IAS WITH DR RAVI · APPSC GROUP 1

Day 29
English Revision Notes

1,000 Topics in 100 Days

Topics 281–290

Review edition · November 2026

Topics

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Later Vedic age: changes in polity, society and religion

Concept in one line

The later Vedic phase is the age of the later Vedic texts, which R.S. Sharma (old NCERT *Ancient India*) places in about 1000 to 500 BCE, when Vedic culture moved east into the Ganga basin and kingship, society and religion changed; the examination asks what changed from the Rigvedic phase in each of these.

Revision notes

2.1 Recall, period and sources

- **Recall.** Topic 231: the Mature Harappan phase ended about 1900 BCE, after which life became rural in the Late Harappan cultures. Topic 261: the Rigvedic age, which R.S. Sharma dates to about 1500 to 1000 BCE, in the land of seven rivers (Sapta Sindhu), with chiefs, assemblies (the sabha, the samiti and the vidatha, whose precise distinctions Britannica says are not clear) and a cattle-centred economy.
- **Left to other days.** The Vedic texts themselves are Topic 302; the sixteen Mahajanapadas are Topic 351.
- **Period.** R.S. Sharma (old NCERT *Ancient India*): the later Vedic texts were compiled in the upper Gangetic basin in about 1000 to 500 BCE. NCERT Class VI (*Our Pasts I*, "Kingdoms, Kings and an Early Republic") says that around 3000 years ago some men became recognised as rajas by performing big sacrifices.
- **Texts.** Sharma names the Samhitas of the Sama, Yajur and Atharva Vedas, and the Brahmanas. He also says (chapter 2) that the Rig Veda mainly contains prayers, while the later Vedic texts contain not only prayers but also rituals, magic and mythological stories (Topic 261).

- **The Brahmanas.** Britannica: prose commentaries attached to the Vedas, explaining their significance as used in ritual sacrifices and the symbolic import of the priests' actions; Britannica's "Vedic religion" dates them to about 800 to 600 BCE. The Shatapatha Brahmana is placed in the 8th to 6th century BCE by A.B. Keith and about 700 BCE by Asko Parpola (as cited by Wikipedia).
- **Archaeology: Painted Grey Ware (PGW).** Sharma counts nearly 700 PGW sites, mostly in the upper Gangetic basin, whose people used earthen bowls and dishes of painted grey pottery. NCERT Class VI: plates and bowls are the commonest PGW vessels; excavated sites include Purana Qila in Delhi, Hastinapura near Meerut and Atranjikhera near Etah. Wikipedia: PGW is conventionally dated about 1200 to 600-500 BCE (Adams; Jain), probably corresponds to the middle and late Vedic period and the Kuru-Panchala kingdom, and 1,576 sites were known as of 2018 (Uesugi). Sharma's "nearly 700" is an older count.

2.2 The spread eastward

- **Kuru and Panchala.** Sharma: the Bharatas and the Purus combined to form the Kuru people; Wikipedia ("Kuru kingdom", citing Witzel) describes an alliance of the two tribes after the Battle of the Ten Kings. The Kurus occupied Delhi and the upper part of the Ganga-Yamuna doab and coalesced with the Panchalas, who held its middle portion (Sharma).
- **Capital.** Sharma: the Kurus set up their capital at Hastinapur, in Meerut district. Wikipedia ("Kuru kingdom") gives Asandivat (modern Assandh, Haryana) as the first Kuru capital, with Indraprastha and Hastinapura as the main cities in later literature. In an NCERT-based question, give Hastinapur.
- **Koshala and Videha.** Sharma: towards the end of the period, around 600 BCE, Vedic people spread to Koshala in eastern Uttar Pradesh and Videha in north Bihar. Koshala is associated with the story of Rama. Sharma says it is not mentioned in Vedic literature, but the Shatapatha Brahmana does name it: the Sadanira river "even now forms the boundary of the Kosalas and Videhas" (1.4.1.17, Eggeling's translation).
- **Videgha Mathava (Shatapatha Brahmana 1.4.1.14, Eggeling's translation, as quoted by Wikipedia).** Agni Vaishvanara went burning along the earth towards the east, and Gotama Rahugana and Videgha Mathava followed him. He dried up the rivers, but did not burn over the Sadanira, which flows from

the northern mountain; the Brahmans did not cross it in former times. Witzel (as cited by Wikipedia) says Videha emerged as a political centre farther east, and Janaka's court gave patronage to Brahmin sages. Wikipedia ("Videha") says the Vaidehas were first organised as a monarchy in the era of the Brahmanas, about 900 to 700 BCE.

- **Other polities.** Upinder Singh (as cited by Wikipedia) counts oligarchical states (gana or sangha) among the polities that had emerged by this period (Topic 351).

2.3 Iron and agriculture

- **Name of iron.** Sharma: the later Vedic texts call it shyama or krishna ayas. Witzel (as cited by Wikipedia): shyama ayas, "black metal", is first mentioned in the Atharvaveda; the Rigvedic ayas was copper or bronze (Topic 261).
- **When and where (Sharma).** Iron appears around 1000 BCE in Dharwar district, Karnataka. Iron weapons such as arrow-heads and spear-heads were commonly used in western Uttar Pradesh from about 800 BCE. The earliest iron implements of eastern Uttar Pradesh and Videha belong to the 7th century BCE.
- **Iron and farming: two views.** Sharma: very few iron agricultural tools have been found. Kulke and Rothermund (as cited by Wikipedia): after 1000 BCE iron axes and ploughs became widespread and jungles could be cleared with ease.
- **Crops.** Agriculture was the chief means of livelihood (Sharma). Barley continued, but rice and wheat became the chief crops; rice is called vrihi in the Vedic texts, and rice remains from Hastinapur belong to the 8th century BCE (Sharma). The Shatapatha Brahmana speaks at length about ploughing rituals (Sharma). Wikipedia: PGW people grew rice, wheat, millet and barley.
- **First towns.** Sharma calls Hastinapur and Kaushambi (near Allahabad) primitive towns of the end of the Vedic period, or protourban sites.

2.4 Polity: from chief to territorial king

Feature	What changed, as the sources give it
Kingship	Royal power grew (Sharma). Traces of election of the king appear in the later Vedic texts, but the king made his office hereditary, and it generally went to the eldest son; in princely families primogeniture was getting stronger (Sharma)
Territory	The term rashtra, which indicates territory, first appears in this period (Sharma). Upinder Singh (as cited by Wikipedia): the rajan was the custodian of social order and the protector of the rashtra (polity)
Assemblies	The vidatha completely disappeared. The sabha and the samiti continued, but their character changed: they came to be dominated by chiefs and rich nobles, and women were no longer permitted to sit on the sabha (Sharma). Upinder Singh (as cited by Wikipedia): they are still mentioned, but their influence declined
Helpers of the king	The priest, the commander, the chief queen and a few other high functionaries (Sharma)
Rajasuya	Supposed to confer supreme power on the king (Sharma); Britannica says it endowed the king with a divine charisma
Vajapeya	A chariot race, in which the royal chariot was made to win the race against the king's kinsmen (Sharma)
Ashvamedha	Meant unquestioned control over the area in which the royal horse ran uninterrupted (Sharma). NCERT Class VI: a horse was let loose to wander freely, guarded by the raja's men, and if another raja stopped it, a fight followed. Britannica: an elaborate variant of the soma sacrifice

Feature	What changed, as the sources give it
Revenue	Sharma: the chief, when elected, received voluntary presents called bali from the common people, the vis, but the chief tried to perpetuate the right to receive presents; in this period collection of taxes and tributes seems to have become common, and they were probably deposited with an officer called the sangrihitri. Upinder Singh (as cited by Wikipedia): bali, a voluntary gift in the Rigvedic period (Topic 261), became a compulsory tribute, but there was no organised system of taxation

- Witzel (as cited by Wikipedia) calls the Kuru kingdom the earliest Vedic "state"; Robert Bellah finds it hard to say whether it was a true state or a complex chiefdom.

2.5 Society

- **Varna.** Sharma lists four varnas: brahmanas, rajanyas or kshatriyas, vaishyas and shudras. NCERT Class VI names the same four and says the Shudras were expected to serve the other three. Wikipedia: the later Vedic texts fixed social boundaries, roles, status and ritual purity for each group.
- **Within the order (Sharma).** The vaishyas appear to be the only tribute-payers. The fourth varna was deprived of the sacred thread ceremony (upanayana). Some artisans, such as the rathakara (chariot-maker), enjoyed high status. The kshatriyas reacted strongly against the ritual domination of the brahmanas.
- **Gotra (Sharma).** Literally the cow-pen, the place where the cattle of the whole clan were kept. People began to practise gotra exogamy: no marriage between persons of the same gotra or lineage.
- **Ashramas (Sharma).** Four stages: brahmachari (student), grihastha (householder), vanaprastha (hermit) and sannyasin (ascetic). They were not well established in Vedic times: only the first three are mentioned in the later Vedic texts.
- **Family.** The father's power increased; he could even disinherit his son (Sharma).

- **Women: views differ.** Sharma: women were generally given a lower position, though some queens took part in coronation rituals. Upinder Singh (as cited by Wikipedia): the household became an important unit and women were relegated to subordinate roles. Olivelle (as cited by Wikipedia) notes a relatively high position for at least women of some social strata. In an NCERT-based answer, follow Sharma.

2.6 Religion

- **Gods (Sharma).** Indra and Agni, the two outstanding Rigvedic gods, lost their former importance. Prajapati, the creator, came to occupy the supreme position. Rudra, the god of animals, became important. Vishnu came to be conceived as the preserver and protector of the people. Pushan, who was supposed to look after cattle, came to be regarded as the god of the shudras.
- **Ritual.** Britannica: in the late Vedic period the complexities of ritual were emphasised; public (shrauta) rites needed many priests and three fire-altars, and the patron (yajamana) bore the expenses.
- **Cost (Sharma).** Sacrifices involved killing animals on a large scale, especially the destruction of cattle wealth. Cows were the usual sacrificial gifts, with gold, cloth and horses; sometimes the priests claimed portions of territory as dakshina.
- **Reaction.** Around 600 BCE the Upanishads were compiled, especially in the lands of the Panchalas and Videha; they criticised the rituals and stressed right belief and knowledge (Sharma). Britannica calls the Upanishads the concluding portions of the Vedas, dates them to about 700 to 500 BCE and calls them a reaction against the excessive emphasis on ritual.
- **Rudra and Topic 231.** NCERT Class XII (Topic 231) says the Rigveda does not depict Rudra as Pashupati; Sharma's "god of animals" is a later Vedic description.

Extra section: the early and later Vedic phases compared

Point	Early (Rigvedic) phase, Topic 261	Later Vedic phase
Dates (R.S. Sharma)	About 1500 to 1000 BCE	About 1000 to 500 BCE
Region	Sapta Sindhu, the land of seven rivers	Ganga-Yamuna doab (Kuru and Panchala); later Koshala and Videha
Metal	Ayas: copper or bronze (Witzel)	Shyama or krishna ayas, iron
Economy	Cattle-centred; cattle as the dominant commodity	Agriculture chief; rice (vrihi) and wheat became chief crops
Ruler	Chief (rajan), mainly a war leader	Territorial king (rashtra); office made hereditary
Assemblies	Sabha, samiti and vidatha	Vidatha gone; sabha and samiti dominated by chiefs and nobles
Bali	A voluntary gift (Upinder Singh)	Compulsory tribute (Upinder Singh)
Varna	Rigvedic words brahmana and kshatriya not tied to varna (Upinder Singh)	Four varnas with fixed boundaries; shudras denied the sacred thread
Chief gods	Indra and Agni	Prajapati supreme; Rudra and Vishnu rising

How to use the table: most later Vedic changes are the reverse of a Rigvedic feature, so learn them in pairs; but the sabha and samiti did not vanish, and bali did not become an organised tax system.

Three common exam traps

1. **"Iron came with the Rigveda."** The Rigvedic ayas is read as copper or bronze; iron, shyama or krishna ayas, appears in the later texts, first in the Atharvaveda. Its spread was gradual: about 1000 BCE in Dharwar, from about 800 BCE in western Uttar Pradesh (weapons), and the 7th century BCE in eastern Uttar Pradesh and Videha.
2. **"Koshala is not mentioned in any Vedic text."** Sharma's old NCERT says so, but the Shatapatha Brahmana names it: in the Videgha Mathava story (1.4.1.17), the Sadanira river forms the boundary of the Kosalas and Videhas. Koshala, the land associated with Rama, lay in eastern Uttar Pradesh; Videha lay in north Bihar.
3. **"Barley gave way completely to rice."** Barley continued; rice (vrihi) and wheat became the chief crops beside it. Do not confuse the date of the rice remains from Hastinapur (8th century BCE) with the date of iron in western Uttar Pradesh (about 800 BCE onwards).

Articles 20, 21 and 22: protection of life and personal liberty

Concept in one line

Article 20 protects a person in respect of conviction for offences, Article 21 forbids taking away life or personal liberty except according to procedure established by law, and Article 22 lays down safeguards on arrest and the limits of preventive detention. The examination asks for the exact words of each clause, the judgments that shaped them, and what happens to these rights during an Emergency.

Revision notes

2.1 Where these Articles stand

- Unlike Article 19, which opens "All citizens" (Topic 233), Articles 20, 21 and 22 open with "No person", so they are not limited to citizens. Articles 12 and 13 (Topic 62) apply to them as to the rest of Part III.
- Marginal headings: Article 20, "Protection in respect of conviction for offences"; Article 21, "Protection of life and personal liberty"; Article 22, "Protection against arrest and detention in certain cases". The text below is the official text as on 1 May 2024.

2.2 Article 20: three protections for a person facing a criminal charge

Clause	What it says	What it protects	Its limits
(1)	No person shall be convicted of any offence except for violating a law in force when the act was done, nor be subjected to "a penalty greater than that which might have been inflicted under the law in force at the time of the commission of the offence"	Against ex post facto criminal laws: no conviction under a law made after the act, and no heavier penalty than the law of that time allowed	Its words speak only of conviction for an "offence" and of a "penalty"
(2)	"No person shall be prosecuted and punished for the same offence more than once."	Against double jeopardy	Both words, "prosecuted and punished", must be met. In Maqbool Hussain v. State of Bombay (1953), as a later Supreme Court judgment records, the Sea Customs authorities were held "not a judicial tribunal", so a confiscation by them did not bar a later prosecution in a court
(3)	"No person accused of any offence shall be compelled to be a witness against himself."	Against compelled self-incrimination	It protects a person "accused of any offence", and only against compulsion

- **Nandini Satpathy v. P.L. Dani (7 April 1978; Justice V.R. Krishna Iyer for three judges):** Article 20(3) reaches police investigation. Compulsion is not only physical: it covers psychic and environmental pressure. Section 161(2) of

the Code of Criminal Procedure (CrPC), which lets a person refuse police questions whose answers would incriminate him, is a "parliamentary gloss on the constitutional clause". If the accused wants his lawyer present during questioning, "this facility shall not be denied".

- **Selvi v. State of Karnataka (5 May 2010; Chief Justice K.G. Balakrishnan):** compulsory narco-analysis, polygraph and Brain Electrical Activation Profile (BEAP) tests violate the right against self-incrimination (Article 20(3)) and are an unwarranted intrusion into personal liberty (Article 21). Even when a person consents, the results cannot by themselves be admitted as evidence, and the guidelines of the National Human Rights Commission (NHRC) must be strictly followed.

2.3 Article 21: from Gopalan to Maneka Gandhi

> No person shall be deprived of his life or personal liberty except according to procedure established by law.

- **A.K. Gopalan v. State of Madras (19 May 1950; six judges):** Gopalan was detained under the Preventive Detention Act, 1950. The majority read "procedure established by law" as procedure established by law made by the State. Justice Patanjali Sastri said "law" here "does not mean the jus naturale of civil law", that is, it does not mean natural law. Chief Justice Kania added that to read "law" as meaning rules of natural justice "will land one in difficulties". The majority also read Articles 19 and 21 as dealing with different subjects. Section 14 of the Act, which barred a detenu from disclosing to a court the grounds of his detention, was held void for going against Article 22(5). Justice Fazl Ali dissented: he would have read into the phrase notice, an opportunity to be heard, an impartial tribunal and an orderly course of procedure.
- **Maneka Gandhi v. Union of India (25 January 1978; seven judges):** her passport had been impounded under section 10(3)(c) of the Passports Act, 1967 "in public interest". Justice Bhagwati held that "Articles 19(1) and 21 are not mutually exclusive" and that the procedure must be "right and just and fair and not arbitrary, fanciful or oppressive". Justice Kailasam dissented.
- **What changed:** the judgment records that R.C. Cooper (the Bank Nationalisation case) had already overruled the Gopalan majority's doctrine of exclusivity. After Maneka, some law is not enough: the procedure itself must be

fair, and the law must also meet Articles 14 and 19. "Due process" is not in Article 21, but the courts now test the fairness of the procedure, much as Justice Fazl Ali had wanted in 1950.

Some rights the Court has connected with Article 21 (the full list is in Topic 612):

Right	Case and year	What the Court said
Freedom from night-time domiciliary visits by the police	Kharak Singh v. State of U.P., 1962 (18 December)	Regulation 236(b) of the U.P. Police Regulations was struck down under Article 21, though the majority said "the right of privacy is not a guaranteed right under our Constitution"; Justices Subba Rao and Shah dissented
Privacy	K.S. Puttaswamy, 2017 (24 August; nine judges, unanimous)	The right to privacy is protected under Article 21 and as part of the freedoms in Part III
Enforcement against private persons	Kaushal Kishor, 2023 (3 January)	A right under Article 19 or 21 "can be enforced even against persons other than the State or its instrumentalities"
Education	Article 21A (by amendment, not by a judgment)	Free and compulsory education for all children from six to fourteen years, as the State may by law determine; inserted by the 86th Amendment Act, 2002, in force from 1 April 2010 (Topic 642)

2.4 Article 22: arrest and preventive detention

Clause	What it says	Who is covered
(1)	A person arrested shall not be detained in custody without being informed, "as soon as may be", of the grounds of arrest, nor be denied "the right to consult, and to be defended by, a legal practitioner of his choice"	A person arrested in the ordinary way
(2)	Every person arrested and detained in custody shall be produced before the nearest magistrate "within a period of twenty-four hours of such arrest excluding the time necessary for the journey from the place of arrest to the court of the magistrate", and shall not be kept in custody beyond that period without the authority of a magistrate	The same
(3)	Clauses (1) and (2) do not apply (a) to a person who "for the time being is an enemy alien", or (b) to a person "arrested or detained under any law providing for preventive detention"	The two exceptions
(4)	No law for preventive detention shall authorise detention "for a longer period than three months" unless (a) an Advisory Board of persons who are, or have been, or are qualified to be appointed as, Judges of a High Court reports before the three months end that there is sufficient cause, or (b) the person is detained under a law made by Parliament under clause (7)	Persons held in preventive detention
(5)	The detaining authority must communicate the grounds "as soon as may be" and give the earliest opportunity to make a representation against the order	The same
(6)	The authority need not disclose facts it considers against the public interest to disclose	The same

Clause	What it says	Who is covered
(7)	Parliament may by law prescribe (a) when a person may be held longer than three months without the opinion of an Advisory Board, (b) the maximum period of detention, and (c) the procedure of an Advisory Board	Power of Parliament

- **Ordinary arrest and preventive detention:** ordinary arrest follows an alleged offence and carries clauses (1) and (2). Preventive detention holds a person to stop what he may do; clause (3)(b) takes away clauses (1) and (2), and clauses (4) to (7) apply instead.
- **The Forty-fourth Amendment's two months, never brought into force:** section 3 of the Constitution (Forty-fourth Amendment) Act, 1978 (the 44th Amendment) is to substitute a new clause (4): detention beyond "two months" would need the report of an Advisory Board constituted on the recommendation of the Chief Justice of the appropriate High Court. The official Constitution text as on 1 May 2026 prints the three-month clause and marks the new one "date yet to be notified". The same Act is to omit clause (7)(a), again with the date yet to be notified.
- **Preventive detention laws:** Gopalan's case arose under Parliament's Preventive Detention Act, 1950; clause (7) is the source of Parliament's power. The National Security Act, 1980 (Act No. 65 of 1980) lets the Central Government or a State Government detain a person to prevent him from acting in a manner prejudicial to the defence of India, among other grounds, for at most "twelve months from the date of detention". States have their own laws, for example Andhra Pradesh's Act 1 of 1986 against boot-leggers, dacoits, drug-offenders, goondas, immoral traffic offenders and land grabbers.

2.5 Arrest in practice: D.K. Basu and the new criminal procedure law

- **D.K. Basu v. State of West Bengal (judgment of 18 December 1996, reported in (1997) 1 SCC 416, so many books give the year as 1997; Justices Kuldip Singh and A.S. Anand):** the Court laid down eleven requirements for all arrests and detentions until legal provisions were made. Among them:

arresting police must bear clear identification and name tags; a memo of arrest, attested by at least one witness and countersigned by the person arrested, must record the date and time; a friend or relative must be told; the person must be medically examined "every 48 hours" in detention; he may meet his lawyer during interrogation, though "not throughout the interrogation"; and a police control room at district and State headquarters must be informed within 12 hours. An official who fails to comply faces "departmental action" and punishment for "contempt of court".

- **Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS):** in force from 1 July 2024, it replaced the Code of Criminal Procedure, 1973. Earlier judgments, such as Nandini Satpathy, refer to the CrPC. The twenty-four-hour rule is in Article 22(2) itself, so a change in the procedure law does not change it.

2.6 Articles 20 and 21 during an Emergency

- **Article 359(1):** while a Proclamation of Emergency is in operation, the President may by order suspend the right to move any court for the enforcement of the Part III rights mentioned in the order, "(except articles 20 and 21)".
- **Article 359(1A):** while such an order is in operation, the rights it mentions do not restrict the State's power to make laws or take executive action; again "(except articles 20 and 21)".
- **Who put the words in:** section 40 of the Forty-fourth Amendment Act, 1978. The 1950 text had neither these words nor clause (1A); clause (1A) itself was inserted earlier, by the Thirty-eighth Amendment Act, 1975.
- **Article 358** (Topic 233) suspends only Article 19, and only during an Emergency declared on the ground of war or external aggression. The Emergency provisions are in Topic 373.

Extra section: Articles 20 to 22 in the Supreme Court and Parliament, 1950 to 2024

Year	Event	What to remember
1950	A.K. Gopalan (19 May)	"Procedure established by law" read as procedure in law made by the State; section 14 of the Preventive Detention Act, 1950 void
1953	Maqbool Hussain	Confiscation by the Sea Customs authorities was not punishment by a court or judicial tribunal under Article 20(2)
1962	Kharak Singh (18 December)	Night-time domiciliary visits struck down under Article 21
1978	Maneka Gandhi (25 January)	Procedure must be "right and just and fair"; Articles 14, 19 and 21 read together
1978	Nandini Satpathy (7 April)	Article 20(3) reaches police investigation
1978	Forty-fourth Amendment Act (printed with the date 30 April 1979)	Articles 20 and 21 placed outside Article 359; a two-month clause (4) for Article 22 written but never notified
1996	D.K. Basu (18 December)	Eleven requirements on arrest and detention
2002	86th Amendment Act	Article 21A inserted, in force from 1 April 2010
2017	K.S. Puttaswamy (24 August)	Privacy protected under Article 21 and Part III
2023	Kaushal Kishor (3 January)	Article 19 or 21 rights enforceable against persons other than the State

Year	Event	What to remember
2024	BNSS in force (1 July)	Replaced the CrPC, 1973

- The pattern: Gopalan read Article 21 narrowly in 1950; Kharak Singh and Maneka widened it, and the Forty-fourth Amendment made sure that the Emergency cannot switch off Articles 20 and 21.

Three common exam traps

1. **"Any second proceeding for the same act is double jeopardy."** Article 20(2) needs a person to be both "prosecuted and punished", and the earlier punishment must come from a court or judicial tribunal. Proceedings before an authority that is not a judicial tribunal do not bring the clause into play.
2. **"Article 20(3) begins only when the trial begins in court."** The Supreme Court held in 1978 that it reaches the stage of police investigation, and that compulsion includes mental pressure, not only force. What the clause forbids is compulsion: it protects a person accused of an offence from being compelled to be a witness against himself.
3. **"Articles 20, 21 and 22 belong only to citizens."** Each of them speaks of a "person". A foreigner in India is protected by them, unlike the freedoms of Article 19, which belong to "All citizens". NCERT's Class XI chapter says loosely that "No citizen can be denied his or her life except by procedure as laid down under the law", but the Article's own words are "No person".

Constitutional safeguards for women: rights issues and remedies

Concept in one line

The Constitution protects women through Fundamental Rights, an enabling clause for special provisions (Article 15(3)), Directive Principles and a Fundamental Duty, reserved seats in Panchayats and Municipalities and, under the 106th Amendment, seats to be reserved in the Lok Sabha and the Legislative Assemblies after a delimitation, with remedies in the courts. The examination asks which Article provides what, the exact conditions of each reservation, and the holdings of the leading judgments.

Revision notes

2.1 Rights: what the text gives women

- The wording below is that of the official text "as on 1st May, 2024". Earlier topics: Topic 73 (Articles 14 to 18), Topic 154 (Directive Principles), Topic 212 (the SC and ST safeguards).

Article	What it provides for women	Right or directive
14	Equality before the law and the equal protection of the laws for "any person" (Topic 73)	Fundamental Right
15(1)	The State shall not discriminate against any citizen "on grounds only of religion, race, caste, sex, place of birth or any of them"	Fundamental Right
15(3)	"Nothing in this article shall prevent the State from making any special provision for women and children"	Fundamental Right; an enabling clause (2.2)

Article	What it provides for women	Right or directive
16(1)	"Equality of opportunity for all citizens in matters relating to employment or appointment to any office under the State"	Fundamental Right
16(2)	No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence or any of them, be ineligible for, or discriminated against in respect of, any employment or office under the State	Fundamental Right
23(1)	"Traffic in human beings and begar and other similar forms of forced labour are prohibited"; any contravention is an offence punishable in accordance with law	Fundamental Right
39(a)	The State shall direct its policy towards securing "that the citizens, men and women equally, have the right to an adequate means of livelihood"	Directive Principle
39(d)	"That there is equal pay for equal work for both men and women"	Directive Principle
39(e)	"That the health and strength of workers, men and women, and the tender age of children are not abused", and that citizens are not forced by economic necessity into avocations unsuited to their age or strength	Directive Principle
42	"The State shall make provision for securing just and humane conditions of work and for maternity relief"	Directive Principle
44	"The State shall endeavour to secure for the citizens a uniform civil code throughout the territory of India"	Directive Principle
51A(e)	A duty of every citizen "to renounce practices derogatory to the dignity of women"	Neither: a Fundamental Duty of citizens

2.2 Special provisions: Article 15(3) as an enabling clause

- **What "enabling" means here.** Clause (3) commands nothing. It says that nothing in Article 15 "shall prevent" the State from making a special provision for women and children. A law made under it is saved from the bar on discrimination in clause (1).
- **How the courts read it.** In Joseph Shine v Union of India (27 September 2018), the Court recorded that the earlier Yusuf Abdul Aziz case "understood the protection of women as not discriminatory but as being an affirmative provision" under Article 15(3). Joseph Shine did not treat Section 497 of the Indian Penal Code (IPC), on adultery, as such a protection: the Court said that the section "treats the woman as a chattel" and was "absolutely and manifestly arbitrary" under Article 14. So a rule framed as protecting women is still tested against Articles 14 and 21.

2.3 Safeguards in Parts IX and IXA: Panchayats and Municipalities

Point	Panchayats: Article 243D	Municipalities: Article 243T
Seats for women, clause (3)	"Not less than one-third" of the seats filled by direct election in every Panchayat, including the seats reserved for SC and ST women	The same, in every Municipality
Rotation of those seats	They "may be allotted by rotation to different constituencies in a Panchayat"	The same, in a Municipality
Offices of Chairpersons, clause (4)	Reserved for the SCs, the STs and women "in such manner as the Legislature of a State may, by law, provide". A proviso adds that "not less than one-third of the total number of offices of Chairpersons in the Panchayats at each level shall be reserved for women", and another that the reserved offices go by rotation to different Panchayats at each level	Reserved in the same way, but the clause has no proviso, so it fixes no share for women

Point	Panchayats: Article 243D	Municipalities: Article 243T
Time limit, clause (5)	The SC and ST reservation ends with the period in Article 334; the general one-third for women and the offices reserved for women are outside that limit	The same

- These match Topics 33 and 273 (in force from 24 April 1993 and 1 June 1993). How the States apply them is Topic 853.

2.4 Safeguards in the 106th Amendment: the Lok Sabha and the Assemblies

- **The Act.** The Constitution (One Hundred and Sixth Amendment) Act, 2023, which the Government called the Nari Shakti Vandan Adhiniyam when it was passed as a Bill, received the President's assent on 28 September 2023. Section 1(2): it "shall come into force on such date as the Central Government may, by notification in the Official Gazette, appoint". As reported on 17 April 2026, the Ministry of Law and Justice issued that notification on 16 April 2026, appointing 16 April 2026.

Article added	House	What it provides
239AA (2) (ba), (bb), (bc)	Legislative Assembly of the National Capital Territory of Delhi	"Seats shall be reserved for women"; one-third of the seats reserved for the SCs go to SC women; one-third of the directly elected seats, including those, go to women. Delhi has no ST clause
330A	House of the People (Lok Sabha)	"Seats shall be reserved for women"; "as nearly as may be, one-third" of the SC and ST seats under Article 330(2) for SC or ST women; and, as nearly as may be, one-third of all seats filled by direct election, including those, for women

Article added	House	What it provides
332A	Legislative Assembly of every State	The same pattern, for the Assemblies and the SC and ST seats under Article 332(3)
334A	All three Houses	When the reservation starts, how long it lasts, and rotation

- **The condition, Article 334A(1).** The clause says that "the provisions of the Constitution relating to the reservation of seats for women in the House of the People, the Legislative Assembly of a State and the Legislative Assembly of the National Capital Territory of Delhi shall come into effect after an exercise of delimitation is undertaken for this purpose after the relevant figures for the first census taken after commencement of the Constitution (One Hundred and Sixth Amendment) Act, 2023 have been published and shall cease to have effect on the expiration of a period of fifteen years from such commencement." The only commencement the clause names is that of the 106th Amendment Act; it does not say in other words from which commencement the fifteen years run.
- **Clause (2):** the seats "shall continue till such date as the Parliament may by law determine". **Clause (3):** rotation of the seats "shall take effect after each subsequent exercise of delimitation as the Parliament may by law determine".
- **Two contrasts with Part IX.** Here the share is "as nearly as may be, one-third", not "not less than one-third"; and here there is a fifteen-year period, which local bodies do not have. The Act names only the Lok Sabha, the State Assemblies and the Delhi Assembly; the Council of States and the State Legislative Councils are not in it.
- **The failed change of April 2026.** The Constitution (One Hundred and Thirty-first Amendment) Bill, 2026, introduced on 16 April 2026, would have dropped the rule that the delimitation for women's seats must follow the first census taken after commencement. On 17 April 2026 it got 298 votes to 230, short of the two-thirds majority, and fell. So Article 334A(1) stands as enacted in 2023. The amendments from the 101st to the 106th are Topic 833.

2.5 Institutions

- **National Commission for Women (NCW):** a statutory body under the National Commission for Women Act, 1990, constituted on 31 January 1992; it advises the Government on policy matters affecting women (Topic 133). The NCW and the State commissions for women are Topic 733.
- **National Human Rights Commission (NHRC):** a statutory body (Topic 103).

2.6 Remedies and the role of the courts

Remedy	Where	Basis
Writ for a Fundamental Right	Supreme Court	Article 32, only for the Fundamental Rights (Topic 112)
Writ for a Fundamental Right or "for any other purpose"	High Court	Article 226, the wider power (Topic 112)

Judgment	Date and Bench	Holding
Air India v Nergesh Meerza	28 August 1981; three judges	Ending an air hostess's service on her first pregnancy is "unconstitutional, void and violative of Article 14". The bar on marriage within four years of service was upheld; the Managing Director's unguided power to extend service was struck down
Vishaka v State of Rajasthan	13 August 1997; three judges (Verma, C.J.)	A writ under Article 32 on sexual harassment at work. The Court found a violation of Articles 14, 15 and 21, used the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) to read them, and laid down guidelines, "binding and enforceable in law until suitable legislation is enacted", as law declared under Article 141
Shayara Bano v Union of India	22 August 2017; five judges; 3 to 2	Instant triple talaq (talaq-e-biddat) set aside. Two of the three majority judges (Nariman and Lalit, JJ.) held it "manifestly arbitrary" and violative of Article 14; the third (Kurian Joseph, J.) held it invalid as against the Quran

Judgment	Date and Bench	Holding
Joseph Shine v Union of India	27 September 2018; five judges; unanimous	Section 497 IPC (adultery) struck down as violating Articles 14, 15 and 21; Section 198(2) of the Code of Criminal Procedure struck down to the extent it applied to Section 497
Secretary, Ministry of Defence v Babita Puniya	17 February 2020; two judges (Chandrachud and Rastogi, JJ.)	An absolute bar on women officers in the Army being considered for command appointments cannot be sustained; all serving Short Service Commission women officers to be considered for permanent commission whatever their years of service; compliance within three months. The Court called the Union's line of submission "disturbing" and found in it "sex stereotypes premised on assumptions about socially ascribed roles of gender"

- **The role of the courts in one line:** they fill a gap until Parliament acts (Vishaka), test rules framed as protection against Article 14 (Nergesh Meerza, Joseph Shine), and set aside practices that are arbitrary (Shayara Bano). The laws that followed are Topic 492.

2.7 Rights issues today

Issue	Position, with its date	Point to remember
Representation	74 women were elected to the Lok Sabha in 2024, 13.6 per cent of 543 seats, down from 78 (14.4 per cent) in 2019 (All India Radio, 25 June 2024; PRS Legislative Research)	The 106th Amendment's seats wait for the delimitation in Article 334A(1)
Personal laws and Article 44	The uniform civil code is a Directive Principle, which no court can enforce (Topic 154); Shayara Bano (2017) set aside instant triple talaq	A court can test a practice; implementation of a code requires legislation by the competent legislature, subject to the Constitution

Extra section: women's safeguards in order of time, 1950 to 2026

Year	Event	What to remember
1950	The Constitution commences on 26 January	Article 15(3) has stood since then, with no amending footnote (Topic 73)
1976	42nd Amendment	Adds the Fundamental Duties; Article 51A(e), renouncing practices derogatory to the dignity of women, is one of them
1981	Nergesh Meerza, 28 August	First-pregnancy rule struck down under Article 14
1990	National Commission for Women Act	The NCW is constituted on 31 January 1992
1993	73rd and 74th Amendments in force	24 April 1993 (Panchayats) and 1 June 1993 (Municipalities): not less than one-third of seats for women
1997	Vishaka, 13 August	Workplace guidelines binding until a law is made
2017	Shayara Bano, 22 August	Instant triple talaq set aside, 3 to 2
2018	Joseph Shine, 27 September	Section 497 IPC struck down
2020	Army permanent commission case, 17 February	Absolute bar on women officers in command appointments set aside
2023	106th Amendment, assent on 28 September	Articles 239AA(2)(ba) to (bc), 330A, 332A and 334A
2024	18th Lok Sabha	74 women, 13.6 per cent

Year	Event	What to remember
2026	16 April: the 106th Amendment Act notified; 17 April: the 131st Amendment Bill falls	The Act is in force, but the seats still wait for the delimitation after the first census after commencement

- The pattern: in 1993 the reservation for women came into force with the Parts themselves; in 2023 the Constitution was amended at once, but the seats were tied to a later delimitation.

Three common exam traps

1. **"Women's seats in the Lok Sabha came in 2023."** Only the amendment did: assent on 28 September 2023, and the Act itself was brought into force on 16 April 2026. The seats come into effect only after a delimitation done after the figures of the first census taken after commencement are published. The Bill of April 2026 that would have removed this link was defeated.
2. **"The ban on trafficking and forced labour binds only the State."** Article 23 is one of the rights that the Supreme Court has called enforceable "against the whole world" (People's Union for Democratic Rights, 1982; Topic 73). A private employer or trafficker is covered, and the contravention is an offence punishable in accordance with law.
3. **"Every women's reservation ends after a fixed period."** In Panchayats and Municipalities, clause (5) of Articles 243D and 243T ends only the SC and ST reservation with the period of Article 334; the general one-third for women has no end date. The 106th Amendment is the one with a period: fifteen years, and the seats continue till such date as Parliament may by law determine.

Rural employment guarantee: from MGNREGA to the present law

Concept in one line

India's rural employment guarantee was given by law in the Mahatma Gandhi National Rural Employment Guarantee Act, 2005 (MGNREGA), with at least 100 days of unskilled manual work a year for every rural household whose adult members volunteer for it; as on 1 November 2026 the law in force is the Viksit Bharat-Guarantee for Rozgar and Ajeevika Mission (Gramin) Act, 2025 (VB-G RAM G Act), in force from 1 July 2026, which guarantees not less than 125 days. The examination asks for the design of each Act, how they differ, and the dates.

Revision notes

Recall: Topic 93 taught how poverty is measured (poverty lines and the MPI), and Topic 135 taught the types of unemployment, among them seasonal and disguised unemployment, and how the PLFS measures it. Wage employment is one answer to both.

2.1 Where the guarantee came from

- **Maharashtra, 1972:** an Employment Guarantee Scheme was sanctioned by a Government Resolution of the Maharashtra Government dated 28 March 1972. It was later placed in the Maharashtra Employment Guarantee Act, 1977. The Zilla Parishad of Ahmednagar records that the Government of India took a cue from this State law.
- **National Food for Work Programme (NFFWP):** the Ministry of Rural Development announced it in October 2004 for 150 districts, as a 100 per cent centrally sponsored scheme. The same release said a National Employment Guarantee Act would be enacted.
- **The Act:** the National Rural Employment Guarantee Act, 2005 (Act No. 42 of 2005) is dated 5 September 2005. Section 1(3) let the Centre bring it into force on different dates for different areas.

- **Phases, as the Ministry of Rural Development gives them:** it came into force on 2 February 2006 in 200 districts (Phase I); 130 more districts were added in 2007-08 (Phase II, from 1 April 2007); and it covered all the districts from 1 April 2008 (Phase III, the remaining 285 rural districts).
- **Renaming:** the amending Act 46 of 2009 added "Mahatma Gandhi" to the name, with effect from 2 October 2009.

2.2 The design of MGNREGA (the 2005 Act, with later changes marked in their rows)

Feature	What the Act said
The guarantee	Not less than 100 days of work in a financial year to every household whose adult members volunteer to do unskilled manual work (section 3(1))
Who registers	Adult members of a household living in a rural area and willing to do unskilled manual work; a job card is issued within 15 days of the application (Schedule II)
Nature	Demand-driven: work follows the demand of the workers. The Union Budget notes call it "a demand driven programme"
Time limit	Work within 15 days of the receipt of an application (Schedule II)
Unemployment allowance	If work is not given within 15 days: not less than one-fourth of the wage rate for the first 30 days in the financial year, and not less than one-half for the rest of the year (section 7). The State bears its cost (section 22(2))
Distance	Work within a radius of 5 km of the village; if work is given beyond it, 10 per cent of the wage rate is paid as extra wages (Schedule II)
Wage and material	Material cost, including the wages of skilled and semi-skilled workers, not to exceed 40 per cent at the district level (Schedule I, as substituted in 2016). This is the wage to material ratio of 60:40
Centre's share	All the wages for unskilled manual work, and up to three-fourths of the material cost (section 22(1))

Feature	What the Act said
Works through Gram Panchayats	At least 50 per cent of the works in terms of cost (section 16(5))
Social audit	The Gram Sabha conducts regular social audits of all the projects under the Scheme (section 17(2))
Women	Priority to women, so that at least one-third of the beneficiaries are women who have registered and requested for work (Schedule II)
Name	"Mahatma Gandhi" added from 2 October 2009

2.3 The present law, as on 1 November 2026

- **Passage:** Parliament passed the VB-G RAM G Bill on 18 December 2025; the Rajya Sabha passed it by voice vote hours after the Lok Sabha.
- **The Act:** Act No. 36 of 2025, dated 20 December 2025.
- **Commencement:** 1 July 2026, under notification S.O. 2382(E) of 11 May 2026 (section 1(2)).
- **Repeal of MGNREGA:** section 37(1) repeals the 2005 Act with all its rules, notifications, schemes, orders and guidelines from a date the Centre appoints. Notification S.O. 2383(E) of 11 May 2026 appointed 1 July 2026.
- **Transition:** Job Cards of workers who have completed e-KYC stay valid until Gramin Rozgar Guarantee Cards are issued, and ongoing MGNREGA works may continue under the new Act (PIB, 11 May 2026). Employment generated and wage liability accrued under the old Act are treated as done under the new one (section 37(2)), and its assets, liabilities and funds pass to the new authorities (section 37(5)).
- **Schemes and rules:** each State Government must make its Scheme within six months of commencement (section 3(1)); Tamil Nadu, for one, notified its Scheme with effect from 1 July 2026. The parameters of the normative allocation are left to rules of the Central Government (section 4(5)); draft rules were published for comments on 22 May 2026 (G.S.R. 396(E)).

- **Peak farm seasons:** no work is started or carried on during peak agricultural seasons. The State notifies in advance a period aggregating to sixty days in a financial year, covering sowing and harvesting (section 6). It may notify different periods for different districts, blocks or Gram Panchayats.
- **Gram Panchayat:** every work must come from a Viksit Gram Panchayat Plan, prepared by the Gram Panchayat (sections 4(1) and 4(3)). The plans add up to the Viksit Bharat National Rural Infrastructure Stack (section 4(2)).

2.4 MGNREGA and the present law compared

Feature	MGNREGA, 2005 (repealed from 1 July 2026)	VB-G RAM G Act, 2025
In force	2 February 2006 to 30 June 2026; repealed from 1 July 2026 (S.O. 2383(E))	From 1 July 2026 (S.O. 2382(E))
Guaranteed days in a financial year	Not less than 100 (section 3(1))	Not less than 125 (section 5(1)); more within economic capacity (section 5(4))
Centre to State sharing	Centre: all unskilled wages and up to three-fourths of material cost; State: the unemployment allowance	A Centrally Sponsored Scheme (section 22(1)): 60:40 for most States and Union territories with a legislature; 90:10 for the North Eastern States, Uttarakhand, Himachal Pradesh and Jammu and Kashmir; the whole cost in Union territories without a legislature (sections 22(2), 22(3))
How much the Centre gives	Demand-driven	State-wise normative allocation fixed by the Centre each year; spending above it is borne by the State (sections 4(5), 4(6))

Kept unchanged in the new Act, with its own section numbers: the unemployment allowance after 15 days at the same minimum rates (section 11), now paid by the State together with delay compensation (section 22(8)); the material cost ceiling of 40 per cent at the District level (Schedule I); at least 50 per cent of the works by cost through Gram Panchayats (section 19(e)); regular social audits by the Gram Sabha (section 20(2)); and, in Schedule II, at least one-third women among the beneficiaries, the 5 km radius and the 10 per cent extra wages beyond it.

2.5 The record of MGNREGA

Indicator	Figure	Year and source
Person-days generated	290.60 crore	2024-25 (PIB, 26 August 2025)
Women's share of person-days	58.15 per cent, up from 48 per cent in 2013-14	2024-25 (PIB, 26 August 2025)
Workers employed	7.88 crore, down from 11.17 crore in 2020-21	2024-25 (Lok Sabha reply, 22 July 2025)
Average days of work per household	50 in 2024-25; 43 in 2025-26, the lowest in a decade	Lok Sabha reply of the Minister, 28 July 2026, as reported by PTI
Households completing 100 days	Fewer than 10 per cent of the households that worked	PRS, Demand for Grants analysis 2026-27

- Against a guarantee of 100 days, the average household got 43 days in 2025-26, less than half.
- The Centre notifies wage rates State by State. Andhra Pradesh's notified rate for unskilled work was Rs 300 a day in 2024-25 (Lok Sabha reply, 22 July 2025).

2.6 Issues, each with its source

- **Delayed and low wages:** the Ministry told the Lok Sabha (22 July 2025) that more than 96 per cent of fund transfer orders were generated within 15 days of the closure of the muster roll over the last five years, and that wage liabilities up to 2024-25 were cleared. PRS notes that in 2025-26 (data to

December 2025) the wage actually paid was below the notified rate in 20 of 31 States and Union territories. The Standing Committee on Rural Development and Panchayati Raj found wages inadequate and asked for a new base year in place of 2009-10 (37th Report, February 2024).

- **Unemployment allowance:** only about 8 per cent of the allowance due from 2019 to 2025 was paid, and 2 per cent in 2025-26 (to February 2026) (PRS).
- **Aadhaar-based payment:** the Aadhaar Payment Bridge System (APBS) was made mandatory for wage payment from 1 January 2024, so that payments are not upset when a worker changes a bank account. In 2024-25 (to 5 December 2024), 97.59 per cent of transactions went through it (Lok Sabha reply, 10 December 2024).
- **Funding:** over the last five years the Centre bore about 90 per cent of the spending; PRS expects the States' spending to rise under the 60:40 pattern.
- **Social audit:** PIB (26 August 2025) says the social audit of every Gram Panchayat must be held at least twice a year, but by December 2025 only 1.7 lakh of 2.7 lakh Gram Panchayats (63 per cent) had completed even one in 2025-26 (PRS). The new Act requires the Gram Panchayat to give the Gram Sabha all records, including geo-tagged photographs, for the audit (section 20(3)).

2.7 Money and the debate

- **Union Budget 2026-27 (Demand No. 87, Department of Rural Development):** Viksit Bharat-G RAM G Scheme Rs 95,692.31 crore; Mahatma Gandhi NREGA Rs 30,000 crore. For MGNREGA, the actual spending in 2024-25 was Rs 85,834.40 crore and the revised estimate for 2025-26 Rs 88,000 crore.
- With the States' share, the total outlay for 2026-27 is expected to exceed Rs 1.51 lakh crore, and administrative expenditure rises from 6 to 9 per cent (PIB, 11 May 2026).
- **Government's case:** the Act moves from a standalone welfare intervention to an integrated instrument of development and resilient infrastructure, in line with Viksit Bharat @2047 (PIB). The Minister told Parliament the Bill would fix the old scheme's shortcomings, and that the name "Mahatma Gandhi" was added in 2009 for electoral gain.

- **Opposition's case (reported 19 December 2025):** it objected to dropping Mahatma Gandhi's name, said the Bill put a financial burden on the States, and wanted it sent to a parliamentary committee.

2.8 Andhra Pradesh, and what comes later

- **AP in a line:** Andhra Pradesh generated 241.07 crore person-days from 2014-15 to 2024-25 (to 5 December 2024), and 99.6 per cent of its wage transactions in 2024-25 went through APBS (Lok Sabha reply, 10 December 2024).
- NRLM and self-employment schemes: Topic 435. Poverty eradication programmes since independence: Topic 614.

Extra section: chronology

Date	Event
28 March 1972	Maharashtra's Employment Guarantee Scheme sanctioned
1977	Maharashtra Employment Guarantee Act
October 2004	National Food for Work Programme announced for 150 districts
5 September 2005	National Rural Employment Guarantee Act, 2005
2 February 2006	In force in 200 districts
1 April 2007	130 more districts
1 April 2008	All districts
2 October 2009	Renamed with "Mahatma Gandhi"
1 January 2024	APBS mandatory for wages
18 December 2025	Parliament passes the VB-G RAM G Bill
20 December 2025	Act No. 36 of 2025

Date	Event
11 May 2026	Notifications fix the dates of commencement and repeal
1 July 2026	VB-G RAM G Act in force; MGNREGA repealed
28 July 2026	Lok Sabha told the average for 2025-26 was 43 days a household
Within six months of 1 July 2026	Each State to make its Scheme

Three common exam traps

1. **"125 days" is a floor, and the dates differ.** The new Act says "not less than" 125 days, and lets the Centre or a State give more. It was passed in December 2025 but came into force only on 1 July 2026, the same day MGNREGA was repealed.
2. **Two different "60:40"s.** Under both Acts material cost is capped at 40 per cent at the district level, not for each work: that is the wage to material 60:40. The new Act adds a second 60:40, the sharing of cost between the Centre and most States, where MGNREGA had the Centre bear all unskilled wages.
3. **The guarantee is for a household, not for each person.** The days belong to the household; the actual average was far below the guarantee, 50 days in 2024-25 and 43 in 2025-26.

Five Year Plans: First to Fifth, models and targets

Concept in one line

India's first five Five Year Plans ran from 1951 to 1978, with a break of three Annual Plans from 1966 to 1969, and each had its own model or approach, priorities, growth target and main events. The exam asks which Plan went with which model, project, event and growth record.

Revision notes

Recall in a line each. Topic 255: the four goals of the plans in NCERT were growth, modernisation, self-reliance and equity; the Planning Commission was set up on 15 March 1950 by a Resolution of the Government of India, through the Cabinet, and the National Development Council (NDC) on 6 August 1952. Topic 35: NITI Aayog replaced the Planning Commission on 1 January 2015. Topic 155: the Industrial Policy of 1991, the later contrast to the State-led industry of these Plans. Topic 185: the Green Revolution and the drought of 1965-66. Topic 213: growth is a rise in output; development adds qualitative change. Later days: the Sixth to Twelfth Plans (Topic 405) and the achievements and failures of planning (Topic 684).

2.1 The start and the machinery

- NCERT (Class XII) says the Planning Commission "was set up in March, 1950 by a simple resolution of the Government of India." NCERT (Class XI) says it was set up "with the Prime Minister as its Chairperson". Jawaharlal Nehru was its first Chairman.
- The Plans were drafted by the Commission; Topic 255 showed that the NDC gave the final approval.
- D.R. Gadgil was the Commission's Deputy Chairman in the Fourth Plan's early years; he gave up the post on 2 May 1971. The **Gadgil formula** of 1969 was a set of guidelines for sharing central assistance among the States in the Fourth and Fifth Plans. It was not a growth model.

2.2 The two models

Point	Harrod-Domar model	Mahalanobis model
Who and when	Roy Harrod (1939) and Evsey Domar (1946)	P.C. Mahalanobis, in 1953
What it assumed	Output depends on the capital stock alone, and the marginal product of capital is constant; so the growth of output equals the savings rate times the marginal product of capital, minus depreciation	A closed economy, that is, an inward-looking trade policy, under which imports would be mainly capital goods; it sought the best division of investment among the producing sectors
Plan based on it	The First Plan, "with few modifications"	The Second Plan

- In short: Harrod-Domar ties growth to saving and investment; Mahalanobis decides which sectors the investment should go to.
- MoSPI's chapter on the Five Year Plans adds that the Second Plan again used the Harrod-Domar model for its overall projections, and the Mahalanobis model to divide resources among sectors such as agriculture and industry.
- NCERT (Class XI) says planning "in the real sense of the term, began with the Second Five Year Plan", and calls Mahalanobis the "architect of Indian planning". NCERT (Class XII) calls him the architect of the Second Plan and a supporter of rapid industrialisation and of an active role for the public sector.

2.3 The first five Plans at a glance

Growth figures in this table are per cent a year, as the Ministry of Planning gave them in the Lok Sabha on 29 August 2001. Section 2.4 gives the other official figures.

Plan	Model or approach	Priority	Target	Actual	Key events
First (1951-56)	Harrod-Domar model	Agriculture: the agrarian sector, with dams and irrigation	2.1	3.61	Huge allocations for projects such as the Bhakra Nangal Dam; the Hirakud and Damodar Valley dams
Second (1956-61)	Mahalanobis model	Heavy industries and quick structural change	4.5	4.27	Steel plants at Bhilai, Durgapur and Rourkela, built with help from the Soviet Union (Bhilai), Britain (Durgapur) and West Germany (Rourkela)
Third (1961-66)	Not significantly different from the Second, says NCERT	Continued the Second's line	5.6	2.84	The war with China of 1962 and the hostilities of 1965, followed by two bad harvests
Annual Plans (1966-69)	Three one-year plans, the 'plan holiday'	Agriculture and industry	No target	No figure in this table	The rupee devalued in June 1966; drought in 1966-67
Fourth (1969-74)	"Growth with stability" and the progressive achievement of self-reliance	Stability with growth; the new strategy for agriculture	5.7	3.30	The 14 largest commercial banks nationalised from 19 July 1969; the Green Revolution

Plan	Model or approach	Priority	Target	Actual	Key events
Fifth (1974-79 as planned; ended in March 1978)	Attack on poverty	Minimum needs and employment	4.4	4.80	Minimum Needs Programme from its first year; cut short in 1978 by the Janata Government

2.4 Targets and actual growth: what the sources say

The figures differ from one official source to another, because they were worked out at different times and on different bases.

Plan	Target	Lok Sabha answer, 2001	Sixth Plan document, Table 1.1	MoSPI compendium, Table 15.1
First	2.1	3.61	3.6	3.5
Second	4.5	4.27	4.0	4.2
Third	5.6	2.84	2.2	2.8
Fourth	5.7	3.30	3.3	3.2
Fifth	4.4	4.80	5.2	4.7

- **Bases.** The targets of the First to Third Plans were set for national income, the Fourth Plan's for net domestic product (NDP), and later ones for gross domestic product (GDP). MoSPI's actual figures are growth of GDP at factor cost.
- The Fourth Plan document itself speaks of "an average annual increase of about 5.5 per cent in total production"; the tables give 5.7 per cent, the target for NDP.

- Wikipedia gives 3.6, 4.27, 2.4, 3.3 and 4.8 as the actual figures, and 5.6 as the Fourth Plan's target.
- What all the sources agree on: the First and Fifth Plans did better than their targets; the Second, Third and Fourth fell short; the Third did worst. When a question gives one set of figures, answer with that set; if you must choose, take the Lok Sabha figures.

2.5 The Plans one by one

- **First Plan (1951-56).** NCERT (Class XII): it "sought to get the country's economy out of the cycle of poverty" and "addressed, mainly, the agrarian sector including investment in dams and irrigation". The Second Plan document says national income rose by "some 18 per cent" over the five years, and foodgrain output by 20 per cent.
- **Second Plan (1956-61).** NCERT (Class XII): "The Second FYP stressed on heavy industries"; "If the first plan had preached patience, the second wanted to bring about quick structural transformation." The Plan itself speaks of a "shift in emphasis towards industrialisation" and an investment of Rs 6,200 crore. Preliminary work on the three steel plants was done in the First Plan; their building fell to the Second. NCERT (Class XI) recalls that the State was to control "the commanding heights of the economy, as the Second Five Year plan put it."
- **Third Plan (1961-66).** The Fourth Plan document says that industry grew by 8.2 per cent a year against a target of 11 per cent, and that real income per head in 1965-66 was about the same as in 1960-61.
- **Annual Plans (1966-69).** NCERT (Class XII): the Fourth Plan "was due to start in 1966", but "The government decided to take a 'plan holiday'." Three Annual Plans followed, and the Fourth Plan began in 1969. National income rose by only 0.9 per cent in 1966-67, after a severe drought.
- **Fourth Plan (1969-74).** Its document says: "Growth with stability should remain the objective of the Perspective Plan, as it is of the Fourth Plan." The Government nationalised the 14 largest commercial banks from midnight of 19 July 1969, by an Ordinance. NCERT (Class XII) adds that the green revolution "delivered only a moderate agricultural growth".

- **Fifth Plan (1974-79 as planned).** The Minimum Needs Programme was introduced in its first year. Its parts included elementary education, rural health, rural water supply, rural roads, rural electrification, house sites for landless labourers and the improvement of urban slums. MoSPI's chapter on the Five Year Plans gives its two main objectives as "removal of poverty" (Garibi Hatao) and "attainment of self reliance". On 16 November 1977, Prime Minister Morarji Desai told the Lok Sabha that the Fifth Plan should end with the financial year ending in March 1978, and that a new plan for 1978 to 1983 should begin in April 1978. He called this "the concept of the Rolling Plan": at the end of each year the plan adds one more year. Topic 255 noted that the next government rejected that plan in 1980.

2.6 The 'Hindu rate of growth'

- The phrase is credited to the economist Raj Krishna. It describes the slow growth of about 3.5 per cent a year from the 1950s to the late 1970s. Sources differ on when he first used it: the mid-1970s, 1978 or 1982.
- The Sixth Plan document gives the same figure in plain words: "the underlying trend rate of growth of national income was 3.5 per cent".

Extra section: a chronology, 1950 to 1980

Date	Event
15 March 1950	The Planning Commission is set up
1951	The First Plan begins
6 August 1952	The National Development Council is set up
1953	Mahalanobis works out his model
1956	The Second Plan begins
1961	The Third Plan begins
1962	War with China
1965	Hostilities with Pakistan, followed by two bad harvests

Date	Event
June 1966	The rupee is devalued, after the Third Plan has ended
1966 to 1969	Three Annual Plans, the 'plan holiday'
1969	The Fourth Plan begins; the Gadgil formula for central assistance
19 July 1969	The 14 largest commercial banks are nationalised
2 May 1971	Gadgil gives up the post of Deputy Chairman
1974	The Fifth Plan begins; the Minimum Needs Programme starts
16 November 1977	The Prime Minister announces the early end of the Fifth Plan
March 1978	The Fifth Plan ends
April 1978	A new plan for 1978 to 1983 begins, as a rolling plan
1980	The next government rejects the plan of 1978

Three common exam traps

1. **Taking one growth figure as the only one.** The Third Plan's actual growth is 2.84 per cent in the Lok Sabha answer of 2001, 2.8 in MoSPI's table, 2.2 in the Sixth Plan document and 2.4 in Wikipedia. The Fourth Plan's target is 5.7 per cent in the tables, but its own document speaks of about 5.5 per cent. Match the figure to the source the question uses.
2. **Thinking the Fourth Plan followed the Third at once.** NCERT says the Fourth Plan was due in 1966, but a 'plan holiday' came first: three Annual Plans from 1966 to 1969. The Fourth Plan ran from 1969 to 1974.
3. **Taking the Gadgil formula for a growth model.** The Gadgil formula of 1969 was a set of guidelines for sharing central assistance among the States in the Fourth and Fifth Plans. It said nothing about how fast the economy should grow.

Continental drift and plate tectonics

Concept in one line

Continental drift (Alfred Wegener, 1912) held that all the continents once formed one supercontinent, Pangaea, which broke up and drifted apart; sea-floor spreading and plate tectonics (1967) later explained the movement as that of rigid lithospheric plates. The examination asks for the names and dates, the evidence, NCERT's list of plates and the types of plate boundaries with their examples.

Revision notes

2.1 From continental drift to plate tectonics: a short timeline

Year	Who	What (as NCERT gives it, unless another source is named)
1596	Abraham Ortelius	First suggested that the Americas, Europe and Africa were once joined (NCERT; the USGS also dates the idea to 1596)
1912	Alfred Wegener, a German meteorologist	Put forth the continental drift theory. Britannica: he first presented it in lectures in 1912 and published it in full in 1915 in *The Origin of Continents and Oceans*
1930s	Arthur Holmes	Discussed convection currents operating in the mantle
1961	Harry Hess	Proposed sea-floor spreading
1964	Bullard	Presented a computer fit of the Atlantic coastlines

Year	Who	What (as NCERT gives it, unless another source is named)
1967	McKenzie and Parker, and also Morgan, independently	Put forward the concept of plate tectonics

2.2 Wegener's continental drift

- All the continents formed one continental mass, the super continent **Pangaea** ("all earth"), surrounded by one mega-ocean, **Panthalassa** ("all water") (NCERT).
- Around 200 million years ago Pangaea began to split, first into two large masses: **Laurasia** (the northern component) and **Gondwanaland** (the southern component).
- Topic 136 recalled that the Peninsular Plateau was formed by the breaking and drifting of the Gondwana land.

2.3 The evidence for drift (NCERT)

Evidence	What NCERT says
Matching of continents (jig-saw fit)	The coastlines on the two sides of the Atlantic fit together. Bullard (1964) made a computer map of the fit, tried at the 1,000-fathom line instead of the present shoreline
Rocks of the same age across the oceans	A belt of ancient rocks, 2,000 million years old, on the Brazil coast matches rocks in western Africa

Evidence	What NCERT says
Tillite	Glacial tillite gives unambiguous evidence of past climates (palaeoclimates). NCERT says the Gondwana sediments of India have counterparts in "six different landmasses of the Southern Hemisphere", and names five of them: Africa, the Falkland Islands, Madagascar, Antarctica and Australia
Placer deposits	NCERT says the rich placer deposits of gold on the Ghana coast are derived from the Brazil plateau, across the Atlantic
Distribution of fossils	Lemurs occur in India, Madagascar and Africa, which led some to imagine a land "Lemuria" linking the three. Skeletons of Mesosaurus, a small reptile of shallow brackish water, are found only in the Southern Cape province of South Africa and in the Iraver formations of Brazil (so spelt in NCERT; this rock unit is usually called the Irati Formation), now 4,800 km apart with an ocean between them

- **Glossopteris** is not named in the NCERT chapter. The USGS cites fossil ferns, Glossopteris, found in regions that are now polar, as part of the case for drift.

2.4 The force for drifting, and why the theory was rejected

- **Wegener's two forces (NCERT):** the **pole-fleeing force** (the next paragraph spells it "polar-fleeing"), which relates to the rotation of the earth, and the **tidal force**, due to the attraction of the moon and the sun.
- NCERT: most scholars considered these forces to be totally inadequate.
- **USGS:** the main objection was the lack of a mechanism: what forces could move such large masses of solid rock over such great distances? Harold Jeffreys argued that solid rock could not plough through the ocean floor without breaking up.
- **Britannica:** his driving forces seemed implausible, and by 1930 most geologists had dismissed the theory. It was revived as part of plate tectonics in the 1960s.

2.5 Convection currents and the ocean floor

- **Holmes (1930s):** convection currents operate in the mantle. They are generated by radioactive elements that cause thermal differences in the mantle, and there is a system of such currents in the entire mantle (NCERT).
- **Mapping the ocean floor:** NCERT divides the ocean floor here into three major divisions: continental margins, deep-sea basins and mid-ocean ridges. (Topic 144 used the fuller division of the ocean floor chapter: the continental shelf, the continental slope, the deep sea plain and the oceanic deeps or trenches, with the mid-oceanic ridge as a minor feature.)
- The mid-oceanic ridges were found to be the most active areas of volcanic eruption (NCERT).

2.6 Sea-floor spreading (Hess, 1961)

What NCERT says the study of the ocean floor showed:

- Rocks on either side of the crest of a mid-oceanic ridge, at equal distances from it, are similar in age and composition.
- "Rocks closer to the mid-oceanic ridges have normal polarity and are the youngest." Rocks grow older away from the crest. (The USGS adds that the magnetic stripes suggest the earth's magnetic field has reversed many times.)
- Most oceanic crust is younger than about 200 million years; older remnants are inferred. This is not a universal ceiling for ocean-floor sediment. Some continental formations are 3,200 million years old.

Hess's explanation (NCERT):

- Constant eruptions at the crest of the ridges bring up new lava. This forms new oceanic crust and pushes the crust on either side apart.
- The young age of the oceanic crust, and the fact that the spreading of one ocean does not cause the shrinking of another, made Hess think about the consumption of the oceanic crust. He held that the ocean floor that is pushed away sinks down at the oceanic trenches and gets consumed.
- The USGS adds that most geologists believe the earth has changed little, if at all, in size since its formation.

2.7 Plate tectonics (1967)

- **A plate (NCERT):** a massive, irregularly-shaped slab of solid rock. The lithosphere, made of the crust and the top mantle, is broken into plates.
- Lithosphere thickness varies with age and setting. USGS gives less than 15 km for young oceanic lithosphere to about 200 km or more beneath ancient continents. The full lithosphere includes crust and rigid upper mantle; crustal thickness is not lithosphere thickness.
- A plate is called continental or oceanic according to which of the two occupies the larger part of it.
- Plates move horizontally over the asthenosphere as rigid units. "Continents are part of a plate and what moves is the plate" (NCERT). Wegener had thought that the continents themselves moved.
- **What moves the plates (NCERT):** the slow movement of the hot, softened mantle below the rigid plates is the driving force. The mantle moves in convection cells, heated by radioactive decay and residual heat.

Major plates (NCERT: seven)	Minor plates (NCERT)
1. Antarctica and the surrounding oceanic plate	Cocos plate: between Central America and the Pacific plate
2. North American plate	Nazca plate: between South America and the Pacific plate
3. South American plate	Arabian plate: mostly the Saudi Arabian landmass
4. Pacific plate	Philippine plate: between the Asiatic and the Pacific plate
5. India-Australia-New Zealand plate	Caroline plate: between the Philippine and the Indian plate, north of New Guinea
6. Africa with the eastern Atlantic floor plate	Fiji microplate: between the Pacific and Indo-Australian plates
7. Eurasia and the adjacent oceanic plate	

2.8 The three types of plate boundaries

Type	Motion (NCERT)	Landform	Example
Divergent	Plates pull away from each other and new crust is generated. NCERT calls these spreading sites	Mid-oceanic ridge; on land, a rift may open	Mid-Atlantic Ridge, NCERT's best-known example. The USGS adds Iceland, which is splitting along the spreading centre between the North American and Eurasian plates, and the East African Rift, where a new spreading centre may be developing
Convergent	Crust is destroyed as one plate dives under another. The place where a plate sinks is a subduction zone. NCERT gives three ways: (i) an oceanic and a continental plate; (ii) two oceanic plates; (iii) two continental plates	Trenches where a plate sinks (USGS); mountains	(i) The Nazca plate is subducted under South America, raising the Andes, with the Peru-Chile Trench offshore (USGS). (ii) The Mariana Trench, where the Pacific plate converges against the Philippine plate, with island arcs such as the Marianas and the Aleutians (USGS). (iii) The Himalayas, at the northern boundary of the Indian plate (NCERT)
Transform	Crust is neither produced nor destroyed as the plates slide horizontally past each other	Transform faults: NCERT calls them planes of separation, generally perpendicular to the mid-oceanic ridges	San Andreas Fault, where the Pacific plate has been grinding past the North American plate for 10 million years (USGS)

- The USGS adds a fourth category, plate boundary zones: broad belts in which the boundaries are not well defined.

2.9 Rates of plate movement

- NCERT: the Arctic Ridge has the slowest rate, less than 2.5 cm a year. The East Pacific Rise near Easter Island, in the South Pacific about 3,400 km west of Chile, has the fastest, more than 15 cm a year.
- The USGS gives the spreading along the Mid-Atlantic Ridge as averaging about 2.5 cm a year.

2.10 The Indian plate

- It includes Peninsular India and the Australian continental portions (NCERT), which is why NCERT's major plate is the India-Australia-New Zealand plate.
- **Boundaries (NCERT):** the northern boundary is the subduction zone along the Himalayas, a continent-continent convergence. The eastern boundary is a spreading site east of Australia, an oceanic ridge in the south-west Pacific. The western boundary follows the Kirthar Mountain of Pakistan and the Makrana coast (so spelt in NCERT; usually written Makran, the southern coastal region of Iran and Pakistan), and joins the spreading site from the Red Sea rift running south-east along the Chagos Archipelago.
- Its journey is set out in Section 3.

2.11 The link to earthquakes and volcanoes

- NCERT's map shows a line of earthquake and volcano dots in the central Atlantic, almost parallel to the coastlines, and a belt that coincides with the Alpine-Himalayan system and the rim of the Pacific Ocean, which NCERT calls the "rim of fire" and the USGS the circum-Pacific Ring of Fire.
- Topic 6 taught the layers of the earth and Topic 194 the Himalayas. Earthquakes (Topic 406), volcanoes (Topic 444), rocks (Topic 466), mountains (Topic 494) and the seismic zones of India (Topic 536) come later.

Extra section: the Indian plate’s journey (corrected chronology)

About how long ago	What happened
225 million years	At about 225 million years ago, India remained part of Gondwana. It was not yet an isolated island off Australia. The Tethys separated Gondwana from the northern landmasses; later breakup and northward movement occurred in stages.
200 million years	Pangaea began to break up. This date does not mark India’s independent separation from Antarctica and Australia.
130 million years	India separated from Antarctica and Australia around this time. The exact chronology depends on the reconstruction.
71 million years	NCERT's map shows the positions of India from about this time to the present
66 million years	The main phase of Deccan volcanism occurred around 66 million years ago, when India was near the equator. This is not the onset of every Deccan eruption.
40 to 50 million years	India collided with Asia, causing rapid uplift of the Himalayas. The USGS gives the collision as 50 million years ago on its plate-motions page and as about 40 to 50 million years ago on its Himalaya page, the figure Topic 194 used

About how long ago	What happened
40 million years ago to the present	The Himalayas were formed. Scientists believe the process continues, and the height of the Himalayas is rising even to this date

How to read it:

- India moved north from southern latitudes across the Tethys, passed the equator, and eventually collided with Asia.
- The main Deccan eruptive phase came before the collision. India was near the equator around 66 million years ago.
- The collision is a continent-continent convergence: this is why the northern boundary of the Indian plate runs along the Himalayas.

Three common exam traps

1. **"Wegener said the plates move."** Wegener's theory moved the continents themselves, over Pangaea's break-up into Laurasia (north) and Gondwanaland (south). Plate tectonics says the continents are part of a plate and what moves is the plate. Pangaea is the land; Panthalassa is the ocean.
2. **"The oldest rocks of the ocean floor lie at the mid-oceanic ridges."** It is the other way round. The rocks nearest the crest are the youngest and have normal polarity; the rocks get older on both sides away from the ridge. Old ocean floor is consumed at the trenches, which is why the ocean floor is young compared with the continents.
3. **"The Indian plate is India alone."** NCERT's Indian plate includes Peninsular India and the Australian continental portions, and its major plate is the India-Australia-New Zealand plate. The lithosphere is not the crust alone either: it is the crust and the top mantle.

Ozone layer depletion, Montreal Protocol and Kigali Amendment

Concept in one line

Ozone depletion is the thinning of the ozone layer of the stratosphere by chlorine and bromine released from man-made chemicals such as the chlorofluorocarbons (CFCs), and the Vienna Convention (1985), the Montreal Protocol (1987) and its amendments, the latest being the Kigali Amendment (2016) on hydrofluorocarbons (HFCs), control those chemicals. The examination asks for the science, the treaty dates, what each amendment added and India's schedules.

Revision notes

2.1 The ozone layer

- **Where it is (Topic 15):** NCERT places ozone between 10 and 50 km above the surface. The ozone layer proper lies roughly between 15 and 35 km (Britannica). About 90 per cent of the ozone of the atmosphere is in the stratosphere. The Press Information Bureau (PIB) backgrounder for World Ozone Day 2025 gives "about 15 to 50 km". The figures differ because some count all the ozone and some only the dense layer.
- **What it does:** it absorbs most of the Sun's ultraviolet (UV) rays, especially UV-B (PIB). This absorption is also why temperature rises with height in the stratosphere (Topic 15).
- **How it is measured: the Dobson unit (DU).** One DU is the number of ozone molecules needed to make a layer of pure ozone 0.01 mm thick at 0°C and a pressure of 1 atmosphere. The average ozone layer is about 300 DU, a layer only about 3 mm thick (NASA).
- Ozone is also a greenhouse gas (Topic 96).

2.2 How ozone is destroyed

- **The ozone-depleting substances (ODS)** named in the treaties include the CFCs, halons, carbon tetrachloride, methyl chloroform, methyl bromide, the hydrochlorofluorocarbons (HCFCs), the hydrobromofluorocarbons (HBFCs) and bromochloromethane (2.4).
- **Why the CFCs reach so high:** they are very stable in the lower atmosphere, so they last long enough to reach the stratosphere. There UV light breaks them and releases chlorine, which destroys ozone (NASA).
- **Bromine** takes part in a second chain of reactions along with chlorine, and this causes a large share of the ozone loss (NASA).
- **Why the hole forms over Antarctica (NASA):**
  - In the polar winter, a circling whirl of stratospheric winds, the **polar vortex**, isolates the air over the pole.
  - In the winter darkness this air becomes cold enough for clouds to form. These are the **polar stratospheric clouds**, which form at 15 to 25 km, only below minus 78°C (Topic 15).
  - Reactions on the surface of these cloud particles turn stored chlorine into active forms.
  - When sunlight returns in spring, UV light frees the chlorine, and the chlorine destroys ozone. The hole grows until the vortex weakens.
- **Season:** the hole forms at the beginning of the southern spring, August to October (NASA).
- **Definition:** NASA's Ozone Watch takes the ozone hole to be the region over Antarctica with total ozone of 220 DU or lower. Values below 220 DU were not seen before 1979. So the "hole" is a region of very low ozone, not an empty gap.
- **The discovery:** in 1985 J. C. Farman, B. G. Gardiner and J. D. Shanklin published in the journal *Nature* the first paper on springtime losses of ozone over Antarctica. Their measurements came from the British Antarctic Survey's Halley Bay observatory, where ozone had been measured since 1957 with a Dobson spectrophotometer. In 1986 NASA scientists used satellite data to show that the hole is a regional-scale Antarctic phenomenon (NASA).

2.3 Effects of ozone depletion (PIB)

More UV-B at the surface causes skin cancer, sunburn and early ageing of the skin; cataracts and blindness; a weaker immune system; and harm to crops, plankton and young fish.

2.4 The treaties

Treaty	Adopted or agreed	In force	What it did
Vienna Convention for the Protection of the Ozone Layer	22 March 1985	22 September 1988	A framework convention: systematic observation, research and exchange of information. It did not require countries to take control actions
Montreal Protocol on Substances that Deplete the Ozone Layer	16 September 1987	1 January 1989	Binding controls on the production and consumption of ODS
London Amendment	1990 (Second Meeting of the Parties, London, 27 to 29 June 1990)	Not covered here	Added carbon tetrachloride and methyl chloroform, and ten more CFCs. The same meeting set up the Multilateral Fund
Copenhagen Amendment	1992 (Fourth Meeting, Copenhagen, 23 to 25 November 1992)	Not covered here	Brought methyl bromide, HBFCs and HCFCs under control. The same meeting agreed the non-compliance procedure and set up the Implementation Committee

Treaty	Adopted or agreed	In force	What it did
Montreal Amendment	1997 (Ninth Meeting, Montreal, 15 to 17 September 1997)	Not covered here	A licensing system for the import and export of ODS
Beijing Amendment	1999 (Eleventh Meeting, Beijing, 29 November to 3 December 1999)	Not covered here	Brought bromochloromethane under control; added further controls on HCFCs
Kigali Amendment	15 October 2016 (Twenty-Eighth Meeting, Kigali, Rwanda, 10 to 15 October 2016)	1 January 2019 (the condition of 20 ratifications was met on 17 November 2017)	Phase-down of HFCs (2.5)

- The years of the amendments are the years of the meetings that agreed them. The Ozone Secretariat of the United Nations Environment Programme (UNEP) lists these five amendments.
- **Universal ratification:** on 16 September 2009 the Vienna Convention and the Montreal Protocol became the first treaties in the history of the United Nations to be ratified by every country (UN). UNEP and the Ministry's Ozone Cell call the Vienna Convention the first convention of any kind to achieve this.
- **Adjustments:** the Protocol also allows "adjustments" that speed up the agreed reductions. An adjustment applies automatically to all the Parties (Ozone Cell).
- **The Multilateral Fund (1990):** it meets the extra (incremental) costs that developing countries face in meeting the controls. These countries are called **Article 5 Parties**, after the article of the Protocol that gives them more time.

- **World Ozone Day, 16 September,** marks the date in 1987 when the Montreal Protocol was signed. The UN General Assembly proclaimed the International Day for the Preservation of the Ozone Layer on 19 December 1994. The theme for 2026 is "Global action for a cooler planet", marking ten years of the Kigali Amendment (UNEP).

2.5 The Kigali Amendment: why HFCs

- HFCs were brought in as replacements for ODS. They do not deplete ozone, but they are powerful greenhouse gases (UNEP).
- UNEP's fact sheet gives HFC global warming potentials (GWP) from about 121 to about 14,800 (Topic 96).
- HFCs are also one of the six gases of the Kyoto Protocol (Topic 96). Kigali brings their production and consumption under the Montreal Protocol.
- The 2022 assessment (2.7) estimates that the Kigali Amendment will avoid 0.3°C to 0.5°C of warming by 2100, leaving out HFC-23 emissions.

The phase-down groups (UNEP fact sheet)

Group	Baseline years	Freeze	Cuts below the baseline
Developed countries (most non-Article 5 Parties)	2011 to 2013	No separate freeze	10% in 2019, 40% in 2024, 70% in 2029, 80% in 2034, 85% in 2036
Article 5 Group 1 (most developing countries)	2020 to 2022	2024	10% in 2029, 30% in 2035, 50% in 2040, 80% in 2045
Article 5 Group 2: India, Bahrain, Iran, Iraq, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, United Arab Emirates	2024 to 2026	2028	10% in 2032, 20% in 2037, 30% in 2042, 85% in 2047

- The Amendment's text writes the same schedule as the share of the baseline allowed. For Group 2 that share is 15 per cent from 2047, which is an 85 per cent cut.

- **For India, a wording to note:** the Cabinet release of 18 August 2021 gives India's four steps as 10 per cent in 2032, 20 per cent in 2037, 30 per cent in 2042 and 80 per cent in 2047. The Cabinet release of 30 November 2016, UNEP's fact sheet and the Amendment's text give 85 per cent for 2047; the 2016 release also gives India's baseline years (2024 to 2026) and freeze year (2028). If a question follows the treaty, answer 85 per cent.

2.6 India's actions

Action	Detail
Vienna Convention	India acceded on 18 March 1991 (UNEP)
Montreal Protocol and London Amendment	India acceded to both on 19 June 1992 (UNEP)
Copenhagen, Montreal and Beijing Amendments	India acceded on 3 March 2003 (UNEP)
Kigali Amendment	Cabinet approved ratification on 18 August 2021; India ratified on 27 September 2021 (UNEP)

Action	Detail
Ozone Depleting Substances (Regulation and Control) Rules, 2000	Made in 2000 under the Environment (Protection) Act, 1986; they banned CFCs and halons in new equipment by 2003 (PIB). The amendment rules of 2014 and 2019 were made under the same Act (Ozone Cell)
CFCs, carbon tetrachloride and halons	Phased out for controlled uses by 2010, the year the Montreal Protocol schedule set for them (Ozone Cell). CFC production and consumption stopped from 1 August 2008, 17 months ahead of that schedule (PIB)
HCFCs	Baseline 2009 to 2010; cuts of 10% in 2015, 35% in 2020, 67.5% in 2025 and 100% in 2030 (Ozone Cell). The Protocol still lets Article 5 Parties use, from 2030 to 2040, up to an average of 2.5 per cent of the baseline a year, only for servicing refrigeration, air-conditioning and fire-protection equipment that exists on 1 January 2030 and for two other narrow uses (UNEP). HCFC-141b was phased out in the foam sector from 1 January 2020. From 1 January 2025 HCFCs may not be used to make any new equipment
India Cooling Action Plan (ICAP), 2019	Aims to cut cooling demand by 20 to 25 per cent, energy use for cooling by 25 to 40 per cent and refrigerant demand by 25 to 30 per cent by 2037-38 (PIB)

- The **Ozone Cell** of the Ministry of Environment, Forest and Climate Change (MoEFCC) handles this work. Its website carries India's control schedules, the HCFC Phase-out Management Plan (HPMP) and the ICAP.
- PIB says India has met its phase-out targets for all ODS under the Montreal Protocol.

2.7 Recovery and the latest ozone hole

- **The WMO/UNEP Scientific Assessment of Ozone Depletion: 2022** was released on 9 January 2023. It is prepared every four years by the Scientific Assessment Panel of the Montreal Protocol.
- If present policies continue, the ozone layer should return to its 1980 values by about 2066 over the Antarctic, by 2045 over the Arctic and by 2040 over the rest of the world.
- Nearly 99 per cent of the banned ODS have been phased out. The Antarctic hole has slowly improved in area and depth since 2000.

Season (NASA Ozone Watch)	Largest daily area	Mean area, 7 September to 13 October	Lowest daily ozone
2006 (largest mean area on the table)	29.6 million sq km (24 September)	26.6 million sq km	84 DU (8 October)
2025	22.9 million sq km (9 September)	18.7 million sq km	127 DU (25 September)

- **Update checked on 7 November 2026:** the October 2026 scientific assessment projects near-global total-column ozone returning to 1980 values around 2040 and Antarctic ozone during the 2060s under the assessed scenario. NASA's 4 November 2026 report gives a 2026 seasonal mean area of about 25 million sq km for 7 September to 13 October, the seventh-largest area in 48 years of monitoring. Annual size varies with atmospheric conditions; long-term recovery is judged over decades. The 2022 projections above remain identified with that assessment. Sources: https://csl.noaa.gov/assessments/ozone/2026/downloads/executivesummary.pdf ; https://science.nasa.gov/earth/climate-change/ozone-layer/2026-ozone-hole/

2.8 Links with other topics

- **Topic 15:** the layers of the atmosphere and the heights used above.
- **Topic 96:** the greenhouse gases; CFCs and HCFCs are greenhouse gases as well as ODS.

- **Topic 107:** the climate treaties; the Kyoto Protocol covers greenhouse gases "not controlled by the Montreal Protocol".
- **Topic 896 (later):** the Basel, Rotterdam, Stockholm and Minamata conventions on hazardous chemicals.

Extra section: chronology

Year or date	Event
1957	Ozone measurements begin at Halley Bay, Antarctica
22 March 1985	Vienna Convention adopted
1985	Farman, Gardiner and Shanklin report the Antarctic ozone loss in *Nature*
1986	NASA satellite data show the hole is a regional-scale Antarctic phenomenon
16 September 1987	Montreal Protocol agreed
22 September 1988	Vienna Convention in force
1 January 1989	Montreal Protocol in force
June 1990	London Amendment; Multilateral Fund set up
18 March 1991	India accedes to the Vienna Convention
19 June 1992	India accedes to the Montreal Protocol and the London Amendment
November 1992	Copenhagen Amendment
19 December 1994	UN General Assembly proclaims World Ozone Day
September 1997	Montreal Amendment

Year or date	Event
December 1999	Beijing Amendment
3 March 2003	India accedes to the Copenhagen, Montreal and Beijing Amendments
1 August 2008	India stops CFC production and consumption
16 September 2009	Vienna Convention and Montreal Protocol reach universal ratification
2010	India completes the phase-out of CFCs, carbon tetrachloride and halons for controlled uses
15 October 2016	Kigali Amendment agreed
2019	India Cooling Action Plan
27 September 2021	India ratifies the Kigali Amendment
9 January 2023	Scientific Assessment of Ozone Depletion: 2022 released
2028	Freeze year for India's HFCs
2030	India's HCFC cut reaches 100 per cent; a small servicing tail is allowed to 2040
2047	Last step of India's HFC phase-down

Three common exam traps

1. **Mixing up the Vienna Convention and the Montreal Protocol.** The Vienna Convention (1985, in force 1988) is the framework: research, observation and exchange of information, with no control measures. The Montreal Protocol (1987, in force 1989) carries the binding controls. Only the two in-force years, 1988 and 1989, are one year apart; the adoption years, 1985 and 1987, are two years apart.

2. **"HFCs destroy ozone, and Kigali is a climate treaty under the UNFCCC."** HFCs do not deplete ozone; they are greenhouse gases that replaced ODS. The Kigali Amendment amends the Montreal Protocol, not the Kyoto Protocol or the UN Framework Convention on Climate Change (UNFCCC), even though HFCs are also on the Kyoto list.
3. **"The ozone hole was first found by satellite."** The first paper came in 1985 from ground measurements of the British Antarctic Survey at Halley Bay, by Farman, Gardiner and Shanklin. NASA's satellite data showed in 1986 that the hole is a regional-scale Antarctic phenomenon.

Clocks: when hands coincide, oppose or are at right angles

Concept in one line

The minute hand gains 55 minute spaces on the hour hand in every 60 minutes, so the time at which the two hands lie one over the other, point in opposite directions or stand at right angles can be worked out from the gap the minute hand must make up. The exam asks for that time between two given hours, and for how many times each of these positions comes in 12 hours or in a day.

Revision notes

2.1 What we carry from Topic 88

- Topic 88 (angle between the hands) gave the speeds: the minute hand turns 6° a minute and the hour hand 0.5° (1/2°) a minute, so the minute hand gains 5.5° (5 1/2°) a minute on the hour hand. It also gave the formula **Angle = |30H - 5.5M|** for the time H hours M minutes.
- The dial has 60 **minute spaces** of 6° each and 12 **hour spaces** of 30° each. One hour space holds 5 minute spaces.
- Three positions are taught here. The hands **coincide** when one lies over the other (gap 0). They are **opposite** when they point in opposite directions (gap 180°, that is, 30 minute spaces). They are **at right angles** when the gap is 90° (15 minute spaces).

2.2 The relative speed in two units

- **In degrees.** The gain of the minute hand is 6 - 1/2 = 11/2° a minute. This is its speed relative to the hour hand.
- **In minute spaces.** In 60 minutes the minute hand goes round once (60 minute spaces) and the hour hand moves one hour space (5 minute spaces). So in 60 minutes the minute hand gains 60 - 5 = 55 minute spaces.

- To gain 1 minute space it needs 60/55 = 12/11 minutes. To gain g minute spaces it needs **g × 12/11 minutes**.
- The two units give the same answer: g minute spaces are 6g degrees, and 6g ÷ 11/2 = 12g/11 minutes.

What is measured	In degrees	In minute spaces
Gain of the minute hand in 1 minute	11/2°	55/60 = 11/12 of a space
Gain of the minute hand in 60 minutes	330°	55 spaces
Time to gain one unit	2/11 minute per degree	12/11 minutes per space
Gap for a right angle	90°	15 spaces
Gap for opposite hands	180°	30 spaces

2.3 The one method for all three positions

1. At H o'clock the minute hand is on 12 and the hour hand is on H. So the hour hand is **5H minute spaces ahead**.
2. Decide where the minute hand must stand. To coincide, it must catch up the 5H spaces: gain g = 5H. To be opposite, it must go 30 spaces past the hour hand: g = 5H + 30. For a right angle it may stand 15 spaces behind the hour hand (g = 5H - 15) or 15 spaces ahead of it (g = 5H + 15).
3. Bring g into the range 0 to 59 by adding or taking away 60. A gain of 60 spaces is one full lap of the minute hand over the hour hand, and it brings back the same position.
4. If g is 0 to 54, the event happens at **g × 12/11 minutes past H**. If g is 55, the time is 55 × 12/11 = 60 minutes past H, that is, exactly at the next o'clock; that event belongs to the next hour, and there is none for this position inside this hour.

2.4 When the hands coincide

- The gain is 5H spaces, so the hands coincide at **5H × 12/11 = (60/11) × H minutes past H**.

Between H and H + 1	Spaces to gain (5H)	Minutes past H, (60/11) × H
1 and 2	5	60/11 = 5 5/11
2 and 3	10	120/11 = 10 10/11
3 and 4	15	180/11 = 16 4/11
4 and 5	20	240/11 = 21 9/11
5 and 6	25	300/11 = 27 3/11
6 and 7	30	360/11 = 32 8/11
7 and 8	35	420/11 = 38 2/11
8 and 9	40	480/11 = 43 7/11
9 and 10	45	540/11 = 49 1/11
10 and 11	50	600/11 = 54 6/11
11 and 12	55	660/11 = 60, that is, 12 o'clock; none between 11 and 12

- Read down the last column: each time is 65 5/11 minutes after the one above it (see 2.9).
- Between 11 and 1 the hands coincide only once, at 12 o'clock.

2.5 When the hands are opposite

- The gain is 5H + 30 spaces. For H = 0 to 4 this is 30 to 50, so the time is (5H + 30) × 12/11 minutes past H. Example: between 2 and 3, g = 40, so 480/11 = 43 7/11 minutes past 2.

- For H = 5, g = 55: the hands are opposite exactly at 6 o'clock, which belongs to the hour 6 to 7. So there is **no** opposite position between 5 and 6.
- For H = 6 to 11, 5H + 30 is 60 or more; take away 60 to get g = 5H - 30. Example: between 8 and 9, g = 10, so 120/11 = 10 10/11 minutes past 8. At H = 6, g = 0: 6 o'clock itself.

2.6 When the hands are at right angles

- The gains are 5H - 15 and 5H + 15 (brought into 0 to 59). Most hours give two right angles. Example: between 5 and 6, g = 10 and 40, so 10 10/11 and 43 7/11 minutes past 5.
- **Between 2 and 3:** 5H - 15 = -5, and -5 + 60 = 55. A gain of 55 means 3 o'clock, which belongs to the next hour. Only 5H + 15 = 25 is left, so there is one right angle, at 27 3/11 minutes past 2.
- **Between 8 and 9:** 5H + 15 = 55, which is 9 o'clock. Only 5H - 15 = 25 is left: one right angle, at 27 3/11 minutes past 8.
- So in every hour the hands are at right angles twice, except in the hours 2 to 3 and 8 to 9, where they are at right angles once. The standard books say the same thing another way: in each of the two-hour spans 2 to 4 and 8 to 10 there are only 3 right angles, not 4, because the right angle at 3 o'clock (and at 9 o'clock) falls on the boundary between two hours and is counted only once, in the hour 3 to 4 (and 9 to 10).

2.7 A check with the formula of Topic 88

- Put the time found into $|30H - 5.5M|$. It must give 0° for coinciding hands, 180° for opposite hands, and 90° (or 270°, its reflex angle) for a right angle.
- Example: coincidence between 7 and 8 at M = 420/11. Then 5.5M = 11/2 × 420/11 = 210 = 30 × 7, so the angle is 0°.
- The same formula gives the method: 30H - 5.5M = 0 gives M = 60H/11, the column of the table in 2.4.

2.8 How many times: in 12 hours and in a day

Position	Gap	In 12 hours	In 24 hours	Why not one or two an hour
Hands coincide	0	11	22	None between 11 and 12; 12 o'clock is counted once
Hands opposite	30 spaces (180°)	11	22	None between 5 and 6; 6 o'clock belongs to 6 to 7
Hands at right angles	15 spaces (90°)	22	44	Only one in each of the hours 2 to 3 and 8 to 9
Hands in a straight line (coincide or opposite)	0 or 30 spaces	22	44	11 coincide + 11 opposite

- Each count in one line. Coincide: one in each of 12 hours, less the hour 11 to 12, gives 12 - 1 = 11; a day has two such halves, 22. Opposite: 12 - 1 = 11 (the hour 5 to 6 has none), 22 in a day. Right angles: 2 × 12 = 24, less one in each of the hours 2 to 3 and 8 to 9, gives 22; 44 in a day. Straight line: 11 + 11 = 22 in 12 hours, 44 in a day.
- The hands are "in the same straight line" both when they coincide and when they are opposite; do not count only one of the two.
- A count over some other span (from one given time to another) is Topic 908.

2.9 The interval between two coincidences

- After one coincidence the minute hand must gain a full lap, 60 spaces, to meet the hour hand again: 60 × 12/11 = **720/11 = 65 5/11 minutes**. The same follows from 11 coincidences in 12 hours: 720 minutes ÷ 11.
- So the hands of a correct clock meet every 65 5/11 minutes, not every 60 minutes. If the hands of a clock meet every 64 minutes by correct time, they meet 1 5/11 minutes too soon, so that clock is running fast (it gains); how much it gains in a day is Topic 508.

- For a normally geared clock, successive coincidences always span 65 5/11 minutes of displayed time. If they occur every 64 minutes of correct elapsed time, the clock runs fast: its rate is (720/11)/64 = 45/44, so it gains 32 8/11 minutes in 24 hours. A different hand mechanism would need to be specified separately.

2.10 Slips at a glance

Slip	Wrong	Right
Taking the hour hand as fixed	Hands coincide at 3:15	16 4/11 minutes past 3
Counting 12 o'clock in two hours	12 coincidences in 12 hours	11 in 12 hours
Mixing up the two gaps	30 spaces for a right angle	15 spaces; 30 spaces is for opposite hands
Taking one right angle an hour	Only 5H - 15 worked out	Both 5H - 15 and 5H + 15
Taking 60 minutes as the interval	Hands meet every hour	Every 65 5/11 minutes
Mixing degrees with minute spaces	A gap of 30° turned into 30 × 12/11 minutes	30° = 5 spaces, so 5 × 12/11 minutes

Extra section: a drill of eight questions with full working

1. **At what time between 7 and 8 do the hands coincide?** At 7 o'clock the hour hand is 35 spaces ahead. Gain 35 spaces: 35 × 12/11 = 420/11 = 38 2/11 minutes past 7. Check: 5.5 × 420/11 = 210 = 30 × 7, angle 0°.
2. **At what time between 3 and 4 are the hands opposite?** At 3 o'clock the hour hand is 15 spaces ahead. The minute hand must go 30 spaces past it: gain 15 + 30 = 45 spaces. 45 × 12/11 = 540/11 = 49 1/11 minutes past 3. Check: |90 - 5.5 × 540/11| = |90 - 270| = 180°.

3. **At what time between 9 and 10 are the hands opposite?** 5H + 30 = 75; take away 60: g = 15. 15 × 12/11 = 180/11 = 16 4/11 minutes past 9. Here the minute hand is 30 spaces behind the hour hand. Check: |270 - 90| = 180°.
4. **At what times between 6 and 7 are the hands at right angles?** 5H = 30. Gains 30 - 15 = 15 and 30 + 15 = 45. Times: 180/11 = 16 4/11 and 540/11 = 49 1/11 minutes past 6. Check: |180 - 90| = 90° and |180 - 270| = 90°.
5. **How many times between 8 and 9 are the hands at right angles, and when?** 5H = 40. 40 - 15 = 25 gives 300/11 = 27 3/11 minutes past 8. 40 + 15 = 55 gives 60 minutes, that is, 9 o'clock, which belongs to the next hour. So once, at 27 3/11 minutes past 8. Check: |240 - 150| = 90°.
6. **How many times do the hands coincide from 3 p.m. to 9 p.m.?** Neither 3 o'clock nor 9 o'clock is a coincidence. The hands coincide once in each of the hours 3 to 4, 4 to 5, 5 to 6, 6 to 7, 7 to 8 and 8 to 9 (at 16 4/11, 21 9/11, 27 3/11, 32 8/11, 38 2/11 and 43 7/11 minutes past the hour). Answer: 6.
7. **The hands coincide at 10 10/11 minutes past 2. When do they coincide next?** Add 65 5/11 minutes: 2 hours 10 10/11 minutes + 1 hour 5 5/11 minutes = 3 hours 16 4/11 minutes. Answer: 16 4/11 minutes past 3, the same as the table in 2.4.
8. **At what times between 10 and 11 are the hands in a straight line?** Straight line means coincide or opposite. Coincide: g = 50, so 600/11 = 54 6/11 minutes past 10. Opposite: 50 + 30 = 80, take away 60, g = 20, so 240/11 = 21 9/11 minutes past 10. Two times: 21 9/11 and 54 6/11 minutes past 10.

Three common exam traps

1. **Forgetting that the hour hand keeps moving.** At 3 o'clock the hour hand is 15 spaces ahead, but the hands do not meet at 3:15: by then the hour hand has moved on. The minute hand gains only 55 spaces in 60 minutes, so each space of gain takes 12/11 minutes, and the meeting comes at 16 4/11 minutes past 3. Every answer in this topic carries the factor 12/11.
2. **Counting 12 o'clock twice.** The coincidence at 12 o'clock closes one 12-hour round and opens the next; it is one event, not two. Between 11 and 12 the hands do not coincide at all. So in 12 hours the hands coincide 11 times, not 12, and they meet every 65 5/11 minutes, not every hour.

3. **Taking the wrong gap.** A right angle is a gap of 15 spaces (90°); opposite hands are 30 spaces (180°) apart. A right angle can also stand on either side of the hour hand: between 11 and 12, for example, the two gains are 55 - 15 = 40 and 70 - 60 = 10, giving 43 7/11 and 10 10/11 minutes past 11. Working only one side loses one of the two times.

Probability: basic terms and the classical definition

Concept in one line

When all the outcomes of an experiment are equally likely, the classical probability of an event E is P(E) = (number of outcomes favourable to E) ÷ (number of all possible outcomes), a number from 0 to 1. The exam asks for such probabilities with a die, coins, balls and a pack of cards, and tests the basic terms: equally likely outcomes, complementary events, and impossible and sure events.

Revision notes

2.1 What probability measures, and what you already know

- Probability is a number that says how likely an event is. NCERT's Class X chapter "Probability" starts from experimental probability and then gives the theoretical (classical) definition.
- **Experimental (empirical) probability** = number of trials in which the event happened ÷ total number of trials. NCERT: "The experimental or empirical probability of an event is based on what has actually happened." In NCERT's example, a coin tossed 1,000 times gave 455 heads, so the experimental probability of a head was 0.455. Another 1,000 tosses can give a different figure.
- **Theoretical (classical) probability** is worked out from the list of possible outcomes, without doing the experiment, on the assumption that the outcomes are equally likely. NCERT credits this definition to Pierre Simon Laplace (1795). As the number of trials grows, NCERT says, we may expect the experimental and theoretical probabilities to be nearly the same.
- Recall: a probability is a fraction, reduced to lowest terms, and it is compared with other fractions as in Topic 19; it can be written as a decimal or a percentage as in Topic 29; and, as with a ratio in Topic 59, it compares a part with the whole, not one part with another part.

2.2 The basic terms

Term	Meaning	Example
Experiment	An action whose result cannot be told in advance	Tossing a coin; throwing a die; drawing a card
Trial	One performance of the experiment; experimental probability counts trials	One toss of the coin
Outcome	One possible result of the experiment	Getting 5 when a die is thrown
All possible outcomes	The full list of outcomes of the experiment; NCERT's Class XI chapter calls this set the sample space	1, 2, 3, 4, 5, 6 for one die
Event	A collection of outcomes; the outcomes in it are "favourable" to it	"An even number": 2, 4, 6
Equally likely outcomes	Each outcome is as likely to occur as any other	Head and tail of a fair coin; the six faces of a fair die
Elementary event	An event that has only one outcome	"Getting 4" on one die
Complementary event	"Not E", written $\bar{E}$: it happens exactly when E does not happen	"Not an even number" is "an odd number"
Impossible event	An event that can never happen; its probability is 0	Getting 7 on one die
Sure (certain) event	An event that is bound to happen; its probability is 1	Getting a number less than 7 on one die

2.3 The classical definition and its condition

- NCERT's definition: "The theoretical probability (also called classical probability) of an event E, written as P(E), is defined as" P(E) = (number of outcomes favourable to E) ÷ (number of all possible outcomes of the experiment), "where we assume that the outcomes of the experiment are equally likely."
- **The condition matters.** NCERT's bag of 4 red balls and 1 blue ball: "you are more likely to get a red ball than a blue ball", so "red" and "blue" are not equally likely outcomes. Each of the 5 balls, however, is as likely to be drawn as any other. Count balls, not colours: P(red) = 4/5, not 1/2.
- "At random", "fair", "unbiased" and "well-shuffled" in a question are the signal that the outcomes may be taken as equally likely.

2.4 Rules that follow from the definition

Rule	Why it holds	Example
$0 \leq P(E) \leq 1$	The favourable outcomes can never be fewer than 0 or more than all the outcomes	No answer can be negative or above 1
P(impossible event) = 0	No outcome is favourable	Sum of 13 on two dice: 0/36 = 0
P(sure event) = 1	Every outcome is favourable	Sum of 12 or less on two dice: 36/36 = 1
The probabilities of all the elementary events add up to 1	Each outcome is counted once	One die: 1/6 taken six times = 1
P(E) + P(not E) = 1, so P(not E) = 1 - P(E)	Every outcome is in exactly one of E and not E	P(ace) = 1/13, so P(not an ace) = 12/13

- Two events are complementary only if between them they cover every outcome and share none. "Opposite-sounding" is not enough: check that no outcome is left out.

- NCERT's tennis example uses the same rule with decimals: if the probability that one player wins is 0.62, the probability that the other wins is 1 - 0.62 = 0.38.

2.5 The standard experiments and their outcomes

Experiment	Number of possible outcomes	The outcomes
One coin tossed	2	H, T
One die thrown	6	1, 2, 3, 4, 5, 6
Two coins tossed together	4	HH, HT, TH, TT
Two dice thrown together	36	Ordered pairs (1, 1), (1, 2), ... (6, 6): 6 × 6
One card from a well-shuffled pack	52	4 suits of 13 cards each

- In two coins, HT and TH are different outcomes (head on the first coin, or head on the second), so there are 4 outcomes, not 3. In two dice, (2, 6) and (6, 2) are different outcomes for the same reason.
- **The pack of cards, as NCERT describes it.** 52 cards in 4 suits of 13 cards each: spades, hearts, diamonds and clubs. Spades and clubs are black; hearts and diamonds are red. Each suit has the ace, king, queen, jack, 10, 9, 8, 7, 6, 5, 4, 3 and 2. Kings, queens and jacks are the face cards.

Group of cards	How many	Working
Cards of one suit	13	52 ÷ 4
Red cards (hearts, diamonds)	26	2 × 13
Black cards (spades, clubs)	26	2 × 13
Face cards (kings, queens, jacks)	12	3 in each suit × 4 suits
Red face cards	6	3 × 2 red suits

Group of cards	How many	Working
Aces	4	1 in each suit; an ace is not a face card
Number cards 2 to 10	36	9 in each suit × 4 suits

2.6 A probability as a fraction, a decimal and a percentage

- Reduce the fraction first: 12/52 = 3/13. Then convert as in Topic 29.

Fraction	Decimal	Percentage
1/2	0.5	50%
1/4	0.25	25%
3/4	0.75	75%
1/6	0.1666...	16 2/3%
3/8	0.375	37 1/2%
7/20	0.35	35%

- A probability of 0.88 is 88/100 = 22/25 = 88%. NCERT itself writes some probabilities as decimals (0.88 and 0.96 in its example on shirts).
- Since $0 \leq P(E) \leq 1$, a probability as a percentage lies from 0% to 100%.

2.7 Reading the words, and slips to avoid

Wording or slip	What it means	Two coins or a pack of cards
"Exactly one head"	One head, no more and no fewer	HT, TH: 2/4 = 1/2
"At least one head"	One head or more	HH, HT, TH: 3/4 (NCERT's example)
"At most one head"	One head or fewer	HT, TH, TT: 3/4

Wording or slip	What it means	Two coins or a pack of cards
"No head"	Zero heads	TT: 1/4
Face cards	Kings, queens and jacks only	12 cards, not 16
Aces	Not face cards	4 cards
Colours of balls taken as outcomes	Wrong when the numbers of balls differ	4 red, 1 blue: P(red) = 4/5 = 80%

- "At least one" is often quickest by the complement: P(at least one head) = 1 - P(no head) = 1 - 1/4 = 3/4.
- Drawing two or more cards or balls, with or without putting the first one back, needs the rules taught on Days 49 and 71 (Topics 489 and 709). Today's two MCQs use only one draw of a card, one throw of a die or one toss of coins.

Other days cover the addition and multiplication rules (Topic 489), coins and dice in depth (Topic 499), permutations and combinations for probability (Topic 699), and cards and balls in depth (Topic 709).

Extra section: worked examples and a drill

A. Worked examples

1. **A die.** A fair die is thrown once. Find the probability of a prime number. The outcomes are 1 to 6, so there are 6. The prime numbers among them are 2, 3 and 5, so 3 are favourable. P = 3/6 = 1/2 = 0.5 = 50%. The probability of a number that is not prime is 1 - 1/2 = 1/2. (NCERT's own example: a number greater than 4 has probability 2/6 = 1/3, and a number less than or equal to 4 has 4/6 = 2/3.)
2. **Two coins.** Two coins are tossed together. The outcomes are HH, HT, TH and TT. Exactly one head: HT and TH, so 2/4 = 1/2. At most one head: HT, TH and TT, so 3/4. No head: TT, so 1/4.

3. **Balls.** A bag has 5 red, 7 green and 8 white balls, 20 in all. One ball is drawn at random. P(green) = 7/20 = 0.35 = 35%. P(not white) = (5 + 7)/20 = 12/20 = 3/5 = 60%. P(red) = 5/20 = 1/4. (NCERT's example has 3 blue, 2 white and 4 red marbles, 9 in all: P(white) = 2/9.)
4. **Cards.** One card is drawn from a well-shuffled pack of 52. P(face card) = 12/52 = 3/13. P(red king) = 2/52 = 1/26. P(spade) = 13/52 = 1/4. (NCERT's example: P(ace) = 4/52 = 1/13 and P(not an ace) = 48/52 = 12/13.)

B. Drill: eight questions with full working

1. A die is thrown once. P(odd number)? Odd numbers: 1, 3, 5, so 3 out of 6. P = 3/6 = 1/2.
2. A die is thrown once. P(a number greater than 6)? No face shows more than 6, so the event is impossible: P = 0/6 = 0. P(a number that is 6 or less) = 6/6 = 1, a sure event.
3. Two coins are tossed together. P(two tails)? Only TT out of 4 outcomes. P = 1/4 = 25%.
4. Two coins are tossed together. P(at least one tail)? Directly: HT, TH, TT, so 3/4. By the complement: 1 - P(two heads) = 1 - 1/4 = 3/4.
5. Two dice are thrown together. P(sum 7)? Favourable: (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1), that is, 6 out of 36. P = 6/36 = 1/6 = 16 2/3%.
6. Two dice are thrown together. P(sum 10)? Favourable: (4, 6), (5, 5), (6, 4), that is, 3 out of 36. P = 3/36 = 1/12.
7. A bag has 6 blue, 9 yellow and 5 black balls, 20 in all. One ball is drawn at random. P(not yellow)? 6 + 5 = 11 balls are not yellow. P = 11/20 = 0.55 = 55%. Check: P(yellow) = 9/20, and 9/20 + 11/20 = 1.
8. One card is drawn from a well-shuffled pack of 52. P(a heart numbered from 2 to 10)? Hearts 2, 3, ... 10 are 9 cards. P = 9/52, already in lowest terms.

Three common exam traps

1. **The outcomes must be equally likely before you count.** Two coins have 4 outcomes, not 3: "one head and one tail" is two outcomes, HT and TH. In a bag of balls, count the balls, not the colours: with 4 red and 1 blue, red is 4/5, not 1/2.

2. **"At least", "at most" and "exactly" are different events.** With two dice, "at least one six" has 11 favourable outcomes (11/36), but "exactly one six" has only 10 (10/36 = 5/18), because (6, 6) has two sixes. Read the word, then list the outcomes.
3. **Know the pack.** There are 12 face cards (king, queen and jack of each suit), so P(face card) = 12/52 = 3/13; taking 16 by adding the aces gives the wrong 4/13. Each colour has 26 cards and each suit 13. The total is 52 unless the question says some cards have been removed.

Current affairs: Andhra Pradesh's population management policy

Concept in one line

In 2026 the Andhra Pradesh Government announced a draft Population Management Policy and a set of incentives that seek to encourage families to have more children, because fertility in the State is below the replacement level of 2.1 and its population is ageing. The examination asks about the announcements and their dates, the demographic facts behind them, and how the approach differs from the National Population Policy, 2000.

Revision notes

2.1 Where this topic sits

- **Topic 275** gave the size of the State: 4,95,77,103 people in the 2011 Census recast for the present State, a density of 304, and a total fertility rate (TFR) of 1.7 in NFHS-5 and 1.8 in NFHS-6, against India's 2.0. Those figures are not repeated here except where the policy needs them.
- Topic 145 (population of India), Topic 215 (sex ratio), Topic 475 (age structure) and Topic 493 (demographic dividend) bear on this topic; they are not taught here.
- **TFR:** the average number of children a woman is expected to have during her reproductive years. A TFR of 2.1 is the **replacement level**: below it, a population stops replacing itself in the long run.

2.2 The news: what was announced, when and where

Every step below is as reported by All India Radio (the public broadcaster) or by news agencies and newspapers. As on 1 November 2026, these reports describe a draft and a set of announced incentives; the final terms will be those of the Government Order (GO) when it is issued, so check the latest position before the exam.

- **5 March 2026, State Assembly, Amaravati:** Chief Minister N. Chandrababu Naidu told the Assembly that the State Government was preparing a Population Management Policy, which he described as the first such policy in the country. All India Radio reported on 5 March 2026 that the Government aimed to finalise it by the end of the month and to begin implementing it from 1 April. He said the TFR had fallen from 3.0 in 1993 to about 1.5 at present, and warned of an ageing population and a shortage of young workers.
- **Draft policy, March 2026:** a report of 6 March 2026 says that a draft policy was released and that the Government gave one month for discussion and consultation.
- **Ugadi, March 2026, Vijayawada:** at the Government's Ugadi event the Chief Minister announced an incentive of Rs 25,000 for families having two or three children, and said: "one is not enough, two are good and three are even better" (report of 20 March 2026).
- **16 May 2026, Srikakulam district:** at a public meeting at Narsannapeta the Chief Minister announced Rs 30,000 immediately after the birth of a third child and Rs 40,000 for a fourth child, with details to follow within a month (reports of 16 and 17 May 2026).
- **11 July 2026, World Population Day, Vijayawada:** the Chief Minister launched the "Pillale Sampada" (Children are Wealth) initiative and spoke of a shift from population control to population conservation. He said the Government would consult people before implementing the new policy.

2.3 The measures

Measure	What it does	Where it is stated	Date
Removal of the two-child bar for local body elections	Persons with more than two children may contest panchayat and urban local body elections. The bar had been in force since 1994	Andhra Pradesh Panchayat Raj (Amendment) Bill, 2024 and Andhra Pradesh Municipal Laws (Amendment) Bill, 2024, passed by the Legislative Assembly (news reports)	18 November 2024
Draft Population Management Policy	For a third child or more: Rs 25,000 at delivery; Rs 1,000 a month for the first five years; free education in government schools up to 18 years; household health insurance; support for IVF (in vitro fertilisation); 12 months' maternity leave and two months' leave for the father. Government employees with three or more children: 15 days of wellness leave before retirement and a wellness fund of Rs 50,000	Report of the draft	March 2026
Cash incentive announced at Ugadi	Rs 25,000 for families having two or three children	Report of the Chief Minister's speech	March 2026
Cash incentives for larger families	Rs 30,000 after the birth of a third child; Rs 40,000 for a fourth child	Reports of the Chief Minister's speech	May 2026

Measure	What it does	Where it is stated	Date
"Pillale Sampada" initiative	Launch of the shift to population conservation, with nutrition through Anganwadi centres, childcare facilities at workplaces and fewer unnecessary Caesarean deliveries	All India Radio report	11 July 2026
Talliki Vandanam (an existing scheme)	Rs 15,000 per child to support education	All India Radio report	11 July 2026

- **Reports differ on the Rs 25,000:** two reports place it in the draft for a third child or more; another says it was proposed for a second child; the Ugadi speech spoke of families with two or three children. So learn the amount, not the child it applies to.
- **One report adds** that the Government plans to end incentives for sterilisation.

2.4 Why Andhra Pradesh is changing its approach

Indicator	Andhra Pradesh	Comparison	Source and base
TFR, NFHS-5 (2019-21)	1.7	India 2.0	Lok Sabha answer, 24 July 2026
TFR, NFHS-6 (2023-24)	1.8	India 2.0	Lok Sabha answer, 24 July 2026
TFR as stated by the State	About 1.5	3.0 in 1993	Chief Minister in the Assembly, March 2026; base not stated in the reports

Indicator	Andhra Pradesh	Comparison	Source and base
Year by which the TFR reached 2.1	2004 (undivided State)		Technical Group on Population Projections, report of November 2019
Population aged 60 and above, 2011 base	5,025 thousand of 49,577 thousand, about 10.1 per cent	Aged 0 to 14: 12,527 thousand, about 25.3 per cent	Technical Group's 2011 base table; percentages worked out from it
Share aged 60 and above in future	About 23 per cent by 2047, from about 10 per cent now		The State's projection, as reported from the draft
Median age	32.5 years	India 28.4 years	State Health Department figures, as reported

- **Two TFR figures, two bases.** The NFHS figures are survey estimates for a stated round. The "about 1.5" is the State's own figure, quoted in speeches without a base. The Technical Group's report also gives 1.6 in the Sample Registration System (SRS) for 2017. Give the source with the figure.
- **NFHS-6 was a little higher than NFHS-5** (1.8 against 1.7), but still below the replacement level.
- **The South-North gap (NFHS-6, 2023-24, Lok Sabha answer of 24 July 2026):** Tamil Nadu 1.7, Kerala 1.8, Karnataka 1.8, Telangana 1.9, against Uttar Pradesh 2.2 and Bihar 2.7.
- **Ageing elsewhere:** the Technical Group's report expects Kerala's share aged 60 and above to rise from 13 per cent in 2011 to 23 per cent in 2036, and Uttar Pradesh's from 7 per cent to 12 per cent.
- **The State's reasoning (as reported):** an ageing population and fewer young workers could slow growth (the Chief Minister, March 2026). The Health, Medical and Family Welfare Secretary, Sourabh Gaur, said the focus must shift to enabling and incentivising families to have children (May 2026).

2.5 The national policy in one line

The National Population Policy, 2000 had three objectives: the immediate one, to meet the unmet need for contraception, health infrastructure and personnel; the medium-term one, to bring the TFR to replacement level by 2010; and the long-term one, a stable population by 2045. It promoted the small family norm. Andhra Pradesh's policy works the other way, towards more births. Topic 735 teaches the national policy in full.

2.6 The debate

- **For the policy (the State's case):** fertility below replacement, an ageing population and the need for young workers, as stated by the Chief Minister and the Health Secretary.
- **Women's health and choice:** Poonam Muttreja, Executive Director of the Population Foundation of India, said: "Any pronatalist policy must be explicitly anchored in consent, reproductive autonomy, informed choice, and women's voices." She recalled that the International Conference on Population and Development, 1994 (ICPD, Cairo) rejected incentives and disincentives for fertility, and argued that the cost of raising children is a main reason fertility is falling, which a one-time payment does not meet (The South First, 25 May 2026).
- **Cost and economics:** The Wire (19 June 2026) argued that "Economic development comes from nurturing the available potential, not from incentivising more children per family."
- **Pro-natal policies elsewhere:** Japan, Singapore and South Korea have tried incentives for larger families. Hungary announced a package in 2019, including tax relief for mothers of large families and easier loans, as Wikipedia's article on natalism records, citing The New York Times of 11 February 2019. Russia gives "maternal capital", a subsidy that can be spent on housing or a child's education (the same article, citing Kouprianova, 2013).

Extra section: chronology

Date	What happened
1994	Two-child bar for local body candidates introduced in the undivided State
2000	National Population Policy, 2000: replacement-level TFR by 2010, stable population by 2045
2004	Undivided Andhra Pradesh reached a TFR of 2.1, according to the Technical Group's report
November 2019	Report of the Technical Group on Population Projections, 2011 to 2036
18 November 2024	Assembly passes the Panchayat Raj and Municipal Laws Amendment Bills that remove the two-child bar
5 March 2026	Chief Minister tells the Assembly that a Population Management Policy is being prepared
March 2026	Draft policy released for one month of consultation (report of 6 March 2026)
March 2026	Ugadi speech: Rs 25,000 for families having two or three children
16 May 2026	Srikakulam district: Rs 30,000 for a third child and Rs 40,000 for a fourth child
11 July 2026	World Population Day: "Pillale Sampada" launched in Vijayawada
24 July 2026	Lok Sabha answer gives NFHS-6 TFR: Andhra Pradesh 1.8, India 2.0

Three common exam traps

1. **Quoting one TFR without its source.** The State's "about 1.5", the SRS figure and the NFHS figures are three different estimates. A question that names a survey round wants that round's figure, not the figure from a speech.

2. **Treating an announcement as a final scheme.** The draft of March 2026 was put out for one month of consultation, and in July 2026 the Chief Minister said people would be consulted before implementation. The reported terms of the Rs 25,000 differ from report to report. Until a Government Order fixes them, learn the amounts with the occasion on which they were announced.
3. **Reading "below the national average" as "below replacement".** Replacement is 2.1. India's TFR of 2.0 in NFHS-6 is itself below replacement. The southern States are all below it, while Uttar Pradesh (2.2) and Bihar (2.7) are above it.