves.** A to M are 1 to 13. N to Z are 14 to 26.
- **Position from the end** = 27 - position from the start. D is the 4th letter from the start and the 23rd from the end.

2.3 Tool 2: opposite letters

Two letters are opposite letters when one is as far from A as the other is from Z. Their positions always add up to 27.

Letter	Position	Opposite letter	Position	Sum
A	1	Z	26	27
B	2	Y	25	27
C	3	X	24	27
D	4	W	23	27
E	5	V	22	27
F	6	U	21	27
G	7	T	20	27
H	8	S	19	27
I	9	R	18	27
J	10	Q	17	27
K	11	P	16	27
L	12	O	15	27

Letter	Position	Opposite letter	Position	Sum
M	13	N	14	27

- To find the opposite of any letter, subtract its position from 27. Opposite of H: 27 - 8 = 19, which is S.
- Memory aids: BY (B and Y), DEW (D and W), LOVE (L and O; V and E), and M and N, the two neighbours in the middle of the alphabet.

2.4 Tool 3: going round the alphabet

- Treat the alphabet as a circle. Going forward, A comes after Z. Going backward, Z comes after A.
- Forward shift: add the shift to the position. If the total is more than 26, subtract 26. Y + 3: 25 + 3 = 28; 28 - 26 = 2, which is B. (Count: Z, A, B.)
- Backward shift: subtract the shift from the position. If the result is less than 1, add 26. B - 4: 2 - 4 = -2; -2 + 26 = 24, which is X. C - 3: 3 - 3 = 0; 0 + 26 = 26, which is Z.
- Moving k places backward and moving 26 - k places forward give the same letter. So -3 is the same as +23, and -24 is the same as +2.

2.5 Kinds of letter shift codes

The word EXAM (E = 5, X = 24, A = 1, M = 13) is coded below by each kind of rule.

Kind of code	Rule	Shift at places 1, 2, 3, 4 of the word	Code of EXAM
Constant forward shift	Every letter moves the same number of places forward	+3, +3, +3, +3	HADP
Constant backward shift	Every letter moves the same number of places backward	-3, -3, -3, -3	BUXJ
Increasing shift	From one place to the next the shift grows by the same amount each time	+1, +2, +3, +4	FZDQ
Decreasing shift	From one place to the next the shift falls by the same amount each time	+4, +3, +2, +1	IACN
Alternating shift	One letter moves forward, the next moves backward, and so on by turns	+1, -1, +1, -1	FWBL
Shift by place (odd and even places)	One shift for the 1st, 3rd, 5th ... letters of the word (the odd places) and another shift for the 2nd, 4th, 6th ... letters (the even places)	+2, +3, +2, +3	GACP

Kind of code	Rule	Shift at places 1, 2, 3, 4 of the word	Code of EXAM
Reversal with a shift	The word is written backwards, from its last letter to its first, and then every letter is shifted	EXAM reversed is MAXE; then +1, +1, +1, +1	NBYF
Opposite-letter coding	Every letter is replaced by its opposite letter	No shift: E becomes V, X becomes C, A becomes Z, M becomes N	VCZN

- Going round in these codes: in HADP, X + 3 is 24 + 3 = 27, and 27 - 26 = 1, which is A. In BUXJ, A - 3 is 1 - 3 = -2, and -2 + 26 = 24, which is X.
- An increasing or decreasing shift may also run backward (-1, -2, -3, -4), and the shift need not change by 1 each time (+2, +4, +6, +8).
- The alternating shift is one case of the shift by place.
- In a reversal with a constant shift the order of the two steps does not matter. Reversing EXAM and then adding 1 gives NBYF. Adding 1 and then reversing also gives NBYF.
- Opposite-letter coding done twice gives the word back: the opposite-letter code of VCZN is EXAM.

2.6 Method: finding the rule and applying it

1. Write the word and its code one below the other. Count the letters: both must have the same number.
2. Write the position of every letter. At each place work out the difference: position of the code letter minus position of the word letter.
3. If a difference is large, add or subtract 26 to make it small: +23 becomes -3, and -24 becomes +2. Both forms mean the same shift, so if the row shows no pattern, try the other form: -11 is the same as +15.
4. Read the row of differences with the help of this table.

What the differences show	Rule
All the differences are equal, for example +3, +3, +3, +3	Constant shift: forward if +, backward if -
The differences rise or fall by the same amount each time, for example +1, +2, +3, +4	Increasing or decreasing shift
Two values come by turns, for example +1, -1, +1, -1 or +2, +3, +2, +3	Alternating shift, or shift by place
No pattern in order; but when the first letter of the word is compared with the last letter of the code, the second with the second last, and so on, all the differences are equal	Reversal with a shift

What the differences show	Rule
No pattern; but at every place the position of the word letter and the position of the code letter add up to 27	Opposite-letter coding

1. Test the rule on every letter of the given word, not only on the first two.
2. Apply the rule to the new word, place by place. Go round the alphabet where needed.

2.7 Decoding, and checking the answer

- Decoding means applying the rule backwards. Every + becomes - and every - becomes +. If the code was made by +1, +2, +3, decode by -1, -2, -3.
- If the code was made in two steps, undo the last step first. For "reverse, then +2", decode by "-2, then reverse".
- In opposite-letter coding, decoding is the same as coding: take the opposite letter again.
- Check 1: the answer has the same number of letters as the word in the question.
- Check 2: work in the other direction. Code the word you decoded, or decode the code you wrote. You must get back what the question gave.
- Check 3: look once more at letters near the two ends of the alphabet (A, B, C and X, Y, Z). Mistakes in going round happen there.
- Check 4: use the options. Work out the first and the last letter, strike off the options that do not fit, and then confirm every letter of the option that remains.

3. Extra section: worked examples

A. Constant shift, with going round

In a certain code, HOUSE is written as KRXVH. How is ZEBRA written in that code?

- Compare: H (8) → K (11), O (15) → R (18), U (21) → X (24), S (19) → V (22), E (5) → H (8). Every difference is +3.
- Rule: +3 at every place.
- Apply: Z + 3 is 26 + 3 = 29, and 29 - 26 = 3, which is C. E → H, B → E, R → U, A → D.
- Answer: CHEUD.

B. Increasing shift

In a certain code, CHAIR is written as DJDMW. How is STUDY written in that code?

Step	1st letter	2nd letter	3rd letter	4th letter	5th letter
Word CHAIR, with positions	C 3	H 8	A 1	I 9	R 18

Step	1st letter	2nd letter	3rd letter	4th letter	5th letter
Code DJDMW, with positions	D 4	J 10	D 4	M 13	W 23
Difference: code minus word	+1	+2	+3	+4	+5
New word STUDY, with positions	S 19	T 20	U 21	D 4	Y 25
Add the same shifts	20, which is T	22, which is V	24, which is X	8, which is H	30; 30 - 26 = 4, which is D

- Rule: +1, +2, +3, +4, +5.
- Answer: TVXHD.

C. Reversal with a shift

In a certain code, STONE is written as DMNSR. How is BRAIN written in that code?

- Compare in order: S (19) → D (4) is -15, that is +11. T (20) → M (13) is -7. O (15) → N (14) is -1. N (14) → S (19) is +5. E (5) → R (18) is +13. There is no pattern.
- Compare the word with the code read from its end: S → R, T → S, O → N, N → M, E → D. Every difference is -1.
- Rule: write the word backwards, then -1 at every place.
- Apply: BRAIN written backwards is NIARB. N → M, I → H, A → Z (1 - 1 = 0; 0 + 26 = 26), R → Q, B → A.
- Answer: MHZQA. Shifting without reversing gives AQZHM, which is wrong.

D. Decoding, with an alternating shift

In a certain code, LIGHT is written as MHHGU. Which word is written as DZCKF in that code?

- Compare: L (12) → M (13) is +1. I (9) → H (8) is -1. G (7) → H (8) is +1. H (8) → G (7) is -1. T (20) → U (21) is +1.
- Rule: +1, -1, +1, -1, +1.
- Decode by going backwards: -1, +1, -1, +1, -1. D - 1 is C. Z + 1 is 26 + 1 = 27, and 27 - 26 = 1, which is A. C - 1 is B. K + 1 is L. F - 1 is E.
- Answer: CABLE. Check: coding CABLE by +1, -1, +1, -1, +1 gives DZCKF.

E. Opposite-letter coding

In a certain code, BREAD is written as YIVZW. How is SUGAR written in that code?

- Compare in order: the differences are -3, -9, -9, -1, -7. There is no pattern.

- Compare the word with the code read from its end: the differences are -5, +8, -9, +8, -5. They are not equal.
- Add the positions at each place: B (2) + Y (25), R (18) + I (9), E (5) + V (22), A (1) + Z (26), D (4) + W (23). Every sum is 27.
- Rule: every letter is replaced by its opposite letter.
- Apply: S is 19, and 27 - 19 = 8, which is H. U is 21, and 27 - 21 = 6, which is F. G is 7, and 27 - 7 = 20, which is T. A becomes Z. R is 18, and 27 - 18 = 9, which is I.
- Answer: HFTZI.

4. Three common exam traps

1. **Coding when the question asks for decoding.** "How is this word written?" means apply the rule as it is. "Which word is written as this?" means apply the rule backwards. In example D, a candidate who applies +1, -1, +1, -1, +1 once more to DZCKF gets EYDJG, not CABLE. In a two-step code, undo the last step first.
2. **Going round, and counting the steps.** A comes after Z, so Y + 3 is B. Subtract 26 when you cross Z; the number 27 is only for opposite letters. Count steps, not letters: from Y the three steps are Z, A, B. Counting Y itself as the first step gives A, which is one place short.
3. **Fixing the rule from the first letter alone.** A first difference of +1 fits a constant shift (+1, +1, +1), an increasing shift (+1, +2, +3) and an alternating shift (+1, -1, +1). Check every letter. If the differences in order show no pattern, test the reversal and the sum of 27 before you give up: in example C the differences in order are +11, -7, -1, +5, +13, but with the reversal every difference is -1.

5. MCQs with answers and explanations

Q1. In a certain code, MARKET is written as VGMTCO. How is FROZEN written in that code?

- (1) HTQBGP
- (2) PGBQTH
- (3) LCXMPD
- (4) DPMXCL

Q1. Answer: (2) PGBQTH

- Compare in order: M (13) → V (22) is +9. A (1) → G (7) is +6. R (18) → M (13) is -5. K (11) → T (20) is +9. E (5) → C (3) is -2. T (20) → O (15) is -5. There is no pattern.
- Compare the word with the code read from its end: M (13) → O (15), A (1) → C (3), R (18) → T (20), K (11) → M (13), E (5) → G (7), T (20) → V (22). Every difference is +2.
- Rule: write the word backwards, then +2 at every place. Test: MARKET written backwards is TEKRAM, and +2 at every place gives VGMTCO.

- Apply: FROZEN written backwards is NEZORF. N (14) → P (16). E (5) → G (7). Z is 26, and 26 + 2 = 28; 28 - 26 = 2, which is B. O (15) → Q (17). R (18) → T (20). F (6) → H (8).
- So FROZEN is written as PGBQTH. Check: taking 2 from every letter of PGBQTH gives NEZORF, and that read backwards is FROZEN.
- Why (1) is wrong: HTQBGP is FROZEN with +2 at every place but without the reversal. It has the letters of the correct answer in the opposite order.
- Why (3) is wrong: LCXMPD has the reversal, but every letter is moved 2 places backward instead of forward. The direction is wrong.
- Why (4) is wrong: DPMXCL is FROZEN with every letter moved 2 places backward and without the reversal. It has the mistake of (1) and the mistake of (3) together. It has the letters of (3) in the opposite order.

Q2. In a certain code, PLANET is written as QNDRJZ. In the same code, a certain word is written as WCOPJE. What is the last letter of that word?

- (1) A
- (2) K
- (3) Y
- (4) Z

Q2. Answer: (3) Y

- Find the rule: P (16) → Q (17) is +1. L (12) → N (14) is +2. A (1) → D (4) is +3. N (14) → R (18) is +4. E (5) → J (10) is +5. T (20) → Z (26) is +6. It is an increasing shift: +1, +2, +3, +4, +5, +6.
- The question gives the code and asks for the word, so apply the rule backwards: -1, -2, -3, -4, -5, -6.
- The last letter is at the 6th place, so move E back by 6 places: 5 - 6 = -1; -1 + 26 = 25, which is Y. (Count: D, C, B, A, Z, Y.)
- The whole word: W - 1 is V, C - 2 is A, O - 3 is L, P - 4 is L, J - 5 is E, E - 6 is Y. The word is VALLEY. Check: coding VALLEY by +1, +2, +3, +4, +5, +6 gives WCOPJE.
- Why (1) is wrong: A comes from not going round the alphabet. The candidate stops at A after four steps back, or works out 5 - 6 = -1 and takes position 1.
- Why (2) is wrong: K is E + 6, because 5 + 6 = 11. This moves forward instead of backward. It codes the code once more instead of decoding it.
- Why (4) is wrong: Z is only 5 places back from E. The shift is off by one, which happens when E itself is counted as the first step: E, D, C, B, A, Z.

6. Sources

6.1 Sources

- S1: Encyclopaedia Britannica, "Latin alphabet". https://www.britannica.com/topic/Latin-alphabet

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- S3: Wikipedia, "Caesar cipher" (citing Luciano and Prichett, "Cryptology: From Caesar Ciphers to Public-Key Cryptosystems", *The College Mathematics Journal* 18(1), 1987; Wobst, *Cryptology Unlocked*, Wiley, 2001). https://en.wikipedia.org/wiki/Caesar_cipher
- S4: Wikipedia, "Atbash". https://en.wikipedia.org/wiki/Atbash
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Topic 29 · Percentages: meaning, fractions and percentage equivalents

ENGLISH

1. Concept in one line

A percentage is a fraction with denominator 100, so any percentage can be rewritten as a fraction or a decimal and worked as one. The exam tests quick conversion among the three forms and whether you take the percentage of the right base.

2. Revision notes

2.1 What "per cent" means

- "Per cent" comes from the Latin *per centum*, meaning "per hundred" or "out of hundred". The symbol is %.
- A percentage is a fraction whose denominator is 100. It is also a ratio whose second term is 100. So 23% = 23/100 = 23 : 100 = 0.23.
- A percentage is always a percentage of some quantity. That quantity is the base, and the base counts as 100%.
- The parts of a whole add up to 100%. If 30% of a class are boys, then 100% - 30% = 70% are girls.
- Percentages make comparison easy, because every denominator becomes 100. Which is larger, 3/5 or 13/20? 3/5 = 60% and 13/20 = 65%, so 13/20 is larger.

2.2 Converting between fractions, decimals and percentages

From	To	Rule	Example
Percentage	Fraction	Drop the % sign, write the number over 100 and reduce to lowest terms	24% = 24/100 = 6/25
Fraction	Percentage	Multiply by 100 and attach the % sign	3/4 × 100 = 75%; 5/12 × 100 = $41\frac{2}{3}$%
Percentage	Decimal	Drop the % sign and move the decimal point two places to the left	43% = 0.43; 9% = 0.09; 115% = 1.15; 0.75% = 0.0075
Decimal	Percentage	Move the decimal point two places to the right and attach the % sign	0.459 = 45.9%; 0.07 = 7%; 1.2 = 120%

From	To	Rule	Example
Fraction	Decimal	Divide the numerator by the denominator	3/8 = 0.375; 1/3 = 0.333...
Decimal	Fraction	For a terminating decimal (a decimal that stops): drop the decimal point, write the digits over 1 followed by as many zeros as there are decimal places, then reduce	0.375 = 375/1000 = 3/8; 0.04 = 4/100 = 1/25

- A percentage that itself contains a fraction is converted in the same way: $16\frac{2}{3}\%$ = 50/3 ÷ 100 = 50/300 = 1/6. (Here 16 2/3 means 16 + 2/3, a mixed fraction.)
- When it is easy, a fraction can simply be scaled to denominator 100: 13/20 = 65/100 = 65%.

2.3 Fraction and percentage equivalents: 1/1 to 1/20

Every value in the second column is exact. The third column gives the same value in decimals; where the decimal recurs, it is rounded to two places and marked "approx.".

Fraction	Percentage (exact)	Percentage in decimals
1/1	100%	100%
1/2	50%	50%
1/3	$33\frac{1}{3}\%$	33.33% (approx.)
1/4	25%	25%
1/5	20%	20%
1/6	$16\frac{2}{3}\%$	16.67% (approx.)
1/7	$14\frac{2}{7}\%$	14.29% (approx.)
1/8	$12\frac{1}{2}\%$	12.5%
1/9	$11\frac{1}{9}\%$	11.11% (approx.)
1/10	10%	10%
1/11	$9\frac{1}{11}\%$	9.09% (approx.)
1/12	$8\frac{1}{3}\%$	8.33% (approx.)
1/13	$7\frac{9}{13}\%$	7.69% (approx.)
1/14	$7\frac{1}{7}\%$	7.14% (approx.)

Fraction	Percentage (exact)	Percentage in decimals
1/15	$6\frac{2}{3}\%$	6.67% (approx.)
1/16	$6\frac{1}{4}\%$	6.25%
1/17	$5\frac{15}{17}\%$	5.88% (approx.)
1/18	$5\frac{5}{9}\%$	5.56% (approx.)
1/19	$5\frac{5}{19}\%$	5.26% (approx.)
1/20	5%	5%

How to remember them:

- **Halving chains.** 1/2 = 50%, 1/4 = 25%, 1/8 = $12\frac{1}{2}\%$, 1/16 = $6\frac{1}{4}\%$: each is half of the one before. In the same way: 1/3, 1/6, 1/12 ($33\frac{1}{3}\%$, $16\frac{2}{3}\%$, $8\frac{1}{3}\%$); 1/5, 1/10, 1/20 (20%, 10%, 5%); 1/7, 1/14 ($14\frac{2}{7}\%$, $7\frac{1}{7}\%$); 1/9, 1/18 ($11\frac{1}{9}\%$, $5\frac{5}{9}\%$).
- **A mirror pair.** 1/9 = $11\frac{1}{9}\%$ and 1/11 = $9\frac{1}{11}\%$.
- **1/15** is one-third of 1/5: 20% ÷ 3 = $6\frac{2}{3}\%$.
- A fraction in lowest terms gives a terminating decimal exactly when its denominator has no prime factor other than 2 and 5; its percentage is then a whole number or a terminating decimal too (1/8 = 0.125 = 12.5%; 1/16 = 0.0625 = 6.25%). Reduce the fraction first: 3/12 = 1/4 = 25%, although 12 has the prime factor 3. In every other case the decimal recurs, and so does the percentage, so use the fraction form: 1/3 is $33\frac{1}{3}\%$, and "33%" or "33.33%" is only an approximation.

Useful multiples, built from the table:

Fraction	Percentage (exact)	How to get it
2/3	$66\frac{2}{3}\%$	2 × $33\frac{1}{3}\%$
3/4	75%	3 × 25%
2/5, 3/5, 4/5	40%, 60%, 80%	2, 3 and 4 times 20%
5/6	$83\frac{1}{3}\%$	100% - $16\frac{2}{3}\%$
3/8	$37\frac{1}{2}\%$	3 × $12\frac{1}{2}\%$
5/8	$62\frac{1}{2}\%$	50% + $12\frac{1}{2}\%$
7/8	$87\frac{1}{2}\%$	100% - $12\frac{1}{2}\%$

Fraction	Percentage (exact)	How to get it
5/12	$41\frac{2}{3}\%$	$5 \times 8\frac{1}{3}\%$

2.4 Finding a percentage of a quantity

- x% of y = (x/100) × y. The word "of" means "multiply".
- Example: 35% of 240 = 35/100 × 240 = 84.
- With a fraction equivalent: $37\frac{1}{2}\%$ of 640 = 3/8 × 640 = 240.
- **x% of y = y% of x**, because each of them equals xy/100. So 64% of 25 = 25% of 64 = 16, and 36% of 75 = 75% of 36 = 27. Swap whenever the second number is easier to use as a percentage.

2.5 One quantity as a percentage of another: the base matters

- A as a percentage of B = (A/B) × 100, with the % sign attached (B must not be 0). B, the quantity that follows "per cent of" or "percentage of", is the base and goes in the denominator.
- Put both quantities in the same unit first. 75 paise as a percentage of 5 rupees = 75/500 × 100 = 15%. 36 minutes as a percentage of 2 hours = 36/120 × 100 = 30%.
- Change the base and the answer changes:

Question	Base	Working	Answer
40 is what per cent of 50?	50	40/50 × 100	80%
50 is what per cent of 40?	40	50/40 × 100	125%
The gap of 10 is what per cent of 50?	50	10/50 × 100	20%
The gap of 10 is what per cent of 40?	40	10/40 × 100	25%

- **Part to part is not part to whole.** If a whole is made of two parts in the ratio 1 : 4, the first part is 1/5 = 20% of the whole, but 1/4 = 25% of the second part.
- Percentages of different bases cannot be compared directly: 60% of 50 is 30, which is less than 40% of 100, which is 40.

2.6 Percentage points and per cent

- A percentage point is the plain difference between two percentages, found by subtraction.
- If a rate moves from 40% to 44%, it has risen by 4 percentage points. It has not risen by 4 per cent: 4 is 10 per cent of 40, so the rate has risen by 10 per cent of its earlier value.

Statement about a rate that was 40%	Working	New rate
"It rose by 4 percentage points"	40 + 4	44%
"It rose by 4 per cent"	40 + 4% of 40 = 40 + 1.6	41.6%

- Interest-rate news uses basis points: 1 basis point = 0.01 percentage point, so 100 basis points = 1 percentage point.

2.7 Percentages greater than 100 and less than 1

- **More than 100%:** the quantity is larger than the base. 100% of the base is the base itself, 200% is twice the base, and 250% is 2.5 times the base. 120% of 80 kg = 1.2 × 80 kg = 96 kg. "120% of the target" means 20% more than the target.
- A part of a whole can never be more than 100% of that whole. A figure above 100% appears only when a quantity is compared with a different base that is smaller than it.
- **Less than 1%:** 0.5% = 0.5/100 = 0.005 = 1/200. It is half of one per cent, not half of the whole. In the same way 1/4% = 0.25% = 0.0025 = 1/400.
- Example: 0.2% of 4,500. 1% is 45, and 0.2% is one-fifth of that: 9.

2.8 Quick mental methods

- **10% and 1% are the building blocks.** For 10%, move the decimal point one place to the left; for 1%, two places. For 450: 10% = 45 and 1% = 4.5.
- Build the rest from them: 5% is half of 10%; 20% is twice 10%; 15% = 10% + 5%; 2.5% is half of 5%; 90% = the whole - 10%; 99% = the whole - 1%.
- Example: 18% of 450 = 20% - 2% = 90 - 9 = 81.
- **Use the fraction** when the percentage is in the table: $87\frac{1}{2}$% of 720 = 720 - 1/8 of 720 = 720 - 90 = 630.
- **Swap** when it helps: 16% of 75 = 75% of 16 = 12.

Other days cover percentage change (working it out directly, working backwards, and successive changes), applications to price, consumption and expenditure, problems on marks, votes and income, profit and loss, and interest.

3. Extra section: worked examples

A. Converting between the three forms

1. **0.625 as a fraction and as a percentage.** 0.625 = 625/1000 = 5/8. As a percentage: 0.625 × 100 = 62.5, so 0.625 = $62\frac{1}{2}$%.

2. **7/40 as a percentage and as a decimal.** 7/40 × 100 = 700/40 = 17.5, so 7/40 = 17 $\frac{1}{2}$%. As a decimal: 17.5 ÷ 100 = 0.175.
3. **6 $\frac{2}{3}$% as a fraction.** 6 2/3 = 20/3. So 6 $\frac{2}{3}$% = 20/3 ÷ 100 = 20/300 = 1/15.
4. **0.4% as a decimal and as a fraction.** 0.4 ÷ 100 = 0.004 = 4/1000 = 1/250.

B. A percentage of a quantity

1. **83 $\frac{1}{3}$% of 5,400.** 83 $\frac{1}{3}$% = 5/6. One-sixth of 5,400 is 900, so five-sixths is 4,500.
2. **28% of 250.** Swap: 250% of 28 = 2.5 × 28 = 70.
3. **17 $\frac{1}{2}$% of 800.** 10% = 80, 5% = 40 and 2 $\frac{1}{2}$% = 20. Total: 80 + 40 + 20 = 140.
4. **0.25% of 3,600, and 350% of 48.** 1% of 3,600 is 36, and a quarter of 36 is 9. 350% means 3.5 times: 3.5 × 48 = 168.

C. One quantity as a percentage of another

1. **Same quantity, two bases.** A tank that can hold 800 litres has 280 litres of water in it. Water as a percentage of the capacity: 280/800 × 100 = 35%. The empty space is 800 - 280 = 520 litres. Water as a percentage of the empty space: 280/520 × 100 = 53 $\frac{11}{13}$% (53.85% approximately).
2. **Units first.** 250 g as a percentage of 2 kg: 250/2000 × 100 = 12 $\frac{1}{2}$%. 2 kg as a percentage of 250 g: 2000/250 × 100 = 800%.
3. **From one base to another.** An alloy contains only copper and zinc, and the weight of the zinc is 25% of the weight of the copper. What percentage of the alloy is zinc? Take the copper as 100. Then the zinc is 25 and the alloy is 125. Zinc as a percentage of the alloy: 25/125 × 100 = 20%, not 25%.

D. Percentage points

1. The share of houses with a tap connection in a village rises from 25% to 30%. The rise is 30 - 25 = 5 percentage points. As a per cent of the earlier share, the rise is 5/25 × 100 = 20 per cent. Both figures are correct; they answer different questions.

4. Three common exam traps

1. **Ask "per cent of what?"** "A as a percentage of B" puts B in the denominator. 40 is 80% of 50, but 50 is 125% of 40. If zinc is 25% of the copper in an alloy of the two, it is only 20% of the alloy. A percentage given on one base cannot be used on another base without recalculation.
2. **Percentage points are not per cent.** A rise from 40% to 44% is a rise of 4 percentage points, but a rise of 10 per cent. A question may give one and ask for the other.

3. **A small percentage, or one with a fraction in it, is still divided by 100.** 0.5% is 0.005 (1/200), not 0.5. 1/4% is 1/400, not 1/4. Also keep the fraction exact: 1/3 is 33 $\frac{1}{3}$%, not 33%; 12 $\frac{1}{2}$% is 1/8, but 12% is 3/25.

5. MCQs with answers and explanations

Q1. A farmers' cooperative society holds 5,760 kg of seed. Of this, 6 $\frac{2}{3}$ per cent is groundnut seed, and 87 $\frac{1}{2}$ per cent of the groundnut seed is certified seed. What is the weight of the certified groundnut seed?

- (1) 300 kg
- (2) 315 kg
- (3) 320 kg
- (4) 336 kg

Q1. Answer: (4) 336 kg

- Worked solution, step 1: 6 $\frac{2}{3}$% = 20/3 ÷ 100 = 20/300 = 1/15. Groundnut seed = 5,760 ÷ 15 = 384 kg.
- Step 2: 87 $\frac{1}{2}$% = 7/8. One-eighth of 384 is 48, so seven-eighths is 384 - 48 = 336 kg.
- Check in one line: 7/8 × 1/15 × 5,760 = 336.
- Why (3) is wrong: 320 = 5/6 × 384. It takes 87 $\frac{1}{2}$% as 5/6, but 5/6 is 83 $\frac{1}{3}$%. The fraction for 87 $\frac{1}{2}$% is 7/8.
- Why (2) is wrong: 315 = 7/8 × 360, where 360 = 5,760 ÷ 16. It takes 6 $\frac{2}{3}$% as 1/16, but 1/16 is 6 $\frac{1}{4}$%. The fraction for 6 $\frac{2}{3}$% is 1/15.
- Why (1) is wrong: 300 = 5/6 × 360. It makes both of these slips together.

Q2. A parking area has only cars and motorcycles. The number of cars is 60 per cent of the number of motorcycles. Cars form what per cent of all the vehicles in the parking area?

- (1) 37 $\frac{1}{2}$%
- (2) 40%
- (3) 60%
- (4) 62 $\frac{1}{2}$%

Q2. Answer: (1) 37 $\frac{1}{2}$%

- Worked solution: the base of "60 per cent" is the number of motorcycles, not the total. Take the motorcycles as 100. Then the cars are 60 and the vehicles are 100 + 60 = 160.
- Cars as a percentage of all vehicles = 60/160 × 100 = 3/8 × 100 = 37 $\frac{1}{2}$%.

- Check with other numbers: 25 motorcycles and 15 cars make 40 vehicles, and 15/40 × 100 = 37 $\frac{1}{2}$%.
- Why (2) is wrong: 40% = 100% - 60%. It treats 60% as the motorcycles' share of all vehicles and gives the cars the rest. The question does not say that.
- Why (3) is wrong: 60% is the figure given in the question, used without changing the base. It compares the cars with the motorcycles, not with all the vehicles.
- Why (4) is wrong: 62 $\frac{1}{2}$% = 100/160 × 100. That is the share of the motorcycles, but the question asks for the share of the cars.

6. Sources

6.1 Sources

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- S6: Wikipedia, "Percentage" (citing Bennett and Briggs, *Using and Understanding Mathematics*, 2005; American Heritage Dictionary; Merriam-Webster). https://en.wikipedia.org/wiki/Percentage
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- S10: Telugu Wikipedia, "శాతం". https://te.wikipedia.org/wiki/శాతం
- S11: NCERT, *Exemplar Problems: Mathematics*, Class VII, Unit 7 "Comparing Quantities", the list of main concepts at the start of the unit. https://ncert.nic.in/pdf/publication/exemplarproblem/classVII/Mathematics/gemp107.pdf

Additional verified references

- European Central Bank, basis points and percentages: https://www.ecb.europa.eu/stats/ecb_statistics/anacredit/questions/html/ecb.anaq.200131.0002.en.html

Topic 30 · Current affairs: Digital Personal Data Protection Rules, 2025

ENGLISH

1. Concept in one line

The DPDP framework sets out when digital personal data may be processed, what individuals can ask for, and who is responsible for protecting it. Parliament enacted the DPDP Act, 2023; the Central Government, through MeitY, notified the implementation Rules in November 2025.

Read the status first: These notes explain the framework as notified. On 9 October 2026, its main substantive rights, duties and enforcement provisions are still scheduled for the later operational stage. Official implementation guidance uses **13 May 2027** for that stage. Notification of the Rules did not make every provision operative immediately.

2. Revision notes

2.1 Why it matters and what the Rules do

The right to privacy was recognised as a fundamental right by the Supreme Court's 9-judge Bench in the Puttaswamy judgment in 2017. The DPDP Act received assent on 11 August 2023. It provides a statutory framework for digital personal data, balancing individuals' protection with processing for lawful purposes.

The final Rules were notified through G.S.R. 846(E), dated 13 November 2025, under section 40 of the Act. They prescribe practical requirements such as notices, safeguards, consent-management arrangements and rights-request procedures. **The Act creates the framework; the Rules supply implementation detail.** Read them together, including their phased commencement and the December 2025 corrigendum.

2.2 Applicability and exclusions under section 3

Personal data concerns an individual identifiable by, or in relation to, that data. **Processing** includes activities such as collection, storage, use, sharing and erasure. A company's production total is not personal data merely because it is stored on a computer; an identifiable customer's record is.

Situation	Position under the notified framework
Personal data collected digitally and processed in India	Within the Act's scope, subject to its provisions
Personal data first collected on paper and later digitised	Within scope for the digital processing
A paper record that remains entirely non-digital	Outside this digital-personal-data framework

Situation	Position under the notified framework
Processing outside India connected with offering goods or services to Data Principals within India	Covered; the test is not confined to the processor's location or the individual's citizenship
Processing by an individual for a personal or domestic purpose	Excluded by section 3(c)(i)
Data made publicly available by the Data Principal herself, or by someone legally obliged to make it public	Excluded by section 3(c)(ii)

Publicly visible is not the whole test. A leaked customer list appearing online does not automatically satisfy the publicly available data exclusion. Ask who made it public and whether the statutory conditions are met.

2.3 Who is who

Role	Meaning	Teaching illustration
Data Principal	The individual to whom the data relates	The customer whose personal record is used
Data Fiduciary	Determines the purpose and means of processing, alone or with others	A retailer deciding why and how it uses customer data
Data Processor	Processes data on behalf of a Data Fiduciary	A contracted service provider processing the retailer's records
Consent Manager	Registered with the Board; helps an individual give, manage, review and withdraw consent	A consent-management platform acting as the individual's contact point
Significant Data Fiduciary (SDF)	A fiduciary or class designated by the Central Government under section 10	Designation depends on assessed statutory factors, not simply the label “large company”

A fiduciary may be a company, an individual, the State or another qualifying person. A Data Principal is an individual. For a child, the definition includes the parents or lawful guardian. For a person with disability, it includes the lawful guardian acting on her behalf where applicable.

These are roles in relation to processing. A service provider's name or business sector alone does not establish which role it performs in every transaction.

2.4 Consent and certain legitimate uses

Under section 4, processing must be for a lawful purpose and based on **consent** or one of the **certain legitimate uses** enumerated in section 7.

Consent: It must be freely given, specific, informed, unconditional and unambiguous, expressed through clear affirmative action. It concerns necessary personal data for the specified purpose. A notice explains the data, purpose and ways to exercise rights. The Act provides a language choice of English or a language in the Constitution's Eighth Schedule.

Withdrawal must be as easy as giving consent. Withdrawal does not retrospectively invalidate processing already based on consent. Future processing must stop within a reasonable time unless processing without consent is required or authorised under the Act, Rules or another law; withdrawal may affect the service that depended on that processing.

Certain legitimate uses: These are statutory categories, not an unlimited permission to do whatever a business considers useful. Examples include specified voluntary provision of data without an indication of refusal, qualifying State benefits/services, compliance with specified legal obligations or orders, medical emergencies, disasters and specified employment purposes. Each category has its own conditions.

For example, voluntarily providing details for a stated purpose does not create an unrestricted licence to use them for unrelated purposes. Similarly, a reference to public service does not remove all safeguards from government processing.

2.5 Rights of individuals and their limits

The main rights under sections 11-14 are:

Right	What it enables	Important qualification
Access to information	Obtain a summary of personal data and processing, and relevant sharing information	Section 11 is tied to the prescribed consent-based relationship, including section 7(a); statutory exceptions apply
Correction and erasure	Correct inaccurate or misleading data, complete or update it, and request erasure	Section 12 concerns the relevant consent-based processing; necessary retention for the specified purpose or compliance with law can limit erasure
Grievance redressal	Use an accessible mechanism for complaints about acts or omissions concerning obligations and rights	Use the fiduciary's or Consent Manager's grievance route before approaching the Board
Nomination	Nominate another individual to exercise rights after the Data Principal's death or incapacity	The Act and Rules govern how the nomination operates

Erasure is not an unconditional right to delete every record immediately. Also distinguish access to information about processing from a general right to obtain every internal business document.

Data Principals have duties too: comply with applicable law while exercising rights, avoid impersonation and false or frivolous complaints, do not suppress material information in specified official-document contexts, and provide authentic information when seeking correction or erasure.

2.6 Responsibilities of fiduciaries and processors

The fiduciary remains responsible for compliance in processing done by it or on its behalf. Appointing a processor does not remove that responsibility. Processing by an engaged processor for the activities specified in section 8(2) requires a valid contract.

Key responsibilities include reasonable security safeguards; appropriate accuracy when data is used for an individual-affecting decision or disclosed to another fiduciary; required erasure, subject to retention rules; contact information; grievance handling; and breach intimations. The Rules elaborate safeguards such as appropriate encryption or masking, access controls, monitoring and backups.

The notified breach framework has two recipients: affected individuals and the Board. Affected individuals are informed without delay. The Board receives an initial intimation without delay, followed by detailed information within 72 hours of awareness, unless the Board allows a longer period on written request. This is a supporting distinction, not the whole subject.

2.7 Children and Significant Data Fiduciaries

Child means an individual below 18. The framework requires verifiable parental consent before processing children's personal data. It prohibits processing likely to harm a child's well-being and restricts tracking, behavioural monitoring and targeted advertising directed at children.

These protections must be read with section 9 and the limited exceptions under Rule 12 and the Fourth Schedule. Specified health, educational and child-safety processing can receive conditional relief from parental-consent and tracking-related provisions. This is not a blanket exemption for every school, hospital or activity involving children. The prohibition on detrimental processing in section 9(2) is not removed by the section 9(4) exceptions.

For a person with disability who has a lawful guardian, the framework requires verifiable guardian consent and due diligence concerning the guardian's legal appointment. Do not assume that every person with disability necessarily acts through a guardian.

SDF designation: The Government considers factors including the volume and sensitivity of data, risks to individuals' rights, sovereignty and integrity, electoral democracy, State security and public order. Additional obligations include an India-based Data Protection Officer, an independent auditor and prescribed impact assessments/audits. The Rules also address algorithm-related risks and specified restrictions on transferring designated data outside India.

2.8 Section 3 exclusions and section 17 exemptions are different

Section 3 determines coverage. Section 17 grants relief in particular circumstances; the extent of relief varies.

- Certain legal-claim, judicial and offence-related processing receives specified exemptions, while fiduciary accountability and security safeguards remain under section 17(1).
- Notified State instrumentalities can receive exemptions for the national-interest grounds stated in section 17(2)(a); this is not an automatic exemption for all government bodies.

- Research, archiving or statistical processing qualifies under section 17(2)(b) only if it is not used for a decision specific to an individual and follows prescribed standards, including Rule 16.
- Certain fiduciaries, including startups, may receive specified exemptions by notification; startup status alone is insufficient. Separate State-processing qualifications also exist under section 17(4).

Always identify the provision, beneficiary, purpose and conditions before describing an exemption.

2.9 Transfers outside India

The Act does not impose universal localisation of all personal data. Section 16 allows the Central Government to restrict transfers to notified countries or territories. Stronger protection or transfer restrictions under another applicable law remain relevant.

Rule 15 adds requirements the Government may specify concerning availability of transferred data to foreign States and related entities. Rule 13 separately addresses specified data processed by SDFs. A country-restriction power, a targeted SDF restriction and an across-the-board ban are different things.

2.10 The Board, appeals and penalties

The **Data Protection Board of India** is a statutory body established by the Central Government. The Act provides for a Chairperson and notified other Members. Its framework includes inquiries, directions and monetary penalties; its main enforcement powers are in the later operational stage.

The Rules envisage a digital office, while retaining powers such as summoning individuals. Appeals against Board orders or directions go to the **Telecom Disputes Settlement and Appellate Tribunal (TDSAT)**.

Penalty anchor: Failure to take reasonable security safeguards to prevent a personal data breach can attract a penalty up to **Rs 250 crore**. This is a statutory upper ceiling for that breach category, not an automatic fine for every incident and not compensation automatically paid to an affected individual. Penalty receipts go to the Consolidated Fund of India. The Board considers the statutory factors and gives an opportunity of hearing.

2.11 The RTI connection

Section 44(3) substitutes the personal-information exemption in section 8(1)(j) of the Right to Information Act, 2005. This amendment belongs to the first commencement stage. However, RTI section 8(2), allowing disclosure when the public interest outweighs the protected harm, remains. Do not conclude that every public-interest route to personal information was abolished.

3. Extra section: the essential commencement map

The calendar below follows official implementation guidance, read with Rule 1 and the Act's separate commencement notification, G.S.R. 843(E).

Stage	Main content	Position on 9 October 2026
13 November 2025	Definitions, Board/institutional provisions, specified general provisions and amendments, including the RTI amendment; Rules 1, 2 and 17-21	Operative
13 November 2026	Consent Manager registration stage: Rule 4 and specified Act provisions	Future stage
13 May 2027	Main applicability, processing duties, individual rights and related enforcement; Rules 3, 5-16, 22 and 23	Future stage

The official texts express the later stages as one year and eighteen months after Gazette publication. For revision, keep the three-stage distinction and the current status clear. Recheck official amendments before using a question framed as “currently in force”.

Secondary facts worth recognising: A child is below 18; the security-safeguard penalty ceiling is Rs 250 crore; detailed Board breach information ordinarily has a 72-hour limit, with the permitted extension noted above. These numbers support the framework; they do not replace understanding it.

4. Three common exam traps

1. **Treating all online data as excluded.** The public-availability exclusion has specified conditions. A leak is not automatically lawful public availability. Section 17 exemptions must also be read with their purposes and conditions.
2. **Treating consent or erasure as absolute.** The Act recognises certain legitimate uses; withdrawal does not undo earlier lawful processing. Erasure remains subject to statutory qualifications and necessary retention.
3. **Treating notification as full commencement.** On 9 October 2026, the main substantive stage is still future. Distinguish the Act's framework, the Rules' detailed requirements and which provisions are already operative.

5. MCQs with answers and explanations

Q1. According to the notified text of the Digital Personal Data Protection Act, 2023, read with the Rules, 2025, consider the following statements. The provisions have phased commencement:

1. Personal data collected in non-digital form and subsequently digitised can fall within the Act's scope.
2. Every item of personal data that becomes visible on the Internet is excluded from the Act, regardless of who made it public.
3. The research, archiving or statistical-purpose exemption requires that the data not be used to take a decision specific to a Data Principal and that the processing follow prescribed standards.

Which of the statements given above is/are correct?

- (1) 1 and 2 only
- (2) 2 and 3 only
- (3) 1 and 3 only
- (4) 1, 2 and 3

Q1. Answer: (3) 1 and 3 only

- **Statement 1 is correct:** Section 3(a) covers digital processing of personal data collected digitally or collected non-digitally and then digitised. A paper-only record is a different case.
- **Statement 2 is incorrect:** Section 3(c)(ii) specifies public availability by the Data Principal or by a person legally obliged to make the data public. Mere appearance on the Internet does not establish those conditions.
- **Statement 3 is correct:** Section 17(2)(b) contains both the no-individual-specific-decision condition and the prescribed-standards condition. Rule 16 connects this processing with the Second Schedule's standards.
- **Why (1) is wrong:** It includes incorrect statement 2 and omits correct statement 3.
- **Why (2) is wrong:** It includes incorrect statement 2 and omits correct statement 1.
- **Why (3) is correct:** It includes both correct statements and excludes statement 2.
- **Why (4) is wrong:** It incorrectly includes statement 2.

Q2. Match List I (terms used in the Digital Personal Data Protection Act, 2023) with List II (their meaning under the Act):

List I	List II
A. Data Principal	1. The person who carries out processing of personal data on behalf of the one who determines its purpose and means
B. Data Fiduciary	2. The individual to whom the personal data relates
C. Data Processor	3. A person registered with the Board, who acts as a single point of contact through an accessible, transparent and interoperable platform
D. Consent Manager	4. The person who, alone or in conjunction with other persons, determines the purpose and means of processing of personal data

- (1) A-4, B-2, C-1, D-3
- (2) A-2, B-4, C-1, D-3
- (3) A-2, B-1, C-4, D-3
- (4) A-4, B-1, C-3, D-2

Q2. Answer: (2) A-2, B-4, C-1, D-3

- Why it is correct: The Data Principal is the individual to whom the personal data relates (A-2). The Data Fiduciary is the person who, alone or in conjunction with other persons, determines the purpose and means of processing of personal data (B-4). The Data Processor processes personal data on behalf of a Data Fiduciary (C-1). The Consent Manager is a person registered with the Board, who acts as a single point of contact for consent through an accessible, transparent and interoperable platform (D-3).
- Why (1) is wrong: It swaps the Data Principal and the Data Fiduciary. “The individual to whom the data relates” defines the Data Principal; “determines the purpose and means” defines the Data Fiduciary.
- Why (3) is wrong: It swaps the Data Fiduciary and the Data Processor. The Data Processor works on behalf of the Data Fiduciary; it is the Data Fiduciary that determines the purpose and means.
- Why (4) is wrong: All four of its pairs are wrong. The correct definitions are A-2 (Data Principal), B-4 (Data Fiduciary), C-1 (Data Processor) and D-3 (Consent Manager); none of option (4)’s pairs matches these statutory definitions.

6. Sources

These primary references support both language versions. The role examples are teaching illustrations. Read the legislation with its commencement notification; a description of the notified framework is not a statement that all its provisions already operate.

- S1: DPDP Act, 2023, official Gazette copy: https://www.meity.gov.in/static/uploads/2024/06/2bf1f0e9f04e6fb4f8fef35e82c42aa5.pdf
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