# RRB NTPC (UG) CBT-I Official Paper (Held On: 18 Aug, 2025 Shift 3) (Previous Year Paper)

RRB Group D • 2025 • 100 questions • 90 minutes • Answer key and solutions

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## GENERAL AWARENESS

**Q1.** Which region witnessed the strongest violence and martial law enforcement during the Rowlatt Satyagraha?

**(a)** Bihar
**(b)** Bengal
**(c)** Punjab
**(d)** Gujarat

**Q2.** How many individuals were conferred the Padma Awards in 2025?

**(a)** 120
**(b)** 150
**(c)** 113
**(d)** 139

**Q3.** Which of the following indicators is NOT included in the Multidimensional Poverty Index (MPI)?

**(a)** Years of Schooling
**(b)** Electricity Access
**(c)** Nutrition
**(d)** Monthly Per Capita Expenditure

**Q4.** Announced in 2025, what type of engine is ISRO designing for Next Generation Launch Vehicle (NGLV)?

**(a)** LOX-Kerosene hybrid engine
**(b)** Hydrogen-fueled engine
**(c)** Cryogenic solid fuel engine
**(d)** LOX-Methane engine

**Q5.** Which of the following government bodies is responsible for disaster response and management at the national level in India?

**(a)** SDRF
**(b)** IRDA
**(c)** NDMA
**(d)** NITI Aayog

**Q6.** What geographic feature primarily controls the eastern boundary of the Indian Desert?

**(a)** Western Ghats
**(b)** Satpura Hills
**(c)** Aravalli Hills
**(d)** Vindhya Range

**Q7.** Select the INCORRECT operating system used in computers and laptops.

**(a)** Linux
**(b)** Android
**(c)** Windows
**(d)** Unix

**Q8.** The Monetary Policy Committee (MPC) was established to formalise inflation targeting. How many members constitute India's MPC?

**(a)** 6
**(b)** 3
**(c)** 5
**(d)** 7

**Q9.** Which harmful social practice was banned in 1829 by Lord Bentinck during the British rule in India?

**(a)** Child marriage
**(b)** Polygamy
**(c)** Dowry
**(d)** Sati

**Q10.** Which railway safety system did India begin implementing nationwide, covering 3,500 km in 2025 at a cost of Rs. 1,700 crore?

**(a)** Nationwide Railway Safety System
**(b)** Kavach Automatic Train Protection
**(c)** Namo Bharat Signalling System
**(d)** GPS-based Tracking System

**Q11.** Which of the following ranges separates the Kashmir Valley from the rest of the Himalayan region?

**(a)** Zaskar
**(b)** Pir Panjal
**(c)** Karakoram
**(d)** Ladakh

**Q12.** Where was the 2025 Southeast Asia Regional Forum of Organisation for Economic Cooperation and Development (OECD) held?

**(a)** Jakarta, Indonesia
**(b)** Bangkok, Thailand
**(c)** Manila, Philippines
**(d)** Kuala Lumpur, Malaysia

**Q13.** Which of the following texts is considered the earliest Tamil grammar work?

**(a)** Tolkappiyam
**(b)** Silappadikaram
**(c)** Manimekalai
**(d)** Kural

**Q14.** What is the name of the principle which states that each point on a wavefront acts as a source of secondary wavelets that spread in all directions and form a new wavefront?

**(a)** Doppler's Principle
**(b)** Huygens' Principle
**(c)** Fermat's Principle
**(d)** Superposition Principle

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**Q15.** Which company became the first in India to develop steel pipes for hydrogen transportation?

**(a)** Hindalco Industries
**(b)** Jindal Steel & Power
**(c)** Tata Steel
**(d)** SAIL

**Q16.** Who among the following became India's first Grandmaster in chess in 1988?

**(a)** Dibyendu Barua
**(b)** Viswanathan Anand
**(c)** R Praggnanandhaa
**(d)** Pentala Harikrishna

**Q17.** Which of the following subjects is NOT under the control of the Delhi Legislative Assembly, according to the Constitution?

**(a)** Public order
**(b)** Electricity
**(c)** Education
**(d)** Public health

**Q18.** The Defence Ministry's planned order for 500 Invar anti-tank guided missiles—valued at Rs. 2,000–3,000 crore—will be placed with which defence Public Sector Unit (PSU)?

**(a)** Bharat Dynamics Limited
**(b)** Garden Reach Shipbuilders & Engineers Ltd.
**(c)** Armoured Vehicles Nigam Ltd.
**(d)** Bharat Electronics Limited

**Q19.** he 1962 Sino-Indian War was primarily fought over which geographical region?

**(a)** Himalayan Border
**(b)** Indo-Gangetic Plain
**(c)** Deccan Plateau
**(d)** Brahmaputra Valley

**Q20.** What is the time limit to receive information from a public authority under the RTI Act?

**(a)** 60 days
**(b)** 30 days
**(c)** 45 days
**(d)** 15 days

**Q21.** Employment patterns during 1947-1991 showed limited diversification. Which sector employed the largest share of India's workforce throughout this period?

**(a)** Infrastructure
**(b)** Agriculture
**(c)** Secondary sector
**(d)** Services sector

**Q22.** What is the spatial resolution of the Bharat Forecasting System (BFS) launched in May 2025?

**(a)** 10 kilometres
**(b)** 3 kilometres
**(c)** 12 kilometres
**(d)** 6 kilometres

**Q23.** Where is Wadge Bank, the site of the hydrocarbon exploration project proposed in May 2025 under the Hydrocarbon Exploration and Licensing Policy (HELP) and opposed by fishermen, located?

**(a)** An offshore reef near the Andaman Islands in the Bay of Bengal region
**(b)** A deep-sea basin around 60 km west of Mumbai in the Arabian Sea

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**(c)** A coral atoll close to the Lakshadweep islands in the Indian Ocean
**(d)** A submarine plateau about 80 km off the southern coast in the Indian Ocean

**Q24.** What does GUI stand for in an operating system context?
**(a)** Graphical User Interface
**(b)** Global Utility Interface
**(c)** Graphical Unix Integration
**(d)** General User Instruction

**Q25.** What is the name of the Super Expressway that links the metropolitan cities of New Delhi, Mumbai, Chennai and Kolkata?
**(a)** Golden Quadrilateral
**(b)** North-South Corridor
**(c)** National Highway 44
**(d)** East-West Corridor

**Q26.** Which of the following cities hosted the 19^(th) Pravasi Bharatiya Divas (PBD) Convention held in January 2025?
**(a)** Bhubaneswar
**(b)** Varanasi
**(c)** Indore
**(d)** Bengaluru

**Q27.** In 2025, which Indian regulatory body launched the 'Digital India Financial Literacy Mission' to enhance awareness about digital finance and online fraud prevention?
**(a)** Financial Stability and Development Council (FSDC)
**(b)** National Financial Reporting Authority (NFRA)
**(c)** Securities and Exchange Board of India (SEBI)
**(d)** Reserve Bank of India (RBI)

**Q28.** Which Australian plateau is formed by the solidification of molten lava?
**(a)** Kimberley Plateau
**(b)** Columbia and Snake Rivers Plateau
**(c)** Patagonian Plateau
**(d)** Malwa Plateau

**Q29.** Which of the following Articles deals with the amendment procedure of the Constitution?
**(a)** Article 370
**(b)** Article 208
**(c)** Article 300
**(d)** Article 368

**Q30.** Which of the following statements is correct regarding the legislative allocation of cooperative societies in the Constitution of India?
**(a)** It is a subject in the State List
**(b)** It falls under the Residuary (Union) List.
**(c)** It is a subject in the Union List.
**(d)** It is a subject in the Concurrent List.

**Q31.** Which Constitutional Amendment introduced the Goods and Services Tax (GST) in India?
**(a)** Ninety-ninth Amendment Act, 2015
**(b)** One Hundred and First Amendment Act, 2016
**(c)** One Hundred and Second Amendment Act, 2018
**(d)** One Hundredth Amendment Act, 2015

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**Q32.** Who authored the book ‘PMO: Prime Minister’s Office through the Years’ that was released in May 2025?

**(a)** Jagdeep Dhankhar
**(b)** Manohar Lal Khattar
**(c)** Nayab Singh Saini
**(d)** Himanshu Roy

**Q33.** Which of the following is NOT a part of urban transport infrastructure?

**(a)** Irrigation canals
**(b)** Metro systems
**(c)** Highways
**(d)** Rail networks

**Q34.** Which of the following elements is classified as a lanthanoid group element?

**(a)** Yttrium
**(b)** Actinium
**(c)** Scandium
**(d)** Cerium

**Q35.** In May 2025, which ISRO mission failed to deploy its Earth observation satellite due to a third-stage anomaly in the PSLV-C61 rocket?

**(a)** INSAT-3DS
**(b)** RISAT-2BR2
**(c)** EOS-09
**(d)** Cartosat-3

**Q36.** What is the study of heredity and variation called?

**(a)** Evolution
**(b)** Mutation
**(c)** Genetics
**(d)** Biology

**Q37.** Which country became a full member of BRICS in January 2025?

**(a)** Nigeria
**(b)** Egypt
**(c)** Indonesia
**(d)** Argentina

**Q38.** In Jain religion, the Svetarnbara canon consists of how many of Agamas?

**(a)** 6
**(b)** 12
**(c)** 35
**(d)** 45

**Q39.** The opening of which of the following canals intensified British control over India’s foreign trade?

**(a)** Conolly Canal
**(b)** Suez Canal
**(c)** Buckingham Cana
**(d)** Munak Canal

**Q40.** Which of the following Jain councils was held at Vallabhi (Gujarat) in 512 CE under the chairmanship of Devardhi Kshamasramana?

**(a)** Third
**(b)** Second
**(c)** Fourth
**(d)** First

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## MATHEMATICS

**Q41.** Find the mean proportional between 16 and 256.

**(a)** 64
**(b)** 63
**(c)** 66
**(d)** 65

**Q42.** The marks scored by 10 students are given below.

12, 14, 14, 15, 12, 16, 12, 10, 19, 11

The mode of the given data is:

**(a)** 15
**(b)** 19
**(c)** 14
**(d)** 12

**Q43.** A cuboid has dimensions 18 m × 12 m × 9 m. What is its total surface area?

**(a)** 998 m2
**(b)** 1062 m2
**(c)** 1128 m2
**(d)** 972 m²

**Q44.** By how much is 65% of 65 greater than 3/5 of 25?

**(a)** 21.25
**(b)** 24.25
**(c)** 27.25
**(d)** 25.25

**Q45.** The diagonals of a rectangle PQRS meet at O. If angle QOR = 36^o, then find angle OPS.

**(a)** 144^o
**(b)** 72^o
**(c)** 108^o
**(d)** 54^o

**Q46.** In an election between two candidates, 90% of the registered voters cast their vote and 18% of the votes polled were found invalid. The winning candidate got 51% of the valid votes and won the election by a margin of 1845 votes. How many voters were registered?

**(a)** 124999
**(b)** 124998
**(c)** 124997
**(d)** 125000

**Q47.** Evaluate: (−9) − (−60) ÷ (−6) + (−4) × 6

**(a)** −43
**(b)** −45
**(c)** -46
**(d)** −42

**Q48.** Which of the following numbers divides 716710501?

**(a)** 16
**(b)** 19
**(c)** 20
**(d)** 13

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**Q49.** The value of 5/2+(1/(1+3/8))-3/5 is

**(a)** 297/118
**(b)** 290/107
**(c)** 289/110
**(d)** 284/109

**Q50.** A vertical post of a height 18 ft is broken at a certain height and its upper part, not completely separated, meets the ground at an angle of 30°. Find the height at which the post is broken.

**(a)** 4 ft
**(b)** 6 ft
**(c)** 7 ft
**(d)** 5 ft

**Q51.** 5 men can complete a piece of work in 16 days, while 3 women can do it in 15 days. In how many days can 9 women and 4 men complete this work?

**(a)** 1 day
**(b)** 4 days
**(c)** 2 days
**(d)** 3 days

**Q52.** 92 mirrors were purchased for Rs. 92, and 35 mirrors broke in transit. The trader sold the remaining mirrors at Rs. 4.40 each. Find his profit.

**(a)** Rs. 158.80
**(b)** Rs. 157.90
**(c)** Rs. 161.70
**(d)** Rs. 153.10

**Q53.** An 8% discount and a 5% discount in succession is equivalent to a total discount of _____.

**(a)** 13.5%
**(b)** 12.6%
**(c)** 13.4%
**(d)** 12.5%

**Q54.** The selling price of 22 books is equal to the cost price of 11 books. Find the loss or gain percentage.

**(a)** 100/11 % loss
**(b)** 100/11 % gain
**(c)** 50% gain
**(d)** 50% loss

**Q55.** Pipe A can fill a tank in 12 hours, pipe B can fill the same tank in 30 hours and pipe C can fill the same tank in 18 hours. The time taken by them to fill the same tank if they operate together is::

**(a)** 8 25/31 hours
**(b)** 1525/31 hours
**(c)** 925/31 hours
**(d)** 525/31 hours

**Q56.** 7 years ago, the age of a father was 20 years more than twice his son's age. After how many years, from now, will he be twice his son's age?

**(a)** 13
**(b)** 16
**(c)** 11
**(d)** 12

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**Q57.** A table has a marked price of 8,000. A shopkeeper purchased it at two successive discounts of 20% and 25%. He sold the table for Rs. 8,000 after spending 300 on transportation. Find his profit percentage.

**(a)** 5643/51 %
**(b)** 5645/51 %
**(c)** 5644/51 %
**(d)** 5642/51 %

**Q58.** Find the simple interest (in Rs. ) on Rs. 1,200 at an interest rate of 4% per month for 8 months.

**(a)** Rs. 52
**(b)** Rs. 64
**(c)** Rs. 32
**(d)** Rs. 384

**Q59.** X, Y and Z invest a sum in the ratio of 16 : 85 : 54, respectively. If they earned a total profit of Rs. 3,750 at the end of the year, then what is the difference between share of Y and Z?

**(a)** Rs. 676
**(b)** Rs. 750
**(c)** Rs. 706
**(d)** Rs. 742

**Q60.** Which of the following numbers divides 769501?

**(a)** 105
**(b)** 96
**(c)** 90
**(d)** 97

**Q61.** The product of two consecutive natural numbers is 870. The greater of the two numbers is:

**(a)** 38
**(b)** 30
**(c)** 41
**(d)** 21

**Q62.** The simple interest on a certain sum for 61/2 years at the rate of 6.4% per annum is Rs. 9,204. What will be the amount payable on the same sum at the rate of 7.6% per annum simple interest in 62/3 years?

**(a)** Rs. 33,336
**(b)** Rs. 33,335
**(c)** Rs. 33,348
**(d)** Rs. 33,340

**Q63.** A hollow spherical shell is made of a metal of density 15 g/cm$^3$. Its internal and external radii are 8 cm and 11 cm, respectively. What is the mass (in kg) of the shell ? (Take $\pi$= 22/7)

**(a)** 48.48
**(b)** 52.96
**(c)** 51.48
**(d)** 52.67

**Q64.** The LCM of two numbers is seven times their HCF. The difference between the HCF and LCM is 222. Find the product of the two numbers.

**(a)** 9158
**(b)** 9276
**(c)** 9583
**(d)** 9086

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**Q65.** The average of first 154 odd natural numbers, is:

**(a)** 153.5
**(b)** 154
**(c)** 155
**(d)** 154.5

**Q66.** A bus travelling at 36 km/hr completes a journey in 5 hours. What should be its speed to cover the same distance in 10 hours?

**(a)** 17 km/hr
**(b)** 18 km/hr
**(c)** 22 km/hr
**(d)** 9 km/hr

**Q67.** Rs. 44,200 was divided among A, B and C such that 3 times the share of A = 9 times the share of B = 4 times the share of C. Find the share of A.

**(a)** Rs. 21,304
**(b)** Rs. 21,216
**(c)** Rs. 21,081
**(d)** Rs. 21,178

**Q68.** Simplify $x(3x - 6) + 5(x^2 - 4) + 19$.

**(a)** $8x^2 - 6x - 1$
**(b)** $-8x^2 - 6x - 1$
**(c)** $-8x^2 - 6x + 1$
**(d)** $8x^2 - 6x + 1$

**Q69.** The value of $\sqrt{289}+\sqrt{0.0324}-\sqrt{7.29}=$

**(a)** 14.48
**(b)** 12.59
**(c)** 9.08
**(d)** 11.21

**Q70.** Daksh travels 168 km at 21 km/hr, the next 100 km at 20 km/hr and the next 371 km at 53 km/hr. What is his average speed (in km/hr) for the whole journey?

**(a)** 36.61
**(b)** 23.34
**(c)** 29.63
**(d)** 31.95

## GENERAL INTELLIGENCE AND REASONING

**Q71.** Select the pair that follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

CSL : FPG

KGX : NDS

**(a)** MMX : PQS
**(b)** DJF : GGA
**(c)** JKY : MMT
**(d)** NGN : QJJ

**Q72.** KHIG is related to HEFD in a certain way based on the English alphabetical order. In the same way, DABZ is related to AXYW. To which of the given options is BYZX related, following the same logic?

**(a)** YVVU
**(b)** YWVD

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**(c)** YVWU
**(d)** YUVU

**Q73.** Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

**(a)** LID
**(b)** ROK
**(c)** MJF
**(d)** FCY

**Q74.** Seven boxes T, U, V, W, X, Y and D are kept one over the other but not necessarily in the same order. Only two boxes are kept below W. Only one box is kept above Y. Only one box is kept between Y and U. T is kept immediately above X. D is kept at some place below V. How many boxes are kept between V and T?

**(a)** Two
**(b)** One
**(c)** Four
**(d)** Three

**Q75.** What should come in place of the question mark (?) in the given series?

61 60 56 47 31 ?

**(a)** 6
**(b)** 14
**(c)** 28
**(d)** 9

**Q76.** In a certain code language, ‘keep your goal’ is coded as ‘yt ru kj’ and ‘mind your business’ is coded as ‘kj gb mi’. How is ‘your’ coded in the given language?

**(a)** kj
**(b)** mi
**(c)** ru
**(d)** yt

**Q77.** This question is based on five, four-digit numbers given below.

(Left) 1338 2325 3627 5513 1764 (Right)

(Example: 6975 – First digit = 6, second digit = 9, third digit = 7 and fourth digit = 5) (NOTE: All operations to be done from left to right.)

If all the digits in each number are reversed, then what will be the resultant if the second digit of the second largest number is multiplied to the second digit of the smallest number?

**(a)** 3
**(b)** 2
**(c)** 1
**(d)** 4

**Q78.** Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) logically follow(s) from the statements.

Statements: All pencils are erasers. Some erasers are crayons.

Conclusions (I): Some pencils are crayons.

Conclusions (II): Some erasers are pencils

**(a)** Only conclusion (II) follows
**(b)** Both conclusions (I) and (II) follow.
**(c)** Only conclusion (I) follows.
**(d)** Neither conclusion (I) nor (II) follows.

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**Q79.** Select the pair that follows the same pattern as that followed by the two set of pairs given below. Both pairs follow the same pattern.

ITM : LSO

SSV : VRX

**(a)** SUK : VTL
**(b)** TNN : WMP
**(c)** WQJ : ZRL
**(d)** FTF : ISI

**Q80.** Sheghal ranked 33rd from the top and 18th from the bottom in his class.

How many students are there in his class?

**(a)** 50
**(b)** 53
**(c)** 51
**(d)** 52

**Q81.** What will come in the place of the question mark (?) in the following equation, if '+' and '÷' are interchanged, and '−' and '×' are interchanged?

9 + 5 ÷ 130 − 10 × 22 = ?

**(a)** 1202.8
**(b)** 1259.8
**(c)** 1200.8
**(d)** 1279.8

**Q82.** Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

**(a)** RKQ
**(b)** VOU
**(c)** OHM
**(d)** TMS

**Q83.** Six people A, B, C, D, E and F are sitting in a straight line. All are facing towards North. B is seated third from the extreme right end of the line.

Only two people are seated between B and E.

C is sitting second from the right of B.

F is an immediate neighbour of B and C.

A is sitting to the immediate right of D.

How many people are seated between D and F?

**(a)** Three
**(b)** Two
**(c)** Four
**(d)** One

**Q84.** Refer to the following number-symbol series and answer the question that follows. Counting is to be done from left to right only. (Left) 5 * 8 > 4 1 4 \ 4 $ ^ 3 ? 5 2 % / > 9 2 4 (Right)

How many such numbers are there, each of which is immediately preceded by a symbol and also immediately followed by another number?

**(a)** Four
**(b)** Two
**(c)** One
**(d)** Three

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**Q85.** Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

All scissors are crayons.

Some crayons are erasers.

Conclusions:

(1) Some scissors are erasers.

(II) Some erasers are crayons.

**(a)** Neither conclusion (I) nor (II) follows.
**(b)** Only conclusion (I) follows.
**(c)** Only conclusion (II) follows.
**(d)** Both conclusions (I) and (II) follow

**Q86.** Six friends T, V, W, X, Y and Z are sitting around a circular table, facing the centre. V sits second to the right of Y. Y sits to the immediate left of T. X sits second to the left of W. How many people sit between Z and V when counted from the left of V?

**(a)** One
**(b)** Two
**(c)** None
**(d)** Three

**Q87.** In a certain code language, ‘HALF’ is coded as ‘2586’ and ‘FLAG’ is coded as ‘7862’. What is the code for ‘G’ in the given code language?

**(a)** 2
**(b)** 7
**(c)** 8
**(d)** 6

**Q88.** In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Select the pair in which the numbers are related in the same way as are the numbers of the following pairs.

(Note: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g., 13 – Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

78, 39

84, 42

**(a)** 94, 48
**(b)** 52, 23
**(c)** 66, 33
**(d)** 58, 19

**Q89.** If 1 is added to each odd digit and 4 is subtracted from each even digit in the number 6854376, how many digits will appear more than once in the new number thus formed?

**(a)** None
**(b)** Two
**(c)** Three
**(d)** One

**Q90.** Heerat starts from point A and walks 2 km towards east. She then takes a left turn and walks 2 km. She takes another left turn and walks 2 km. She takes a final left turn and walks 5 km to reach a point B. How far (shortest distance) and towards which direction should she walk in order to reach point A again? (All turns are 90-degree turns only unless otherwise specified.)

**(a)** 2 km west
**(b)** 3 km north

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**(c)** 2 km north
**(d)** 2 km south

**Q91.** Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

**(a)** MP-KO
**(b)** PS-NR
**(c)** UX-SW
**(d)** RU-PS

**Q92.** What should come in place of the question mark (?) in the given series?

58 60 65 73 84 ?

**(a)** 84
**(b)** 98
**(c)** 89
**(d)** 95

**Q93.** Which of the following letter-clusters will replace the question mark (?) in the given series to make it logically complete?

YPP -1 VRM -3 ? PVG -27 MXD -81

**(a)** STJ -9
**(b)** STI -9
**(c)** SSJ -6
**(d)** SSI -6

**Q94.** Suresh starts from Point A and drives 7 km towards West. He then takes a right turn, drives 3 km, turns right and drives 11 km. He then takes a right turn and drives 6 km. He takes a final right turn, drives 4 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90° turns only unless specified.)

**(a)** 3 km to South
**(b)** 3 km to North
**(c)** 4 km to North
**(d)** 4 km to South

**Q95.** What will come in the place of the question mark (?) in the following equation, if '÷' and '−' are interchanged and '×' and '+' are interchanged? 63 × 9 ÷ 3 − 3 × 24 + 22 ÷ 11 + 9 = ?

**(a)** 494
**(b)** 526
**(c)** 500
**(d)** 428

**Q96.** In a certain code language,

A + B means 'A is the sister of B',

A-B means 'A is the brother of B',

A x B means 'A is the wife of B' and

A ÷ B means 'A is the father of B'.

How is F related to Y if 'F – H x L ÷ O + Y'?

**(a)** Mother's father
**(b)** Mother's brother
**(c)** Father's father
**(d)** Father's brother

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**Q97.** All 129 students in a class are standing in a straight line facing north. Lalit is 33rd from the right end while Sahil is 27th from the left end. How many people stand between Lalit and Sahil?

**(a)** 70
**(b)** 68
**(c)** 72
**(d)** 69

**Q98.** If + means −, − means ×, × means ÷, ÷ means +, then what will come in place of the question mark (?) in the following equation?

40 × 4 + 12 ÷ 6 − 4 = ?

**(a)** 20
**(b)** 17
**(c)** 14
**(d)** 22

**Q99.** What should come in place of the question mark (?) in the given series?

391 392 396 405 421 ?

**(a)** 441
**(b)** 431
**(c)** 436
**(d)** 446

**Q100.** Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

HKB 11, FIZ 19, DGX 27, BEV 35, ?

**(a)** ACR 43
**(b)** ZCT 43
**(c)** ZBR 45
**(d)** XAT 42

## ANSWER KEY

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | c | 2 | d | 3 | d | 4 | d | 5 | c | 6 | c | 7 | b | 8 | a | 9 | d | 10 | b |
| 11 | b | 12 | b | 13 | a | 14 | b | 15 | c | 16 | b | 17 | a | 18 | a | 19 | a | 20 | b |
| 21 | b | 22 | d | 23 | d | 24 | a | 25 | a | 26 | c | 27 | d | 28 | a | 29 | d | 30 | a |
| 31 | b | 32 | d | 33 | a | 34 | d | 35 | c | 36 | c | 37 | c | 38 | d | 39 | b | 40 | b |
| 41 | a | 42 | d | 43 | d | 44 | c | 45 | b | 46 | d | 47 | a | 48 | d | 49 | c | 50 | b |
| 51 | b | 52 | a | 53 | b | 54 | d | 55 | d | 56 | a | 57 | c | 58 | d | 59 | b | 60 | d |
| 61 | b | 62 | b | 63 | c | 64 | c | 65 | b | 66 | b | 67 | b | 68 | a | 69 | a | 70 | d |
| 71 | b | 72 | c | 73 | a | 74 | c | 75 | a | 76 | a | 77 | b | 78 | a | 79 | b | 80 | a |
| 81 | d | 82 | c | 83 | b | 84 | d | 85 | c | 86 | d | 87 | b | 88 | c | 89 | b | 90 | b |
| 91 | d | 92 | b | 93 | a | 94 | b | 95 | c | 96 | b | 97 | d | 98 | d | 99 | d | 100 | b |

## SOLUTIONS

**Q1. Answer: (c) Punjab**

The correct answer is Punjab.

Key Points

• Punjab witnessed the strongest violence during the Rowlatt Satyagraha due to widespread anger against the repressive Rowlatt Act enacted by the British government.

• The situation escalated significantly in Amritsar, where protests turned into violent confrontations between the people and British

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authorities.

• The infamous Jallianwala Bagh Massacre occurred on 13 April 1919 in Amritsar, where British troops under General Dyer fired upon a peaceful gathering, killing hundreds of innocent civilians.

• Martial law was imposed in Punjab, particularly in cities like Amritsar and Lahore, to suppress dissent and protests against the British regime.

• The Rowlatt Satyagraha marked a significant turning point in India's freedom struggle, galvanizing nationwide protests against British colonial rule.

Additional Information

• Rowlatt Act:

• The Rowlatt Act, officially known as the Anarchical and Revolutionary Crimes Act of 1919, was passed by the British government to curb revolutionary activities.

• It allowed the government to arrest individuals without trial and suppress freedom of expression, which led to widespread resentment across India.

• The Act was seen as a betrayal of promises made during World War I, when Indians were assured greater autonomy in return for their support in the war.

• Jallianwala Bagh Massacre:

• On 13 April 1919, British troops led by General Reginald Dyer fired on a peaceful gathering a

**Q2. Answer: (d) 139**

The correct answer is Option 4 (139).

Key Points

• The Padma Awards are one of the highest civilian honors in India. They are announced annually on the occasion of Republic Day.

• In the year 2025, a total of 139 individuals were conferred with the Padma Awards. Hence, option 4 is correct.

• The Padma Awards are divided into three categories: Padma Vibhushan (for exceptional and distinguished service), Padma Bhushan (distinguished service of higher order), and Padma Shri (distinguished service).

• The awards recognize achievements in various disciplines such as art, literature, education, sports, medicine, social work, science and engineering, public affairs, civil service, trade and industry, and more.

• The recipients of the Padma Awards are announced every year in January, and the awards are distributed by the President of India at ceremonial functions held at the Rashtrapati Bhavan.

Additional Information

• Padma Awards Categories:

• Padma Vibhushan: The second-highest civilian award in India, awarded for exceptional and distinguished service in any field.

• Padma Bhushan: The third-highest civilian award, given for distinguished service of a high order in any field.

• Padma Shri: The fourth-highest civilian award, recognizing distinguished service in any field.

• Historical Background:

• The Padma Awards were instituted in 1954 by the Government of India.

• The awards are announced annually on the occasion of the Republic Day of India.

• These awards aim to recognize achievements in all fields of activities or disciplines where an element of public service is involved.

• Notable Recipients:

• Individuals from various fields, such as arts, literature, science, social work, and sports, have been honored with Padma Awards.

• Some notable recipients include Dr. A.P.J. Abdul Kalam, Mother Teresa, and Ratan Tata.

• Award Selection Process:

• Nominations are solicited from the public, state governments, Union Territory Administrations, Ministries, and other organizations.

• The nominations are then scrutinized by a committee headed by the Cabinet Secretary, and the final recommendations are made to the Prime Minister and the President for approval.

Important Points

• Eligibility: All persons without distinction of race, occupation, position, or sex are eligible for these awards. However, government servants, including those working with public sector undertakings, are not eligible.

• Posthumous Awards: These are granted in rare cases where the individual has rendered highly exceptional services before their demise.

• Design: The awards are in the shape of a peepal leaf with the words "Padma" inscribed in Devanagari script. The awards are made of bronze, with the Padma Vibhushan being gold-plated, the Padma Bhushan gilded, and the Padma Shri in standard

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bronze.

• Significance: These awards highlight the diverse talents and contributions of individuals in various fields and serve as an inspiration to others to strive for excellence.

**Q3. Answer: (d) Monthly Per Capita Expenditure**

The correct answer is Monthly Per Capita Expenditure.

Key Points

• The Multidimensional Poverty Index (MPI) measures poverty by considering multiple deprivations faced by individuals at the household level in three key dimensions: health, education, and living standards.

• Indicators included in the MPI for education are years of schooling and school attendance. Hence, "Years of Schooling" is included in the MPI.

• Indicators under living standards assess access to basic services and assets, such as electricity access, sanitation, drinking water, housing, and cooking fuel. Therefore, "Electricity Access" is included.

• For health, MPI includes indicators like nutrition and child mortality. This makes "Nutrition" part of the MPI.

• Monthly Per Capita Expenditure is not included in the MPI, as it focuses on multidimensional aspects rather than income or expenditure-based measures of poverty. This makes it the correct answer.

Additional Information

• Multidimensional Poverty Index (MPI):

• The MPI was developed by the Oxford Poverty and Human Development Initiative (OPHI) and the United Nations Development Programme (UNDP) in 2010.

• It assesses poverty beyond income measures, capturing multiple deprivations across 10 indicators under three dimensions: health, education, and living standards.

• The MPI is used globally to understand poverty in a more comprehensive way and inform policymaking.

• Countries use MPI to determine targeted interventions for poverty reduction and track progress towards global goals like the Sustainable Development Goals (SDGs).

• Dimensions and Indicators of MPI:

• Health: Includes nutrition and child mortality.

• Education: Covers years of schooling and school attendance.

• Living Standards: Includes access to electricity, drinking water, sanitation, housing, cooking fuel, and ownership of assets.

• Monthly Per Capita Expenditure:

• This is a measure used in traditional income-based poverty metrics.

• It focuses on the average monetary expenditure per person within a household.

• While useful in assessing financial poverty, it does not address non-monetary dimensions of poverty, such as health or education.

• It is commonly used in economic surveys, such as the National Sample Survey Organisation (NSSO) in India.

• Important Reports and Indices:

• The MPI is part of the Human Development Index (HDI) framework developed by UNDP.

• India's MPI is included in the Global Multidimensional Poverty Index, published annually by OPHI and UNDP.

• According to the 2023 Global MPI report, India has made significant progress in poverty reduction, with millions lifted out of multidimensional poverty.

**Q4. Answer: (d) LOX-Methane engine**

The correct answer is LOX-Methane engine.

Key Points

• ISRO (Indian Space Research Organisation) announced plans in 2025 to develop a new generation of launch vehicle (NGLV) equipped with LOX-Methane engines.

• The development of LOX-Methane engines is part of ISRO's efforts to create more efficient, reusable, and environmentally friendly rocket propulsion systems for future space missions.

• LOX-Methane engines use liquid oxygen (LOX) as an oxidizer and methane as a fuel, which is a more sustainable and cleaner alternative compared to traditional fuels like hydrazine or RP-1 (kerosene).

• These engines are designed to cater to the increasing demand for launching heavy payloads into orbit, which aligns with ISRO's vision for the next-generation space exploration and satellite deployment.

• The LOX-Methane combination also allows potential reuse of rockets, as methane burns cleanly and minimizes residue buildup within the engine, facilitating refurbishment for multiple launches.

Additional Information

• LOX-Methane Engines:

• Liquid Oxygen (LOX): LOX is used as an oxidizer in rocket propulsion systems due to its high efficiency and ability to produce large thrust when combined with fuels.

• Methane: Methane is a clean-burning fuel that reduces engine residue, making it suitable for reusable rocket systems. It is also easier to store and handle compared to hydrogen.

• Advantages: LOX-Methane engines are more environmentally friendly, cost-effective, and offer higher efficiency for deep-space missions, as methane can be sourced from Martian soil for refueling purposes.

• ISRO's Next Generation Launch Vehicle (NGLV):

• ISRO is focusing on developing the NGLV to replace its current workhorse launch vehicle, the GSLV Mk III, for enhanced payload capacity and greater reusability.

• Applications: NGLV is expected to support diverse missions, including launching communication satellites, interplanetary exploration, and large-scale space missions.

• Reusable Design: NGLV will incorporate reusable technology to reduce launch costs and increase competitiveness in the global space market.

• Other Propulsion Systems:

• LOX-Kerosene Engines: These engines are widely used in rockets such as SpaceX's Falcon series but are less efficient and less environmentally friendly compared to LOX-Methane engines.

• Hydrogen-Fueled Engines: Hydrogen engines offer high efficiency but come with storage and handling challenges due to hydrogen's cryogenic properties.

• Cryogenic Solid Fuel Engines: These engines are used for specific applications but lack the reusability and efficiency offered by LOX-Methane systems.

• Global Context:

• Space agencies like SpaceX and Blue Origin are already leveraging LOX-Methane engines for their reusable rocket programs, indicating the growing trend towards adopting this technology globally.

• ISRO's development of LOX-Methane engines will align India with cutting-edge advancements in space propulsion systems and enhance its competitive edge in space exploration.

Important Points

• Why LOX-Methane?

• Clean Combustion: Methane burns cleaner than kerosene and hydrogen, reducing engine maintenance and enabling reuse.

• Storage Benefits: Methane is easier to store as it does not need extremely low temperatures like hydrogen.

• Space Exploration: Methane can be produced on Mars using in-situ resource utilization, supporting long-term interplanetary missions.

• Global Adoption: Leading companies like SpaceX use LOX-Methane engines, showcasing their reliability and efficiency for modern space missions.

• ISRO's Contribution:

• ISRO has consistently invested in advanced propulsion systems to enhance India's capabilities in space exploration and satellite deployment.

• The NGLV project with LOX-Methane engines represents a significant step forward in making India self-reliant in next-gen space technology.

**Q5. Answer: (c) NDMA**

The correct answer is NDMA.

Key Points

• National Disaster Management Authority (NDMA) is the apex body responsible for disaster management in India.

• It was established under the Disaster Management Act, 2005, which provides a legal framework for disaster preparedness, mitigation, and response at the national level.

• The NDMA is headed by the Prime Minister of India, who acts as the Chairperson.

• Its primary role is to formulate policies, plans, and guidelines for disaster management and coordinate with various ministries, departments, and state governments for implementation.

• NDMA conducts disaster risk reduction and preparedness programs, facilitates capacity building, and ensures the availability of funds for disaster response and recovery.

Additional Information

• SDRF (State Disaster Response Force):

• SDRF is established by state governments to handle disaster response at the state level.

• It operates under the guidelines provided by NDMA but focuses on state-specific disaster management activities.

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• It is responsible for immediate rescue and relief operations in case of disasters within the state.
• IRDA (Insurance Regulatory and Development Authority of India):
• IRDA is a statutory body formed under the IRDA Act, 1999.
• It regulates and promotes the insurance and reinsurance industry in India.
• Its primary focus is on protecting policyholders' interests rather than disaster management.
• NITI Aayog:
• NITI Aayog, established in 2015, is the policy think tank of the Government of India.
• Its focus is on fostering cooperative federalism and developing long-term strategies for economic growth and development.
• It does not directly handle disaster management but may provide strategic inputs on disaster-related policies.
• Key Features of the Disaster Management Act, 2005:
• The Act envisages the creation of the NDMA at the national level, along with State Disaster Management Authorities (SDMAs) and District Disaster Management Authorities (DDMAs) at the state and district levels.
• It emphasizes a proactive approach to disaster preparedness, mitigation, and response.
• It mandates the creation of National Policy on Disaster Management and National Institute of Disaster Management (NIDM).

Important Points

• NDMA's Vision:
• To build a safe and disaster-resilient India by developing a culture of prevention, preparedness, and mitigation.
• To ensure a coordinated and prompt response during disasters.
• Significant Initiatives by NDMA:
• Implementation of the National Cyclone Risk Mitigation Project (NCRMP).
• Promotion of Early Warning Systems for disasters like cyclones, earthquakes, and floods.
• Capacity building and training programs for disaster response teams.

**Q6. Answer: (c) Aravalli Hills**

The correct answer is Aravalli Hills.

Key Points

• The eastern boundary of the Indian Desert, also known as the Thar Desert, is primarily controlled by the Aravalli Hills, which act as a natural barrier limiting the desert's expansion eastward.
• The Aravalli Range is one of the world's oldest mountain ranges, dating back to the Precambrian Era, and runs in a northeast-southwest direction across the states of Rajasthan, Haryana, Gujarat, and Delhi.
• The Aravalli Hills contribute to the geographical and climatic delineation of the region by intercepting the southwestern monsoon winds and reducing their moisture content, which affects the arid conditions of the Thar Desert.
• These hills prevent the desertification of regions east of the range and provide a natural border between the arid zones of the desert and the fertile plains of eastern Rajasthan.
• The presence of the Aravalli Hills also influences the flow of rivers like the Luni River, which flows westward into the desert, shaping the hydrology of the region.

Additional Information

• Aravalli Hills:
• The Aravalli Range is approximately 692 km long and stretches from Delhi to Gujarat.
• The highest peak of the Aravalli Range is Guru Shikhar, located in Mount Abu, Rajasthan, with an elevation of 1,722 meters.
• It is primarily composed of Proterozoic rocks such as quartzite, marble, and granite, which are rich in minerals.
• Several cities like Udaipur, Ajmer, and Alwar are located in the Aravalli region.
• Thar Desert:
• The Thar Desert, also known as the Great Indian Desert, is the 17th largest desert in the world and the 9th largest subtropical desert.
• It spans an area of approximately 200,000 square kilometers, covering parts of Rajasthan, Gujarat, Punjab, and Haryana, and also extends into Pakistan.
• The Thar Desert is characterized by low rainfall (less than 250 mm annually), high temperatures, and sand dunes.
• Western Ghats:
• The Western Ghats are a UNESCO World Heritage Site and run parallel to the western coast of India.
• They are known for their biodiversity and are located in states like Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu.
• Satpura Hills:
• Located in central India, the Satpura Range runs between the Narmada and Tapti rivers.

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• It is rich in forests and is home to several national parks like Satpura National Park and Pachmarhi Biosphere Reserve.

• Vindhya Range:

• The Vindhya Range is located in central India and runs east-west, separating northern India from the southern peninsula.

• It is a low-lying mountain range with an average elevation of 300-600 meters.

**Q7. Answer: (b) Android**

The correct answer is Android.

Key Points

• Android is primarily an operating system for mobile devices, such as smartphones and tablets, rather than a dedicated operating system for computers and laptops.

• Android was developed by Google and is based on a modified version of the Linux kernel and other open-source software.

• Although Android can technically run on laptops or desktops using emulators or custom setups, it is not commonly used for such purposes and is not a mainstream operating system for computers.

• In contrast, Linux, Windows, and Unix are widely recognized operating systems for computers and laptops, designed for diverse computing needs, including personal, professional, and server-based tasks.

• Linux, Windows, and Unix are highly versatile and support a wide range of hardware configurations, making them standard choices for desktop and laptop computers. Hence, the statement "Android is not a common OS for computers and laptops" is correct.

Additional Information

• Linux:

• Linux is an open-source operating system kernel originally developed by Linus Torvalds in 1991.

• It is known for its stability, security, and flexibility, making it a popular choice for servers, desktops, and embedded systems.

• Linux distributions, such as Ubuntu, Fedora, and Debian, are widely used as desktop operating systems.

• It is highly customizable and supports a wide range of hardware.

• Windows:

• Windows is a series of operating systems developed by Microsoft, with its first version released in 1985.

• It is one of the most widely used operating systems for personal computers globally.

• Windows offers a user-friendly interface and extensive compatibility with software and hardware.

• Popular versions include Windows 7, Windows 10, and Windows 11.

• Unix:

• Unix is a multi-user, multitasking operating system originally developed in the 1970s by AT&T Bell Labs.

• It is widely used in servers, workstations, and mainframes.

• Many modern operating systems, including Linux and macOS, are based on Unix or heavily inspired by it.

• Unix is known for its stability, scalability, and robustness in handling complex computing tasks.

• Android:

• Android was first released in 2008 and is currently the most popular mobile operating system worldwide.

• It is built on the Linux kernel but is optimized for touchscreen devices like smartphones and tablets.

• Android supports a wide range of applications available on the Google Play Store.

• While not typically used as a desktop or laptop OS, Android's architecture allows for some cross-platform functionality with emulators.

• Important Points:

• Linux, Windows, and Unix are the primary operating systems used in computers and laptops due to their versatility, compatibility, and reliability.

• Android, despite its Linux-based foundation, remains predominantly a mobile operating system and is rarely used for traditional computing devices.

• Understanding the differences in purpose and application of operating systems is crucial for selecting the right OS for specific tasks.

**Q8. Answer: (a) 6**

The correct answer is 6.

Key Points

• The Monetary Policy Committee (MPC) was established by the Reserve Bank of India (RBI) in 2016 to formalize inflation targeting and strengthen India's monetary policy framework.

• The MPC is composed of a total of 6 members. Out of these, 3 members are from the RBI, including the Governor of RBI as the

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chairperson, and 3 are external members appointed by the Government of India.

• The committee meets 4 times a year, and its primary objective is to set the policy interest rate (repo rate) to achieve the inflation target set by the government.

• Each member of the MPC has one vote. In case of a tie, the RBI Governor has the casting vote.

• The inflation target is set under the Reserve Bank of India Act, 1934, and the current target is 4% (+/- 2%) for the period 2021–2026.

Additional Information

• Composition of the MPC:

• RBI Members: The Governor of RBI (Chairperson), the Deputy Governor in charge of monetary policy, and one officer nominated by the RBI.

• External Members: Three external experts appointed by the Government of India for a term of 4 years.

• Objective of the MPC:

• The main goal of the MPC is to achieve price stability while also considering the objectives of economic growth.

• The MPC is guided by the government's inflation target, which is reviewed every 5 years.

• Inflation Targeting in India:

• India adopted inflation targeting as part of its monetary policy framework in 2016.

• The inflation target is currently set at 4% with a permissible band of +/- 2%.

• Decision-Making Process:

• The MPC decides on the repo rate, which is the rate at which RBI lends money to commercial banks.

• Decisions are made by a majority vote, and the RBI Governor has the casting vote in case of a tie.

• Significance of the MPC:

• Ensures transparency and accountability in setting monetary policy.

• Strengthens the RBI's ability to achieve its inflation-targeting goals.

• Contributes to maintaining macroeconomic stability in India.

Important Points

• Historical Context:

• The MPC was formed under the provisions of the Reserve Bank of India Act, 1934, following amendments made in 2016.

• Before the MPC, monetary policy decisions were taken solely by the RBI Governor.

• Global Context:

• Inflation targeting is a widely adopted monetary policy approach globally, first implemented by New Zealand in 1990.

• Countries like the United States, United Kingdom, and Canada also use inflation targeting frameworks.

• Example of MPC Decision:

• During the COVID-19 pandemic, the MPC reduced the repo rate to stimulate economic growth while keeping inflation within the target range.

**Q9. Answer: (d) Sati**

The correct answer is Sati.

Key Points

• Sati was an ancient Hindu practice in India where a widow immolated herself on her husband's funeral pyre.

• Lord William Bentinck, the Governor-General of India, banned the practice of Sati in 1829 by implementing the Bengal Sati Regulation Act.

• The regulation declared Sati as illegal and punishable by law, marking a significant reform during British rule in India.

• The decision to abolish Sati was influenced by social reformers such as Raja Ram Mohan Roy, who strongly opposed this practice and advocated for women's rights.

• The abolition of Sati was a major step toward improving the status of women in India during the colonial period.

Additional Information

• Child Marriage:

• Child marriage refers to the practice of marrying off individuals (usually girls) below the age of 18.

• The practice was prevalent in India and continues to be a challenge in some parts of the country, despite reforms and laws such as the Prohibition of Child Marriage Act, 2006.

• This act prescribes punishment for those involved in promoting or conducting child marriages.

• Polygamy:

• Polygamy refers to the practice of having multiple spouses simultaneously.

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• In India, polygamy is illegal under the Hindu Marriage Act, 1955, which applies to Hindus, Buddhists, Jains, and Sikhs.

• However, personal laws for certain communities, such as Muslims, allow polygamy under specific conditions.

• Dowry:

• The dowry system involves the transfer of money, goods, or property from the bride's family to the groom's family during marriage.

• The Dowry Prohibition Act, 1961, was enacted to prohibit the practice of dowry and punish those demanding or accepting dowry.

• Despite legal prohibitions, the practice remains a social issue in India, leading to instances of dowry-related harassment and violence.

• Sati and Social Reform:

• The abolition of Sati was a landmark in Indian social reform, spearheaded by activists like Raja Ram Mohan Roy.

• The practice was deeply rooted in patriarchal and religious beliefs, which justified the immolation of widows as a form of loyalty.

• British intervention and Indian reformist movements played a crucial role in eradicating this inhumane practice.

Important Points

• Raja Ram Mohan Roy's Contribution:

• Raja Ram Mohan Roy was a key figure in the fight against Sati. He argued against the practice, citing religious scriptures that did not mandate it.

• He founded the Brahmo Samaj, which advocated for reforms in Hindu society, including the abolition of Sati and promotion of education for women.

• Legal Framework:

• The abolition of Sati was formalized through the Bengal Sati Regulation Act, 1829, which made the practice illegal and punishable.

• Subsequent laws and reforms continued to address issues of gender inequality and oppressive practices against women in India.

• Impact on Indian Society:

• The abolition of Sati marked a significant step in the emancipation of women in India.

• It set a precedent for further reforms, including the promotion of women's education, property rights, and access to legal remedies.

**Q10. Answer: (b) Kavach Automatic Train Protection**

The correct answer is Kavach Automatic Train Protection.

Key Points

• Kavach Automatic Train Protection (ATP) is an indigenous railway safety system developed by the Indian Railways to enhance train safety and prevent accidents such as collisions and derailments.

• The implementation of the Kavach system is a significant milestone in the Indian Railways' efforts to modernize its infrastructure and improve safety. By 2025, the system is planned to cover a distance of 3,500 km at a cost of Rs. 1,700 crore.

• The Kavach system uses state-of-the-art technologies like signals passed at danger (SPAD), automatic braking in case of driver error, and real-time communication between the train and signaling systems to ensure the highest level of safety.

• It was successfully tested on March 4, 2022, with a demonstration attended by the Union Minister of Railways, Ashwini Vaishnaw, showcasing its effectiveness in preventing accidents.

• The Indian government aims to expand the Kavach system to cover the entire railway network, ensuring the safety of passengers and reducing risks associated with human errors in train operations.

Additional Information

• Features of Kavach System:

• Automatic Braking: The Kavach system automatically applies brakes to prevent collisions in case the train overshoots a signal or encounters another train on the same track.

• SPAD (Signals Passed at Danger): It ensures that the train halts before passing a danger signal, thereby averting potential accidents.

• Real-Time Communication: The system allows real-time communication between trains and station signaling systems to provide updates on movement and track conditions.

• Indigenous Development: Kavach is a Make in India initiative, developed by Indian Railways, which ensures cost-effectiveness and promotes local manufacturing capabilities.

• Importance of Kavach:

• It aims to reduce human errors, which are a leading cause of train accidents in India.

• Kavach is expected to significantly enhance passenger safety and improve the efficiency of train operations on Indian railways.

• As part of the modernization drive, the Indian Railways plans to implement this system across its high-density routes and ensure

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safer and faster travel for passengers.

• Comparison with Other Options:

• Nationwide Railway Safety System: This is a generic term and does not refer to any specific system implemented by Indian Railways.

• Namo Bharat Signalling System: No such system exists in Indian Railways under this name.

• GPS-based Tracking System: While GPS technology is used for tracking trains, it is not a comprehensive safety system like Kavach, which includes automatic braking and SPAD features.

• Future Plans:

• The Indian Railways has set a target to implement the Kavach system across 34,000 km of its network, focusing on high-density routes.

• The initiative aligns with the government's vision of achieving high levels of safety and reliability in the railway sector.

**Q11. Answer: (b) Pir Panjal**

The correct answer is Pir Panjal.

Key Points

• The Pir Panjal Range is the largest range of the Lesser Himalayas (Himachal).

• It forms the southern boundary of the Kashmir Valley and separates it from the Jammu region and the rest of the Himalayan region.

• The famous Banihal Pass lies in the Pir Panjal Range and provides an important route connecting the Kashmir Valley with Jammu.

• The Pir Panjal Tunnel (Banihal-Qazigund Road Tunnel) and the Pir Panjal Railway Tunnel are major transport links through this range.

• Hence, the Pir Panjal Range separates the Kashmir Valley from the rest of the Himalayan region.

Additional Information

• Zaskar Range:

• Located to the east of the Kashmir Valley.

• Separates the Kashmir Valley from the Indus Valley in Ladakh.

• Karakoram Range:

• Located in the northernmost part of the Trans-Himalayas.

• Home to K2 (Mount Godwin-Austen), the world's second-highest peak.

• Ladakh Range:

• Situated between the Karakoram Range and the Zaskar Range.

• Forms part of the Trans-Himalayan mountain system.

Important Points

• Pir Panjal Range is the largest range of the Lesser Himalayas.

• It separates the Kashmir Valley from the Jammu Plain and the rest of the Himalayan region.

• Banihal Pass and the Pir Panjal Tunnel are important features of this range.

• Zaskar, Ladakh, and Karakoram are part of the higher Himalayan and Trans-Himalayan systems.

**Q12. Answer: (b) Bangkok, Thailand**

The correct answer is Bangkok, Thailand.

Key Points

• The 2025 Southeast Asia Regional Forum of the Organisation for Economic Cooperation and Development (OECD) was held in Bangkok, Thailand.

• This forum is a platform for dialogue, cooperation, and policy exchange among Southeast Asian nations and OECD member countries.

• The choice of Bangkok as the host city underscores Thailand's leadership in promoting regional economic integration and sustainable development.

• The forum focuses on regional economic growth, development policies, and sustainability, with an emphasis on collaboration between Southeast Asia and OECD countries.

• Thailand's strategic location in Southeast Asia makes it a hub for regional diplomacy and international economic discussions.

Additional Information

• Organisation for Economic Cooperation and Development (OECD):

• The OECD is an international organization that works to stimulate economic progress and world trade.

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• It was founded in 1961 and has 38 member countries, primarily developed nations.
• The organization provides a platform for policy dialogue, research, and exchange of best practices among member and partner countries.
• Its goals include promoting sustainable economic growth, employment, and raising living standards.
• Southeast Asia Regional Forum:
• This forum is part of the OECD's engagement with Southeast Asian nations to foster regional cooperation.
• The forum addresses key issues such as trade, investment, education, environment, and governance.
• It acts as a bridge between the OECD and developing economies in Asia to align policies for sustainable development.
• Thailand's Role in Regional Cooperation:
• Thailand has been an active participant in regional organizations, including ASEAN, advocating for economic growth and integration.
• The country is strategically located and serves as a gateway to Southeast Asia, making it a preferred venue for international forums.
• Its policies emphasize inclusive growth, sustainable development, and regional cooperation.
• Other Host Cities in Southeast Asia:
• Jakarta, Indonesia: Known for hosting international forums, particularly ASEAN-related events.
• Manila, Philippines: A hub for economic and cultural exchanges in Southeast Asia.
• Kuala Lumpur, Malaysia: Recognized for its focus on innovation and regional diplomacy.

Important Points

• Thailand's economic policies:
• Thailand is committed to achieving sustainable development through its national strategies and policies.
• The country emphasizes regional cooperation to address global challenges like climate change and digital transformation.
• OECD's Southeast Asia Regional Programme:
• Launched in 2014, the programme aims to strengthen cooperation between OECD countries and Southeast Asian nations.
• It focuses on policy alignment to foster economic growth and sustainable development.
• Global Economic Forums:
• Such forums play a crucial role in promoting international collaboration to address global economic challenges.
• They provide a platform for countries to exchange best practices and develop coordinated approaches to economic development.

**Q13. Answer: (a) Tolkappiyam**

The correct answer is Tolkappiyam.

Key Points

• Tolkappiyam is considered the earliest Tamil grammar work and one of the oldest surviving texts in Tamil literature.
• It is attributed to the author Tolkappiyar and dates back to approximately 500 BCE to 200 CE, making it a foundational text for Tamil grammar and linguistics.
• The text is divided into three sections: Ezhuttadhikaram (phonology), Soladhikaram (morphology), and Poruladhikaram (semantics).
• Tolkappiyam not only addresses the grammar of the Tamil language but also delves into the social and cultural aspects of the Tamil-speaking population during ancient times.
• This ancient treatise has had a profound impact on Tamil linguistics and is regarded as a cornerstone for understanding the linguistic and cultural heritage of Tamil Nadu.

Additional Information

• Silappadikaram:
• Written by Ilango Adigal, Silappadikaram is one of the five great epics of Tamil literature and dates back to the 5th-6th century CE.
• It is a narrative poem that tells the story of Kovalan and Kannagi, focusing on themes of love, betrayal, and justice.
• While it is a monumental work of Tamil literature, it is not a grammar text.
• Manimekalai:
• Manimekalai is another Tamil epic, written by Sathanar, and is considered the sequel to Silappadikaram.
• The story revolves around the life of Manimekalai, the daughter of Kovalan and Madhavi, and explores Buddhist philosophy and teachings.
• It is a religious and philosophical text rather than a grammar work.
• Kural:

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• Also known as Tirukkural, this classical Tamil text was authored by Thiruvalluvar and is one of the most revered works in Tamil literature.

• It consists of 1,330 couplets divided into three sections: Aram (virtue), Porul (wealth), and Inbam (love).

• Though it is regarded as a treatise on ethics and morality, it does not serve as a grammar text.

• Important Points:

• Tamil Sangam Literature: The Sangam period (~300 BCE to 300 CE) is known for its rich literary contributions, including works on grammar, poetry, and ethics.

• Tolkappiyam's Legacy: It serves as a foundation for the study of Tamil language and culture, influencing subsequent works in Tamil literature.

• Classification: Tolkappiyam is classified as a seminal text in Tamil linguistics and continues to be studied by linguists and scholars worldwide.

**Q14. Answer: (b) Huygens' Principle**

The correct answer is Huygens' Principle.

Key Points

• Huygens' Principle states that every point on a wavefront acts as a source of secondary wavelets, which spread out in all directions at the same speed as the wave. The new wavefront is formed by the envelope of these secondary wavelets.

• This principle was proposed by Christiaan Huygens in 1690 and serves as a foundational concept in wave theory and optics.

• Huygens' Principle is fundamental to understanding phenomena like reflection, refraction, diffraction, and interference of waves.

• The principle applies to all types of waves, including light waves, sound waves, and water waves, making it a universal concept in wave mechanics.

• It provides a clear explanation of the behavior of light as a wave, particularly when passing through media or around obstacles.

Additional Information

• Doppler's Principle:

• Doppler's Principle, or Doppler Effect, explains the change in frequency or wavelength of a wave in relation to an observer moving relative to the wave source.

• It is commonly observed in sound waves and light waves, such as the change in pitch of a siren as it moves closer or farther away.

• This principle is widely used in applications like weather radar, astronomical observations, and medical imaging.

• Fermat's Principle:

• Fermat's Principle states that light follows the path that takes the least time when traveling from one point to another.

• It is a fundamental concept in geometrical optics and explains the behavior of light in phenomena like reflection and refraction.

• This principle is named after the French mathematician Pierre de Fermat.

• Superposition Principle:

• The Superposition Principle states that when two or more waves overlap, the resulting wave is the sum of the individual waves.

• This principle is key to understanding interference patterns and is applicable to all types of waves, including sound, light, and water waves.

• It explains phenomena such as constructive and destructive interference.

• Applications of Huygens' Principle:

• Huygens' Principle is used to derive laws of reflection and refraction.

• It helps explain the bending of light around obstacles, a phenomenon known as diffraction.

• The principle aids in understanding interference patterns, such as those observed in double-slit experiments.

• It is crucial in designing optical instruments like microscopes and telescopes.

Important Points

• Historical Background:

• Huygens' Principle was instrumental in the development of the wave theory of light, which later paved the way for modern optics.

• It was challenged by Newton's corpuscular theory but eventually gained acceptance due to its ability to explain phenomena like diffraction and interference.

• Modern Implications:

• The principle is used in computational methods like the finite-difference time-domain (FDTD) method for solving wave equations.

• It plays a critical role in fields such as acoustics, optics, and electromagnetism.

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**Q15. Answer: (c) Tata Steel**

The correct answer is Tata Steel.

Key Points

• Tata Steel became the first company in India to successfully develop steel pipes for hydrogen transportation, marking a significant milestone in the energy and manufacturing sector.

• These steel pipes are specifically designed to transport hydrogen gas, which is considered a cleaner and more sustainable energy carrier.

• The development of such pipes is a crucial step in supporting India's transition to a hydrogen-based economy, aligning with the government's National Hydrogen Mission launched in 2021.

• Tata Steel's innovation emphasizes the importance of high-strength, high-quality steel that can withstand the unique challenges posed by hydrogen, such as hydrogen embrittlement, which can weaken metals.

• This advancement not only strengthens India's energy infrastructure but also demonstrates the company's commitment to sustainable and environmentally friendly industrial practices.

Additional Information

• Hydrogen as a Clean Energy Source:

• Hydrogen is considered a clean and sustainable energy carrier as it produces water when burned, without emitting greenhouse gases.

• The Indian government launched the National Hydrogen Mission in 2021 to promote the production, usage, and export of green hydrogen.

• The mission aims to make India a global hub for green hydrogen production and achieve energy independence.

• Challenges in Hydrogen Transportation:

• Transporting hydrogen requires specialized infrastructure due to its small molecular size and high reactivity.

• Issues like hydrogen embrittlement (weakening of metals when exposed to hydrogen) necessitate the use of advanced materials like high-strength steel.

• Tata Steel's Contribution:

• Tata Steel has been a pioneer in the steel manufacturing sector in India, known for its innovative and sustainable practices.

• With this development, the company has taken a critical step in supporting hydrogen-based industries and reducing carbon emissions.

• Other Companies in Steel and Energy Sectors:

• Hindalco Industries: Primarily focuses on aluminium and copper manufacturing, not steel pipe development.

• Jindal Steel & Power: Known for producing steel products and power generation but has not been reported to develop hydrogen transport pipes.

• SAIL (Steel Authority of India Limited): India's largest steel-making company, focusing on traditional steel production rather than hydrogen infrastructure.

• Future Implications:

• The successful development of hydrogen transportation pipes by Tata Steel will contribute to India's renewable energy goals and global leadership in sustainable technologies.

• This innovation also aligns with international efforts to achieve carbon neutrality and reduce reliance on fossil fuels.

Important Points

• National Hydrogen Mission:

• Launched in 2021 by the Government of India to enable the country to achieve a low-carbon footprint.

• Aims to produce 5 million tonnes of green hydrogen by 2030.

• Focuses on domestic production of hydrogen and establishing export markets.

• Hydrogen Economy:

• A hydrogen economy is based on the use of hydrogen as a fuel for power generation, transportation, and other industrial applications.

• It is seen as a critical solution to reduce greenhouse gas emissions and address climate change.

• Hydrogen Applications:

• Used in fuel cells to produce electricity.

• Can power vehicles, trains, and even aircrafts in the future.

• Utilized in industrial processes like ammonia production and oil refining.

**Q16. Answer: (b) Viswanathan Anand**

The correct answer is Viswanathan Anand.

Key Points

• Viswanathan Anand became India's first Grandmaster in chess in the year 1988.

• He earned the Grandmaster title by winning the Shakti Finance International Chess Tournament held in Coimbatore, Tamil Nadu.

• Anand's achievement marked a historic milestone for Indian chess, inspiring generations of young chess players across the country.

• He is famously known as the "Lightning Kid" due to his fast-paced and intuitive style of play.

• Viswanathan Anand has also been the World Chess Champion five times (2000, 2007, 2008, 2010, and 2012) and is regarded as one of the greatest chess players in history.

Additional Information

• Viswanathan Anand's Early Life:

• Born on 11 December 1969 in Mayiladuthurai, Tamil Nadu, India.

• He started learning chess at the age of 6 and showed extraordinary talent from a young age.

• Anand was guided by his mother, Sushila, who played a significant role in nurturing his chess skills.

• Achievements:

• He won the World Junior Chess Championship in 1987, becoming the first Indian to achieve this feat.

• Anand has won the prestigious Chess Oscar six times (1997, 1998, 2003, 2004, 2007, and 2008).

• He was awarded India's highest sporting honor, the Rajiv Gandhi Khel Ratna Award, in 1991–92.

• He is also the recipient of the Padma Vibhushan, India's second-highest civilian award.

• Other Indian Chess Grandmasters:

• Dibyendu Barua: Became India's second Grandmaster in 1991.

• Pentala Harikrishna: Achieved the Grandmaster title in 2001. He is one of India's top chess players.

• R Praggnanandhaa: A rising chess prodigy who became the youngest Indian Grandmaster at the age of 12 in 2018.

• Global Chess Contributions:

• Viswanathan Anand has contributed significantly to popularizing chess in India and globally.

• He was the first Asian to win the FIDE World Chess Championship, breaking the European dominance in the sport.

• He has written books on chess strategy, such as "My Best Games of Chess", which are widely read and celebrated.

Important Points

• Milestones in Indian Chess:

• India now boasts over 80+ Grandmasters, indicating the rapid growth of chess in the country.

• Indian players have consistently performed well in international chess tournaments, including the Chess Olympiad.

• Chess in Schools: Many states have introduced chess programs in schools, inspired by Anand's achievements.

• The emergence of young talents like R Praggnanandhaa and Nihal Sarin continues to strengthen India's position in the global chess arena.

**Q17. Answer: (a) Public order**

The correct answer is Public order.

Key Points

• Public Order is one of the subjects mentioned in the State List under the Seventh Schedule of the Indian Constitution. However, for Delhi, this subject falls under the purview of the Central Government and not the Delhi Legislative Assembly.

• The Government of National Capital Territory of Delhi Act, 1991 and Articles 239AA of the Indian Constitution specify the powers of the Delhi Legislative Assembly. Certain subjects like Public Order, Police, and Land are excluded from its jurisdiction.

• Electricity is under the control of the Delhi Legislative Assembly as per its legislative powers. It has the authority to legislate and manage electricity-related matters within its territory. Hence, option 2 is incorrect.

• Education falls under the purview of the Delhi Legislative Assembly, enabling it to make laws and administer policies related to schools, colleges, and universities in its jurisdiction. Hence, option 3 is incorrect.

• Public Health is another subject that the Delhi Legislative Assembly has authority over. It can manage healthcare services, hospitals, and sanitation within the National Capital Territory. Hence, option 4 is incorrect.

Additional Information

• Division of Powers in the Indian Constitution:

• The Indian Constitution divides subjects into three lists: Union List, State List, and Concurrent List, under the Seventh Schedule.

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• Matters under the Union List are exclusively under the jurisdiction of the Central Government, such as defense, foreign affairs, and atomic energy.

• The State List includes subjects under the control of state governments, such as police, public health, and agriculture.

• The Concurrent List contains subjects where both the Central and State Governments can legislate, such as education and criminal law.

• Special Status of Delhi:

• Delhi is a Union Territory with a legislative assembly, governed under Article 239AA of the Constitution.

• While the Delhi Legislative Assembly can make laws on subjects in the State List and Concurrent List, it cannot legislate on Public Order, Police, and Land, which are under the control of the Central Government.

• The Lieutenant Governor of Delhi acts as the representative of the President of India and has the authority over these excluded subjects.

• Importance of Public Order:

• Public Order refers to the maintenance of peace and order in society, ensuring safety and the rule of law.

• It covers matters related to crime prevention, riots, public disturbances, and enforcement of laws to maintain social harmony.

• In Delhi, the Ministry of Home Affairs oversees Public Order through the Delhi Police.

• Other Legislative Powers of Delhi:

• The Delhi Legislative Assembly can legislate on subjects such as education, electricity, public health, and transport.

• Examples include initiatives in improving public healthcare infrastructure and policies for ensuring quality education.

Important Points

• Article 239AA:

• This article was inserted in the Constitution by the 69th Constitutional Amendment Act, 1991.

• It provides the framework for the governance of the National Capital Territory of Delhi.

• It established a Legislative Assembly with the power to legislate on certain matters, excluding Public Order, Police, and Land.

• Role of Lieutenant Governor:

• The Lieutenant Governor is the administrative head of Delhi and represents the President of India.

• For matters outside the purview of the Delhi Legislative Assembly, the Lieutenant Governor exercises executive powers.

**Q18. Answer: (a) Bharat Dynamics Limited**

The correct answer is Bharat Dynamics Limited.

Key Points

• Bharat Dynamics Limited (BDL) is a Public Sector Undertaking (PSU) under the administrative control of the Ministry of Defence, Government of India.

• The Defence Ministry plans to place an order for 500 Invar Anti-Tank Guided Missiles, valued at Rs. 2,000–3,000 crore, with BDL.

• Invar missiles are fired from the T-90 tanks and are designed for destroying enemy tanks equipped with explosive reactive armour.

• BDL is the designated manufacturer for Invar missiles under a licensed technology transfer agreement with the original equipment manufacturer.

• BDL is headquartered in Hyderabad, Telangana, and is a leading manufacturer of missiles in India.

Additional Information

• Bharat Dynamics Limited (BDL):

• BDL was established in 1970 in Hyderabad to serve as a manufacturing base for guided missile systems.

• The company is engaged in the production of missiles, torpedoes, and allied defence equipment, and has played a pivotal role in India's missile programme.

• BDL manufactures various types of missiles, including surface-to-air missiles, anti-tank guided missiles, and underwater weapons.

• It collaborates with the Defence Research and Development Organisation (DRDO) for the development and production of advanced missile systems.

• Invar Anti-Tank Guided Missiles:

• Invar missiles are fire-and-forget missiles designed to destroy tanks and other armored vehicles equipped with explosive reactive armour.

• The missiles are fired from T-90 tanks, which are main battle tanks used by the Indian Army.

• They are known for their high accuracy and effectiveness in neutralizing heavily armored targets.

• India has been manufacturing Invar missiles under licensed technology transfer agreements from the original equipment

manufacturer.

• Other Defence PSUs:

• Garden Reach Shipbuilders & Engineers Ltd.: This Kolkata-based PSU is primarily involved in the construction of warships and other naval vessels.

• Armoured Vehicles Nigam Ltd.: Specializes in manufacturing armoured vehicles and tanks for the Indian Armed Forces.

• Bharat Electronics Limited (BEL): A Bangalore-based PSU that develops and manufactures electronic equipment for the Indian Armed Forces, including radars, communication systems, and sonar systems.

• Strategic Importance:

• The procurement of Invar missiles is crucial for enhancing the capabilities of the Indian Army in modern warfare.

• This acquisition aligns with the Government of India's "Make in India" initiative, promoting indigenous defence manufacturing.

• BDL's role in producing Invar missiles locally helps reduce dependence on foreign suppliers and boosts India's self-reliance in defence.

Important Points

• T-90 Tanks:

• The T-90 is a third-generation Russian battle tank utilized by the Indian Army.

• It is equipped with a 125mm smoothbore main gun, a coaxial machine gun, and a remote-controlled anti-aircraft gun.

• India has been producing T-90 tanks under license at the Heavy Vehicle Factory in Avadi, Tamil Nadu.

• Indigenous Defence Production:

• India has been actively promoting self-reliance in defence manufacturing through initiatives like Make in India.

• This includes collaborations between Indian defence PSUs like BDL and international manufacturers for technology transfer.

• Such efforts aim to strengthen India's defence capabilities and reduce dependency on foreign imports.

**Q19. Answer: (a) Himalayan Border**

The correct answer is Himalayan Border.

Key Points

• The 1962 Sino-Indian War was primarily fought over the disputed Himalayan Border regions between India and China, particularly over the Aksai Chin region in the western sector and the McMahon Line in the eastern sector.

• The conflict was a result of a long-standing border dispute between the two nations, which arose due to the lack of a clearly demarcated border following India’s independence from British rule in 1947.

• The key areas of contention were the Aksai Chin region, which China claims as part of Xinjiang, and the Arunachal Pradesh region, which China refers to as South Tibet.

• China built a road connecting Tibet and Xinjiang through Aksai Chin, which was a major point of contention as India considered this region to be a part of Jammu and Kashmir.

• The war lasted from October 20 to November 21, 1962, and resulted in heavy losses for India, with China declaring a unilateral ceasefire and retaining control over Aksai Chin.

Additional Information

• Aksai Chin:

• Location: Aksai Chin is a high-altitude desert region situated in the western Himalayas. It is part of the larger Kashmir region.

• Dispute: India considers Aksai Chin as part of its union territory of Jammu and Kashmir, while China claims it as part of its Xinjiang region.

• Strategic Importance: The region is strategically important for both India and China. For China, it connects Tibet and Xinjiang via the China National Highway 219, whereas for India, it is crucial for its territorial sovereignty.

• The McMahon Line:

• The McMahon Line is the demarcation line drawn during the Simla Convention of 1914, between British India and Tibet.

• China does not recognize the McMahon Line as a legal international boundary, while India considers it as the official border in the eastern sector.

• The dispute over this region includes the Indian state of Arunachal Pradesh, which China claims as part of South Tibet.

• Background of the 1962 War:

• The Panchsheel Agreement of 1954 was an attempt to establish peaceful relations between India and China, but it failed to address the border dispute effectively.

• China's incursion into disputed territories and the construction of a road in Aksai Chin in the 1950s led to escalating tensions between the two nations.

• Indo-Gangetic Plain, Deccan Plateau, and Brahmaputra Valley:

• These regions were not involved in the Sino-Indian War of 1962. The conflict was primarily limited to the disputed Himalayan

border areas.

• The Indo-Gangetic Plain is the fertile region in northern India, while the Deccan Plateau covers central and southern India.

• The Brahmaputra Valley is a region in northeastern India, but it was not a direct area of conflict in the war.

**Q20. Answer: (b) 30 days**

The correct answer is Option 2 (30 days).

Key Points

• The Right to Information (RTI) Act, 2005, empowers citizens to seek information from public authorities to promote transparency and accountability in governance.

• Under the RTI Act, public authorities are required to respond to information requests within 30 days from the date of receipt of the application. This is the general time limit.

• If the information sought concerns the life or liberty of a person, the RTI Act mandates that the information must be provided within 48 hours.

• In cases where an applicant has filed an appeal with the First Appellate Authority, the authority must decide on the appeal within 30 days, or in exceptional cases within 45 days, with reasons for the delay recorded in writing.

• Failure to provide information within the stipulated time limit may result in penalties or disciplinary action against the Public Information Officer (PIO).

Additional Information

• Key Features of the RTI Act:

• The Right to Information Act, 2005, was enacted by the Government of India to promote transparency and accountability in public authorities.

• It covers information on government policies, decisions, and operations to enable citizens to hold public authorities accountable.

• The Act applies to all levels of government—central, state, and local bodies—and includes public sector undertakings and institutions significantly funded by the government.

• Exemptions Under RTI Act:

• The RTI Act provides exemptions for certain types of information under Section 8, such as information affecting sovereignty, national security, or personal privacy.

• Information prohibited by court orders or legislative privileges is also exempt from disclosure.

• Commercially sensitive information and intellectual property are protected under specific clauses.

• Role of Public Information Officers (PIOs):

• PIOs are responsible for handling RTI applications and ensuring timely responses.

• They must provide the requested information or justify its exemption within the stipulated timeframe.

• Failure to comply can lead to monetary penalties and disciplinary actions.

• RTI in India:

• India enacted the RTI Act on 15 June 2005, and it came into effect on 12 October 2005.

• The RTI Act has been instrumental in exposing corruption and ensuring transparency in governance.

• Over the years, RTI has empowered citizens to access public records and demand accountability from authorities.

• Global Perspective:

• The concept of the right to information is recognized globally as a fundamental right under international law and is enshrined in Article 19 of the Universal Declaration of Human Rights (UDHR).

• Countries like Sweden, USA, and UK have similar legislation to enable access to government information.

• India’s RTI Act is considered one of the most progressive laws globally in ensuring transparent governance.

**Q21. Answer: (b) Agriculture**

The correct answer is Agriculture.

Key Points

• During the period of 1947 to 1991, India's employment structure showed limited diversification, with the majority of the workforce employed in the agriculture sector.

• Agriculture remained the backbone of India's economy throughout this period, contributing significantly to employment and being the primary source of livelihood for a large population.

• Despite the growth of other sectors like infrastructure, secondary, and services sectors, the pace of diversification was slow, and agriculture continued to dominate the workforce composition.

• Factors such as limited industrialization, the dominance of rural areas, and a lack of widespread urbanization contributed to the reliance on agriculture during this time.

• The Green Revolution in the 1960s did lead to some modernization in agriculture, but the employment structure still leaned

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heavily towards agricultural activities.

Additional Information

• Agriculture Sector:

• In the post-independence era, agriculture was the primary source of employment, contributing to about 70% of the workforce in 1947.

• The dominance of agriculture was due to the lack of industrial growth and infrastructural development, especially in rural areas.

• Major crops included wheat, rice, pulses, and sugarcane, which were cultivated extensively to meet food demands.

• The Green Revolution introduced modern farming practices, fertilizers, and high-yield crops, boosting agricultural productivity but maintaining agriculture's employment dominance.

• Infrastructure Sector:

• This sector primarily focused on roads, railways, dams, and other public works during the 1947-1991 period.

• Though important for economic development, it employed significantly fewer workers compared to agriculture.

• Secondary Sector:

• Industrialization was relatively slow, and the secondary sector (manufacturing and industries) contributed marginally to workforce employment during this period.

• India's Five-Year Plans attempted to promote industrial growth, but the results were limited in terms of creating large-scale employment.

• Services Sector:

• The services sector, including education, healthcare, and administrative work, showed growth during 1947-1991 but remained small compared to agriculture.

• Urbanization and modernization gradually increased its share of employment towards the later part of the period, but it did not surpass agriculture.

Important Points

• Green Revolution:

• Introduced in the 1960s, this initiative aimed to increase agricultural productivity using modern techniques such as high-yield variety seeds, irrigation, and fertilizers.

• It helped India achieve self-sufficiency in food production but did not significantly alter the employment structure.

• Employment Challenges:

• Rural India faced issues like low income, underemployment, and seasonal unemployment despite the dominance of agriculture.

• The government's focus on promoting small-scale industries and cooperative movements aimed to address employment diversification but had limited success.

• Urbanization:

• Urbanization was slow during this period, which limited the growth of the industrial and services sectors.

• By 1991, India's urban population was only around 25%, reflecting the dominance of rural employment in agriculture.

**Q22. Answer: (d) 6 kilometres**

The correct answer is 6 kilometres.

Key Points

• The Bharat Forecasting System (BFS) launched in May 2025 is a high-resolution weather forecasting model designed for India.

• The BFS has a spatial resolution of 6 kilometres, which allows for detailed and accurate predictions of weather patterns across various regions in India.

• This advanced resolution enhances the ability to forecast localized weather events such as thunderstorms, heavy rainfall, or cyclones, thereby improving disaster preparedness.

• The BFS is part of India's ongoing efforts to modernize its meteorological capabilities, ensuring more precise data collection and prediction systems.

• The system is expected to benefit sectors such as agriculture, transportation, disaster management, and energy by providing timely and accurate weather forecasts.

Additional Information

• Spatial Resolution in Weather Forecasting Models:

• Spatial resolution refers to the size of the grid used in weather prediction models. A resolution of 6 kilometres means each grid cell covers an area of 6 km x 6 km.

• Higher resolutions, like 6 kilometres, allow for more localized and detailed weather predictions compared to coarser resolutions such as 12 or 10 kilometres.

• This is especially important in a geographically diverse country like India, where weather conditions can vary significantly over short distances.

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• Applications of BFS:

• The Bharat Forecasting System will aid in agricultural planning, enabling farmers to make informed decisions regarding planting, irrigation, and harvesting.

• It will improve disaster management by providing accurate forecasts of cyclones, floods, and other extreme weather events.

• It is expected to support sectors like aviation and shipping by offering precise weather data crucial for navigation and safety.

• The BFS will also contribute to renewable energy projects by predicting weather conditions that affect solar and wind energy generation.

• Comparison of Spatial Resolutions:

• 10 kilometres: Typically used in older models, suitable for large-scale weather patterns but less effective for localized events.

• 3 kilometres: Ultra-high resolution, often used for specific regions or research purposes but computationally intensive.

• 12 kilometres: Standard resolution for global models, balancing computational efficiency and detail.

• 6 kilometres: Ideal for regional forecasting, offering a balance between detail and computational efficiency.

• India's Meteorological Advancements:

• The BFS is part of India's initiative to leverage advanced technology for weather forecasting, enhancing the accuracy and reliability of predictions.

• It complements other systems like the Doppler Weather Radar network, satellite-based observations, and climate models.

• These advancements align with India's commitment to improving its climate resilience and disaster preparedness.

Important Points

• Bharat Forecasting System's Contribution:

• It represents a significant upgrade in India's meteorological infrastructure, contributing to better weather prediction accuracy.

• The BFS supports India's goals under international agreements like the Sendai Framework for Disaster Risk Reduction.

• It helps integrate weather forecasting into various sectors, boosting economic efficiency and minimizing losses due to unforeseen weather events.

**Q23. Answer: (d) A submarine plateau about 80 km off the southern coast in the Indian Ocean**

The correct answer is option 4.

Key Points

• It is a submarine plateau (underwater raised region) located in the Indian Ocean.

• It lies about 80 km south of India’s mainland, near Kanyakumari (Cape Comorin).

• It is one of India's richest fishing grounds, supporting many coastal fishermen, especially from Tamil Nadu.

• It recently came into news because fishermen opposed a proposed hydrocarbon exploration project there under the Hydrocarbon Exploration and Licensing Policy (HELP), fearing ecological and livelihood damage.

• Swajal Dhara Yojana:

• Swajal Dhara Yojana was launched in 2002-03 by Prime Minister Atal Bihari Vajpayee to ensure clean drinking water availability in villages.

• The scheme requires 10% of the project cost to be contributed by villagers, while the remaining 90% is funded by the Union Government.

• It emphasizes community participation in water management and aims to address water scarcity efficiently.

• Universal Health Insurance Plan:

• The Universal Health Insurance Scheme (UHIS) was introduced in 2003-04 by the Government of India, targeting families below the poverty line.

• It offers subsidized health insurance coverage and aims to provide financial protection against medical expenses to economically disadvantaged groups.

• The scheme is designed to cover hospitalization costs and promote access to healthcare facilities for the underprivileged.

• Hariyali Project:

• The Hariyali Project was launched in January 2003 to promote watershed development through Panchayati Raj Institutions.

• It integrates existing programs like the Integrated Wastelands Development Programme (IWDP), Drought Prone Areas Programme (DPAP), and Desert Development Programme (DDP) for environmental sustainability.

• The initiative focuses on empowering local governance structures for effective implementation of watershed projects.

Additional Information

• National Nutrition Mission (NNM):

• Also known as Poshan Abhiyaan, launched by the Government of India, aiming to reduce stunting, undernutrition, and anemia among children, women, and adolescents.

• Focuses on behavioral changes, inter-ministerial and inter-departmental convergence, and capacity building.

• Target: Reduce stunting by 2% per annum, underweight prevalence by 2% per annum, and anemia by 3% per annum.

• Swajal Dhara Yojana:

• A community-based water supply scheme launched to address water scarcity in rural areas and ensure sustainable water management.

• Promotes equity by involving local communities in decision-making and emphasizes the need for proper maintenance of water resources.

• Universal Health Insurance Scheme:

• The scheme covers hospitalization expenses up to Rs. 30,000, compensates for accidental death or partial disability, and provides daily hospital expenses.

• It is managed by public sector insurance companies, ensuring that health services are accessible to low-income families.

• Hariyali Project:

• Focuses on sustainable development, afforestation, and improving soil and water conservation measures to combat drought and desertification.

• Encourages participation of local governing bodies to ensure effective implementation of watershed programs.

**Q24. Answer: (a) Graphical User Interface**

The correct answer is Graphical User Interface.

Key Points

• Graphical User Interface (GUI) is a type of user interface that allows users to interact with electronic devices using graphical elements such as windows, icons, buttons, and menus, instead of text-based commands.

• GUI was first introduced in the 1980s with the advent of personal computers and has since become the standard interface for most modern operating systems.

• Operating systems such as Windows, macOS, Linux (with desktop environments like GNOME, KDE), and Android heavily rely on GUI for user interaction.

• A GUI provides a visual and intuitive platform for users to perform tasks such as opening files, navigating directories, and running applications, making technology more accessible to non-technical users.

• GUI uses a combination of input devices such as a mouse, keyboard, or touch screen to allow users to interact with the system in a visual and user-friendly manner.

Additional Information

• Key Features of GUI:

• Icons: Visual representations of commands, files, or applications that allow users to interact with the software by clicking.

• Windows: Separate areas on the screen where individual tasks or applications run, enabling multitasking.

• Menus: Drop-down or pop-up lists offering various options or commands for user interaction.

• Pointing Device: Devices like a mouse or a touchpad are used to navigate and interact with the GUI.

• Advantages of GUI:

• User-friendly: Easier to use compared to Command-Line Interfaces (CLI), as users can interact visually.

• Multitasking: GUIs allow users to work on multiple applications simultaneously by using windows.

• Accessibility: Modern GUIs are designed to be accessible to people with disabilities, incorporating features like screen readers and magnifiers.

• Disadvantages of GUI:

• Resource-intensive: GUIs require more system resources such as memory and processing power compared to CLI.

• Less Control: Advanced users may find GUIs limiting compared to the flexibility of a CLI for complex tasks.

• Examples of GUI-based Operating Systems:

• Microsoft Windows: One of the most popular operating systems, known for its user-friendly GUI.

• Apple macOS: Known for its sleek and intuitive interface, popular among creative professionals.

• Linux Desktop Environments: Such as GNOME, KDE, and XFCE, which provide a GUI for Linux-based systems.

• Android and iOS: Mobile operating systems with touch-based GUIs for smartphones and tablets.

• Historical Context:

• The first GUI was developed by Xerox PARC (Palo Alto Research Center) in the 1970s, which inspired future GUI developments.

• Apple's Macintosh, launched in 1984, was the first commercially successful computer featuring a GUI.

• Microsoft introduced its GUI with Windows 1.0 in 1985, which evolved into the widely used Windows operating system today.

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**Q25. Answer: (a) Golden Quadrilateral**

The correct answer is Golden Quadrilateral.

Key Points

• The Golden Quadrilateral is a network of highways in India connecting the four major metropolitan cities: New Delhi, Mumbai, Chennai, and Kolkata.

• It is one of the largest highway projects in India and was initiated by the Government of India under the National Highways Development Project (NHDP).

• The project was launched in 2001 and was completed in phases, aiming to improve connectivity between major cities and promote economic development.

• The Golden Quadrilateral spans a length of approximately 5,846 kilometers, covering major industrial and agricultural centers of India.

• This expressway facilitates rapid transportation of goods and passengers, significantly reducing travel time and fuel consumption.

Additional Information

• Features of the Golden Quadrilateral:

• The expressway is designed to meet international standards of road infrastructure.

• It connects cities with high economic and industrial significance, boosting trade and commerce across the nation.

• The road infrastructure includes multiple lanes, bypasses, flyovers, and service roads to ensure smooth traffic flow and reduce congestion.

• Importance:

• The Golden Quadrilateral plays a vital role in reducing travel time and improving connectivity between India's major cities.

• It facilitates economic growth by enabling faster transportation of goods and services.

• Improved road infrastructure has led to a rise in tourism, industrial development, and urbanization.

• Other Related Projects:

• The North-South and East-West Corridor connects Srinagar to Kanyakumari and Silchar to Porbandar, respectively.

• National Highway 44 is India's longest highway, connecting Srinagar to Kanyakumari, but it is not part of the Golden Quadrilateral.

• The East-West Corridor is another major infrastructure project aimed at improving connectivity across India.

• Facts and Figures:

• The Golden Quadrilateral was built at a cost of approximately Rs. 60,000 crore.

• It includes four-lane and six-lane roads with advanced features like electronic toll collection systems.

• The project is maintained by the National Highways Authority of India (NHAI).

**Q26. Answer: (c) Indore**

The correct answer is Indore.

Key Points

• The 19th Pravasi Bharatiya Divas (PBD) Convention was held in Indore, Madhya Pradesh, in January 2023.

• The theme of the 19th PBD was "Diaspora: Reliable Partners for India’s Progress in Amrit Kaal."

• Pravasi Bharatiya Divas is celebrated to mark the contribution of the Overseas Indian community to India’s development. It is organized by the Ministry of External Affairs.

• It is observed annually to commemorate the return of Mahatma Gandhi from South Africa to India on 9 January 1915.

• The event provides a platform for the Government of India to engage and connect with the overseas Indian community and enable the diaspora to interact with each other.

Additional Information

• Pravasi Bharatiya Divas (PBD):

• Pravasi Bharatiya Divas was first celebrated in 2003, initiated by the Government of India to recognize the contributions of the Indian diaspora globally.

• The date January 9 was chosen as it marks the day Mahatma Gandhi returned to India from South Africa in 1915, a key moment in the Indian freedom struggle.

• PBD conventions are held every two years, with smaller events organized annually.

• These conventions are attended by overseas Indians, policymakers, and stakeholders, facilitating dialogue and collaboration.

• Indore:

• Indore is the largest city in Madhya Pradesh and is known for its rich heritage, culture, and food.

• The city has won the Swachh Survekshan (Cleanliness Survey) award multiple times consecutively, making it one of the

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cleanest cities in India.

• Indore is also an educational hub, housing prestigious institutions like IIM Indore and IIT Indore.

• It is well-connected by road, rail, and air, making it a suitable venue for large-scale events.

• Purpose and Importance of PBD:

• The event aims to strengthen the emotional and cultural connection between India and its diaspora.

• It provides a platform for NRI and PIO communities to engage in policy discussions and explore business opportunities in India.

• The Government uses the occasion to honor notable contributions by Indians living abroad through the Pravasi Bharatiya Samman Awards.

• Previous Hosts of PBD:

• 2019: The 15th PBD was held in Varanasi, Uttar Pradesh, with the theme "Role of Indian Diaspora in building New India."

• 2017: Bengaluru hosted the 14th PBD with the theme "Redefining engagement with the Indian diaspora."

• Other cities that have hosted PBD include New Delhi, Kochi, and Gandhinagar.

**Q27. Answer: (d) Reserve Bank of India (RBI)**

The correct answer is Reserve Bank of India (RBI).

Key Points

• The Reserve Bank of India (RBI) launched the 'Digital India Financial Literacy Mission' in 2025 to enhance public awareness about digital finance, online fraud prevention, and safe financial practices.

• This initiative aligns with the broader Digital India campaign, which aims to transform India into a digitally empowered society and knowledge economy.

• The mission focuses on educating citizens about safe digital transactions, including the use of UPI, online banking, mobile wallets, and other digital payment platforms.

• The RBI's proactive measures under this mission aim to combat the rising instances of cyber frauds and promote secure financial behavior among individuals.

• The program is rolled out nationwide, targeting rural and urban populations, emphasizing the need for financial inclusion and literacy in the digital era.

Additional Information

• Reserve Bank of India (RBI):

• The RBI is India's central banking institution, established on 1 April 1935, and headquartered in Mumbai.

• It regulates the monetary policy of India and oversees financial institutions, banks, and payment systems.

• Its key functions include controlling inflation, issuing currency, and supervising financial stability.

• The RBI has been instrumental in promoting financial literacy through initiatives like Project Financial Literacy and campaigns targeting different demographics.

• Digital India Campaign:

• Launched in 2015 by Prime Minister Narendra Modi, it aims to transform India into a digital economy.

• The campaign focuses on areas like digital infrastructure, governance, and services offered digitally.

• It encourages the adoption of digital payment systems such as UPI, BHIM, and RuPay.

• Digital literacy is a core component of the initiative to ensure inclusive growth across all sectors.

• Online Fraud Prevention:

• With the rise in digital transactions, cyber frauds such as phishing, identity theft, and data breaches have become prevalent.

• The RBI has issued guidelines on secure online transactions, including two-factor authentication, OTP-based payments, and alerts for suspicious activities.

• Public awareness campaigns are critical to educating individuals on secure practices like avoiding sharing PINs and passwords.

• Financial Literacy in India:

• As per surveys, a significant portion of India's population lacks basic financial literacy, impacting their ability to make informed decisions.

• Financial inclusion programs by the RBI and government aim to bridge the gap, especially in rural areas.

• Initiatives like Pradhan Mantri Jan Dhan Yojana (PMJDY) encourage savings, insurance, and digital financial services.

Important Points

• UPI (Unified Payments Interface):

• UPI is a real-time payment system developed by the National Payments Corporation of India (NPCI).

• It enables instant transfer of funds between two bank accounts via a mobile platform.

• India witnessed a significant rise in UPI transactions, with billions processed monthly.

• Cyber Security Measures:

• RBI mandates banks to implement robust cybersecurity frameworks, including regular audits and monitoring systems.

• Educational programs focus on recognizing phishing attempts, secure passwords, and data protection.

**Q28. Answer: (a) Kimberley Plateau**

The correct answer is Kimberley Plateau.

Key Points

• The Kimberley Plateau is located in the northern part of Western Australia and is known for its rugged terrain and unique geological features.

• This plateau was formed by the solidification of molten lava during ancient volcanic activity, leading to the creation of basalt landscapes.

• The Kimberley region has one of the oldest rock formations in the world, dating back over 1.8 billion years.

• The plateau is rich in minerals and has unique biodiversity, featuring gorges, waterfalls, and stunning geological formations.

• Due to its geological history, the Kimberley Plateau is a significant site for studying ancient earth processes and volcanic activity.

Additional Information

• Kimberley Plateau:

• The Kimberley Plateau is a large region in northern Western Australia, known for its ancient geology and breathtaking landscapes.

• It is characterized by extensive sandstone ranges, deep gorges, and plateaus formed from volcanic activity.

• Some areas of the plateau are covered in basalt, which is a type of igneous rock formed from cooled lava flows.

• The region is home to unique flora and fauna, including species not found anywhere else in the world.

• Other Plateaus Mentioned:

• Columbia and Snake River Plateau: Located in the United States, this plateau is formed by repeated flows of basaltic lava over millions of years.

• Patagonian Plateau: Situated in Argentina, this plateau is primarily composed of sedimentary rocks and is known for its arid climate.

• Malwa Plateau: Located in central India, this plateau is composed of volcanic rocks, primarily basalt, formed due to Deccan volcanic activity.

• Formation of Plateaus:

• Plateaus can form through various geological processes, including volcanic activity, erosion, and tectonic movements.

• Volcanic plateaus like the Kimberley Plateau are created when lava flows spread out and solidify over large areas.

• Such plateaus are often rich in minerals and provide valuable insights into Earth's geological history.

• Significance of Kimberley Plateau:

• The Kimberley Plateau is one of the most remote and pristine regions in Australia, attracting researchers and tourists alike.

• It is a hotspot for biodiversity and is home to indigenous rock art, showcasing the cultural significance of the region.

Important Points

• Age and Location:

• The Kimberley Plateau is over 1.8 billion years old, making it one of the oldest geological formations on Earth.

• It spans approximately 423,000 square kilometers in northern Western Australia.

• Geological Features:

• The plateau consists of basalt rocks formed by lava flows and is surrounded by rugged escarpments and deep gorges.

• Notable landmarks include the Bungle Bungle Range and the Horizontal Falls.

• Uses:

• The Kimberley region is known for its mineral deposits, including diamonds and iron ore.

• It is also a site of cultural significance for indigenous Australians, with ancient rock art and sacred sites.

**Q29. Answer: (d) Article 368**

The correct answer is Article 368.

Key Points

• Article 368 of the Indian Constitution deals with the amendment procedure of the Constitution, enabling Parliament to modify, alter, or repeal any provision of the Constitution.

• The Constitution of India provides for two types of amendments: by a special majority of Parliament and through a special majority of Parliament with the ratification by half of the state legislatures.

• Amendments under Article 368 are categorized into three types: simple majority, special majority, and ratification by states,

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depending on the nature of the constitutional provision being amended.

• The Article stipulates a detailed procedure for making amendments, ensuring that the basic structure of the Constitution is preserved and cannot be altered through amendments.

• Judicial Review: Amendments under Article 368 are subject to judicial review by the Supreme Court to ensure they do not violate the basic structure doctrine established in the Keshavananda Bharati case (1973).

Additional Information

• Types of Amendments:

• Simple Majority Amendments: These are amendments made by a simple majority in Parliament and do not fall under the purview of Article 368. Examples include changes to the Second Schedule and delimitation of constituencies.

• Special Majority Amendments: These require a special majority in both houses of Parliament (i.e., a two-thirds majority of members present and voting). Examples include changes to fundamental rights and directive principles.

• Ratification by States: Certain amendments affecting federal provisions require ratification by at least half of the state legislatures, in addition to a special majority in Parliament.

• Important Amendments:

• First Amendment (1951): Added Article 19(2) restricting freedom of speech and expression.

• 42nd Amendment (1976): Known as the "Mini-Constitution," it introduced changes like the addition of Fundamental Duties and altered the Preamble.

• 44th Amendment (1978): Restored powers of judicial review and curtailed executive authority during emergencies.

• Basic Structure Doctrine:

• In the landmark Keshavananda Bharati case (1973), the Supreme Court ruled that Parliament could not alter the basic structure of the Constitution.

• The doctrine has been upheld in subsequent cases like the Minerva Mills case (1980) and the Indira Gandhi v. Raj Narain case (1975).

• Role of Judiciary:

• The judiciary acts as a guardian of the Constitution and ensures that amendments under Article 368 adhere to the basic structure doctrine.

• It has the authority to strike down amendments that violate fundamental principles of the Constitution.

**Q30. Answer: (a) It is a subject in the State List**

The correct answer is It is a subject in the State List.

Key Points

• In the Constitution of India, subjects are divided into three lists: the Union List, State List, and Concurrent List, as per the Seventh Schedule.

• Cooperative societies are specifically listed as Item 32 in the State List. Therefore, the state governments have the exclusive authority to legislate on this matter.

• The 97th Constitutional Amendment Act, 2011, added a new part (Part IXB) to the Constitution, which deals with the working of cooperative societies. However, the legislative domain remains under the State List.

• The amendment also added the word “cooperatives” to Article 19(1)(c), ensuring that people have the right to form cooperative societies as part of their fundamental rights.

• Statement 1: "It is a subject in the State List" is correct, as cooperative societies fall under the exclusive legislative authority of the states.

• Statement 2: "It falls under the Residuary (Union) List" is incorrect because cooperative societies are explicitly mentioned in the State List, and residuary subjects are those not enumerated in any list.

• Statement 3: "It is a subject in the Union List" is incorrect, as cooperative societies are not included in the Union List.

• Statement 4: "It is a subject in the Concurrent List" is incorrect, as cooperative societies are not enumerated in the Concurrent List.

Additional Information

• State List:

• It consists of 66 subjects under the Seventh Schedule of the Constitution.

• State governments have exclusive legislative power on subjects listed in the State List, such as police, public health, agriculture, and cooperative societies.

• 97th Constitutional Amendment Act, 2011:

• This amendment emphasized the importance of cooperative societies and their autonomy.

• It added Part IXB to the Constitution, laying down provisions for the effective functioning of cooperative societies.

• The amendment also inserted Article 43B, which directs states to promote voluntary formation, autonomous functioning, and

professional management of cooperative societies.

• Union List:

• The Union List consists of 97 subjects, including matters of national importance like defense, foreign affairs, atomic energy, and railways.

• Only the Parliament has the exclusive power to legislate on subjects in the Union List.

• Concurrent List:

• The Concurrent List consists of 47 subjects, where both the Union and State legislatures can legislate, such as criminal law, marriage, education, etc.

• In case of conflict between Union and State laws, the Union law prevails.

• Residuary Powers:

• Residuary subjects are those not enumerated in the Union, State, or Concurrent Lists.

• According to Article 248, the power to legislate on residuary subjects lies exclusively with the Parliament.

Important Points

• Cooperative Movement in India:

• The cooperative movement in India began in the late 19th century with the enactment of the Cooperative Credit Societies Act, 1904.

• Cooperatives play a significant role in various sectors like agriculture, banking, housing, and dairy production.

• Examples include Amul (dairy cooperative) and IFFCO (fertilizer cooperative).

• Supreme Court Judgment:

• In 2021, the Supreme Court ruled that certain provisions of the 97th Constitutional Amendment were unconstitutional as they encroached upon the domain of states.

• The judgment reaffirmed that cooperative societies primarily fall under the State List.

• Role of Cooperative Societies:

• Cooperative societies promote economic welfare, encourage self-help, and foster mutual aid among their members.

• They are pivotal in areas like rural credit, marketing of agricultural produce, and housing.

**Q31. Answer: (b) One Hundred and First Amendment Act, 2016**

The correct answer is One Hundred and First Amendment Act, 2016.

Key Points

• The Goods and Services Tax (GST) was introduced in India through the One Hundred and First Amendment Act of the Constitution, which was enacted in the year 2016.

• The GST was implemented on July 1, 2017, marking a significant reform in India's indirect taxation system.

• This amendment added Article 246A to the Constitution, granting exclusive powers to both the Union and State Governments to legislate on GST.

• It replaced various indirect taxes such as Central Excise Duty, Service Tax, Value Added Tax (VAT), and other indirect taxes.

• Under GST, goods and services are taxed under a single comprehensive tax structure, divided into CGST (Central Goods and Services Tax), SGST (State Goods and Services Tax), and IGST (Integrated Goods and Services Tax).

Additional Information

• Objective of GST:

• The primary aim of GST is to bring uniformity in tax structures across the country by replacing multiple indirect taxes with a single tax.

• It seeks to eliminate the cascading effect of taxes, thereby reducing the overall tax burden on goods and services for consumers.

• Key Features of GST:

• Destination-based Tax: GST is levied at the point of consumption rather than at the point of origin.

• Dual Structure: India's GST follows a dual model, with taxation divided between the Central and State Governments (CGST and SGST).

• Input Tax Credit: GST allows businesses to claim input tax credits for taxes paid on purchases, promoting transparency in taxation.

• Rates: GST is levied at different slab rates, namely 0%, 5%, 12%, 18%, and 28%, depending on the type of goods and services.

• Impact of GST:

• GST has simplified the indirect tax system, reducing the compliance burden for businesses.

• It has led to increased revenue collection for the government by curbing tax evasion.

• By making India a unified market, GST has facilitated easier movement of goods and services across states.

• Important Articles Introduced:

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• Article 246A: Grants powers to both the Union and State Governments to legislate on GST.
• Article 269A: Deals with the levy and distribution of Integrated Goods and Services Tax (IGST) on inter-state trade.
• Article 279A: Establishes the GST Council, which is responsible for making recommendations on GST-related matters.

Important Points

• GST Council:
• The GST Council was established under Article 279A of the Constitution.
• It is chaired by the Union Finance Minister and includes State Finance Ministers as members.
• The Council is responsible for recommending GST rates, exemptions, and other matters related to the implementation of GST.
• Milestones in GST Implementation:
• The GST Bill was passed in Parliament on August 8, 2016, following extensive debates and discussions.
• GST was rolled out on July 1, 2017, marking one of the most significant tax reforms in India's history.
• GST Network (GSTN): A digital platform was created to facilitate the filing of GST returns and tax compliance.

**Q32. Answer: (d) Himanshu Roy**

The correct answer is Himanshu Roy.

Key Points

• Himanshu Roy authored the book "PMO: Prime Minister's Office through the Years", which was released in May 2025.
• The book provides an in-depth analysis of the evolution and functioning of the Prime Minister's Office (PMO) in India.
• It examines the role of the PMO in shaping policy decisions, managing crises, and interacting with various government departments and ministries.
• The book is a significant contribution to understanding the political and administrative structure of India.
• Himanshu Roy is a renowned author and analyst with expertise in Indian politics and governance, which lends credibility to the book's content and insights.

Additional Information

• Prime Minister's Office (PMO) in India:
• The PMO is the administrative office that assists the Prime Minister in policy formulation, coordination among ministries, and supervision of government programs.
• It acts as the central point for decision-making and ensures smooth communication between the Prime Minister and various departments.
• The PMO is headed by the Principal Secretary to the Prime Minister and includes other key officials such as advisors and secretaries.
• It plays a pivotal role in crisis management, foreign policy formulation, and monitoring flagship programs like Digital India and Make in India.
• Himanshu Roy's Contributions:
• Himanshu Roy is a noted scholar in the field of Indian political science, governance, and administration.
• His works typically focus on understanding the nuances of Indian democracy, federalism, and the evolving role of institutions like the PMO.
• His analysis is widely respected for being objective and deeply researched, making his books valuable resources for academics, policymakers, and readers interested in Indian politics.
• Historical Evolution of PMO:
• The Prime Minister's Office in India was first established in 1947, following the country's independence.
• Over the years, the PMO has grown in significance, especially during the tenure of leaders like Jawaharlal Nehru, Indira Gandhi, and Narendra Modi.
• The PMO today is considered one of the most powerful institutions in the Indian administrative setup.
• Importance of Books on Governance:
• Books like "PMO: Prime Minister's Office through the Years" offer valuable insights into the functioning of India's government machinery.
• They help readers understand the challenges and achievements associated with policy-making and administration.
• Such works contribute significantly to academic discussions and policymaking debates.

**Q33. Answer: (a) Irrigation canals**

The correct answer is Irrigation canals.

Key Points

• Urban transport infrastructure refers to systems and facilities designed to support the movement of people and goods within

urban areas, ensuring efficient mobility and connectivity.

• Metro systems: These are rapid transit systems used in urban areas, such as subways or elevated railways, providing fast and efficient transport for city dwellers.

• Highways: These are major roadways that connect cities and towns, facilitating inter-urban and intra-urban travel. They are a crucial part of urban transport planning.

• Rail networks: These include trains and other railway systems that connect different parts of a city or region, aiding in the transport of passengers and goods.

• Irrigation canals, on the other hand, are part of agricultural infrastructure, designed to distribute water for farming purposes, and do not serve the purpose of urban transport. Hence, irrigation canals are NOT a part of urban transport infrastructure.

Additional Information

• Metro Systems:

• Metro systems are also known as subways, undergrounds, or rapid transit systems.

• Examples include the Delhi Metro, London Underground, and New York Subway.

• They are known for reducing traffic congestion and pollution in urban areas.

• Highways:

• Highways are an essential component of urban and inter-urban connectivity.

• Examples in India include the Golden Quadrilateral and North-South and East-West Corridors.

• They are designed for high-speed vehicular traffic, often connecting major cities.

• Rail Networks:

• Urban rail networks include commuter trains and monorails.

• Examples: Mumbai Suburban Railway, Kolkata Metro.

• They are essential for reducing road traffic and promoting mass transportation in densely populated cities.

• Irrigation Canals:

• Irrigation canals are used primarily in agriculture to supply water to fields.

• Examples include the Indira Gandhi Canal in Rajasthan and the Upper Ganga Canal in Uttar Pradesh.

• They do not contribute to urban transport systems but are vital for agricultural productivity.

**Q34. Answer: (d) Cerium**

The correct answer is Cerium.

Key Points

• Cerium is classified as a lanthanoid group element, which belongs to the f-block of the periodic table.

• The lanthanoid series consists of 15 elements from atomic numbers 57 to 71, starting with Lanthanum and ending with Lutetium.

• Cerium is the second element in the lanthanoid series and has an atomic number of 58.

• Lanthanoids are known for their unique electronic configurations, with electrons filling the 4f orbitals.

• Cerium is widely used in various applications, including catalysis (e.g., in automobile catalytic converters), alloys, and glass polishing.

Additional Information

• Lanthanoids Overview:

• Lanthanoids are also known as rare earth elements and include elements like Lanthanum, Cerium, Praseodymium, Neodymium, and Europium.

• They exhibit similar chemical properties due to their electronic configuration and are typically highly reactive.

• The term "lanthanoid" is derived from the element Lanthanum, which is the first element in the series.

• Characteristics of Lanthanoids:

• These elements show a gradual decrease in ionic radii across the series, known as the lanthanoid contraction.

• They are generally metallic in nature, exhibit high melting points, and are good conductors of electricity.

• Lanthanoids are used in industries such as electronics, optics, and nuclear energy due to their magnetic, optical, and catalytic properties.

• Specific Characteristics of Cerium:

• Cerium is one of the most abundant lanthanoids and is found in minerals like monazite and bastnasite.

• It exists in multiple oxidation states, including +3 and +4, which makes it useful in redox reactions.

• Cerium oxide is employed in glass polishing and as a catalyst in various chemical processes.

• Comparison with Other Elements:

• Yttrium: Though chemically similar to lanthanoids, it is classified as a transition element and does not belong to the lanthanoid

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series.

• Actinium: Actinium is part of the actinoid series, which belongs to the 5f block of the periodic table.

• Scandium: Scandium is a transition element and does not exhibit properties typical of lanthanoids.

Important Points

• Applications of Lanthanoids:

• Lanthanoids are extensively used in magnets, lasers, phosphors, and other advanced technologies.

• Rare earth elements like Neodymium and Samarium are key components in high-performance permanent magnets.

• Europium and Terbium are used in fluorescent and LED lighting systems.

• Environmental Considerations:

• Mining and processing of lanthanoids can have significant environmental impacts, including soil and water contamination.

• Efforts are ongoing to recycle lanthanoid-based products to reduce environmental damage and conserve resources.

**Q35. Answer: (c) EOS-09**

The correct answer is EOS-09.

Key Points

• EOS-09, an Earth observation satellite, was launched by ISRO onboard the PSLV-C61 rocket in May 2025. However, the mission faced a failure due to a third-stage anomaly in the rocket.

• The failure occurred during the rocket's flight, which prevented the satellite from being deployed into its intended orbit. This incident marked a rare setback for ISRO, known globally for its reliable launch systems.

• EOS-09 was designed for Earth observation purposes, including agriculture, forestry, and disaster management. Its failure meant the loss of critical data for these applications.

• The PSLV (Polar Satellite Launch Vehicle) is a trusted workhorse of ISRO, capable of launching satellites into various orbits. The third-stage anomaly in the rocket disrupted its trajectory and satellite deployment.

• The failure highlighted the challenges faced in space missions despite ISRO’s established reputation in satellite launches.

Additional Information

• EOS-09 Satellite:

• Earth observation satellites like EOS-09 are used to monitor Earth's surface for various purposes such as climate monitoring, disaster management, agriculture, and forestry.

• EOS-09 was expected to provide critical data for resource management and environmental monitoring.

• It was part of ISRO's ongoing efforts to enhance its satellite capabilities for civilian and scientific applications.

• PSLV-C61 Rocket:

• The Polar Satellite Launch Vehicle (PSLV) is one of ISRO's most reliable and versatile launch vehicles.

• PSLV has been used for launching satellites into both polar and geostationary orbits.

• Despite the failure of the PSLV-C61 mission, the PSLV remains a cornerstone of India’s space program due to its high success rate.

• It has successfully launched numerous satellites for domestic and international clients.

• ISRO's Achievements:

• ISRO is renowned for conducting cost-effective space missions, such as the Mars Orbiter Mission (Mangalyaan) and the Chandrayaan missions.

• India became the first country to reach Mars in its maiden attempt through Mangalyaan in 2014.

• ISRO's focus extends beyond space exploration, contributing to fields like telecommunication, navigation, and Earth observation.

• Challenges in Space Missions:

• Space missions, despite technological advancements, often face challenges such as technical failures, anomalies, and unforeseen circumstances.

• Failures provide valuable insights for improving designs and protocols, ensuring greater success in future missions.

• ISRO has consistently demonstrated resilience and innovation in overcoming setbacks and advancing its capabilities.

Important Points

• Reliability of ISRO Missions:

• ISRO has an impressive track record of successful satellite launches, with a high success rate for its PSLV missions.

• Failures, though rare, serve as learning opportunities for the organization to enhance technological reliability.

• India's Space Program Goals:

• ISRO aims to expand its space exploration missions, with plans for future lunar and interplanetary missions, including Chandrayaan-3 and Gaganyaan.

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• The organization also focuses on developing advanced satellite technology for commercial and scientific applications.
• Global Recognition:
• ISRO is recognized globally for its cost-effective space missions, exemplified by the Mars Orbiter Mission costing only $74 million.
• International collaborations and satellite launches for other countries highlight ISRO's technological prowess.

**Q36. Answer: (c) Genetics**

The correct answer is Genetics.

Key Points

• Genetics is the branch of biology that studies heredity and variation in organisms.
• Heredity refers to the process by which traits and characteristics are passed down from parents to their offspring through genes.
• Variation is the differences in traits among individuals of the same species, which occur due to genetic and environmental factors.
• The term "Genetics" was coined by William Bateson in 1905, who is regarded as one of the pioneers in the field.
• Genetics plays a vital role in understanding inheritance patterns, genetic disorders, evolutionary biology, and biotechnology.

Additional Information

• Evolution:
• Evolution is the process through which organisms change over time due to natural selection, mutations, and genetic drift.
• It explains how species adapt to their environments and how new species emerge from existing ones.
• This concept was famously proposed by Charles Darwin in his book "On the Origin of Species" published in 1859.
• Mutation:
• A mutation is a change in the DNA sequence of an organism's genome.
• Mutations can occur naturally or due to external factors like radiation, chemical exposure, or errors in DNA replication.
• They are a significant source of genetic variation, which is crucial for evolution.
• Biology:
• Biology is the study of living organisms, including their structure, function, growth, evolution, and distribution.
• It encompasses various subfields like botany, zoology, ecology, and genetics.
• The study of biology contributes to advancements in medicine, agriculture, conservation, and biotechnology.
• Genetics in Application:
• Gregor Mendel, known as the "Father of Genetics," conducted pioneering experiments on pea plants to understand heredity.
• Genetics is applied in fields like medical research, genetic engineering, agriculture, and forensic science.
• For example, genetically modified crops are produced using principles of genetics to enhance yield and resistance to pests.

Important Points

• Key Concepts in Genetics:
• DNA (Deoxyribonucleic Acid) is the molecule that carries genetic information in most organisms.
• Genes are specific sequences of DNA that code for proteins and determine traits.
• Chromosomes are structures within cells that contain DNA. Humans have 23 pairs of chromosomes.
• Genetic Disorders like Sickle Cell Anemia and Cystic Fibrosis are caused by mutations in specific genes.
• Advancements in genomics and CRISPR technology have revolutionized genetic research and therapy.

**Q37. Answer: (c) Indonesia**

The correct answer is Indonesia.

Key Points

• Expansion of BRICS took place in 2024 with Egypt, Ethiopia, Iran, and the UAE becoming full members of BRICS from 1 January 2024.
• In January 2025, Indonesia joined the BRICS as a full member.
• Also,Belarus, Bolivia, Kazakhstan, Cuba, Malaysia, Nigeria, Thailand, Uganda, and Uzbekistan were inducted as partner countries of the BRICS.

Additional Information

• BRICS Overview:
• The acronym BRICS stands for Brazil, Russia, India, China, and South Africa, representing major emerging economies.
• BRICS was initially formed in 2006 as BRIC, with South Africa joining later in 2010.
• These countries collectively account for over 40% of the global population and approximately 25% of the global GDP.

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• Egypt's Economic Strengths:

• Egypt has a strategic location, connecting Africa, the Middle East, and Europe, and controls the Suez Canal, a vital trade route for global shipping.

• It is one of Africa's largest economies, with a GDP of $477 billion (as of 2023).

• Key sectors include energy (especially natural gas), agriculture, and tourism.

• BRICS Expansion:

• The decision to expand BRICS was driven by the need to include more emerging economies and strengthen its role in global governance.

• Other countries that joined in the 2023 expansion include Iran, the UAE, and Ethiopia.

• Saudi Arabia was invited in 2024 but has yet to formalise its full membership status.

• Argentina was also invited but officially declined.

Important Points

• Suez Canal:

• The Suez Canal is one of the world's most important trade routes, connecting the Mediterranean Sea to the Red Sea.

• Approximately 12% of global trade passes through the canal annually, making Egypt a critical player in international trade logistics.

• BRICS Bank:

• The New Development Bank (NDB), established by BRICS, provides funding for infrastructure and sustainable development projects in member countries.

• Egypt is expected to benefit from NDB financing for energy, transport, and water infrastructure projects.

**Q38. Answer: (d) 45**

The correct answer is 45.

Key Points

• The Svetambara canon in Jainism consists of a total of 45 Agamas, which are the sacred scriptures of the Jain religion.

• These scriptures are divided into various categories, including 11 Angas, 12 Upangas, 4 Cheddasutras, 10 Prakirnakas, 6 Chedasutras, 2 Chulikasutras, and 4 Mulasutras.

• The Agamas are considered to be the teachings of Lord Mahavira, the 24th Tirthankara of Jainism, and were compiled by his disciples after his Nirvana (liberation).

• The Svetambara sect of Jainism accepts these 45 Agamas as authentic and follows them as their religious texts.

• These texts contain philosophical concepts, ethical guidelines, rituals, cosmology, and spiritual practices to lead a disciplined and virtuous life.

Additional Information

• Svetambara Sect:

• The Svetambara sect is one of the two main branches of Jainism, the other being Digambara.

• Svetambara monks wear white robes, unlike Digambara monks who renounce clothing entirely.

• The Svetambara sect emphasizes the teachings and scriptures of Lord Mahavira as preserved in the 45 Agamas.

• This sect primarily flourishes in regions like Gujarat, Rajasthan, and parts of Maharashtra.

• Agamas in Jainism:

• The Agamas are ancient Jain texts written in the Prakrit language.

• These scriptures are divided into categories based on their subject matter, such as conduct, philosophy, and knowledge.

• They provide insights into Jain cosmology, the path to liberation, and ethical living.

• The teachings of Lord Mahavira, preserved in the Agamas, are considered sacred and central to Jain religious practices.

• Differences between Svetambara and Digambara Canons:

• The Svetambara sect recognizes 45 Agamas, while the Digambara sect believes these texts were lost over time due to historical circumstances.

• Digambara monks follow other texts like the Shatkhandagam and Kasayapahuda instead.

• The interpretation and emphasis on certain teachings differ between the two sects.

• Lord Mahavira:

• Lord Mahavira is the 24th Tirthankara (spiritual teacher) of Jainism.

• He preached the principles of non-violence (Ahimsa), truth (Satya), and renunciation (Tyaga).

• Mahavira attained Nirvana at the age of 72 in 527 BCE at Pavapuri in Bihar.

• His teachings form the core of Jain philosophy and are preserved in the Agamas.

Important Points

• Preservation of Agamas:

• The Agamas were originally passed down orally by Jain monks before being documented.

• The Svetambara sect made efforts to compile and preserve these texts during significant Jain councils.

• Some parts of the Agamas were lost over time due to invasions and natural calamities.

• Jain Philosophy:

• Jainism emphasizes the principles of non-violence, truth, non-stealing, celibacy, and non-possessiveness.

• The religion promotes the concept of karma, where every action has consequences.

• The ultimate goal of Jainism is Moksha (liberation from the cycle of birth and death).

**Q39. Answer: (b) Suez Canal**

The correct answer is Suez Canal.

Key Points

• The Suez Canal, connecting the Mediterranean Sea and the Red Sea, was opened in 1869. It significantly shortened the maritime route between Europe and India, eliminating the need to circumnavigate the southern tip of Africa.

• The canal's opening allowed the British Empire to strengthen its control over trade routes to India, which was considered the "Jewel in the Crown" of the British Empire due to its economic and strategic importance.

• The Suez Canal facilitated quicker transportation of goods, military supplies, and personnel, which bolstered British dominance in global trade and improved the efficiency of their colonial administration in India.

• Since the canal reduced travel time and costs, it enhanced British access to Indian exports like spices, textiles, and raw materials and increased their ability to import British goods to India.

• The British government purchased a controlling interest in the canal in 1875, further consolidating their influence over this crucial trade route.

Additional Information

• Suez Canal:

• The Suez Canal is an artificial sea-level waterway in Egypt that connects the Mediterranean Sea to the Red Sea.

• It spans approximately 193 km and was officially opened in November 1869.

• The canal provides a direct maritime route between Europe and Asia and is among the most important waterways in global shipping.

• The British Empire's acquisition of shares in the Suez Canal in 1875 gave it a strategic advantage in controlling the route to India.

• Conolly Canal:

• The Conolly Canal is located in Kerala, India, and was constructed during the British era for irrigation and transportation purposes.

• While significant for local trade, it did not have a major impact on British control over India's foreign trade.

• Buckingham Canal:

• The Buckingham Canal is a man-made waterway in southern India, primarily used for irrigation and local transportation.

• It was constructed during British rule but was not connected to international trade routes like the Suez Canal.

• Munak Canal:

• The Munak Canal is an important irrigation canal in northern India.

• Although it facilitates agricultural activities, it is unrelated to India's foreign trade or British control.

Important Points

• Impact of the Suez Canal:

• The canal significantly improved trade efficiency between Britain and its colonies, particularly India.

• Its strategic importance led to fierce geopolitical competition over its control, culminating in the British acquisition of shares in 1875.

• The Suez Canal remains a critical trade route for global commerce today, handling about 12% of world trade.

• British Colonial Trade:

• India was a major exporter of cotton textiles, spices, and indigo during British rule, and imports included machinery, manufactured goods, and British textiles.

• The Suez Canal played a crucial role in facilitating these trade flows.

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**Q40. Answer: (b) Second**

The correct answer is Second.

Key Points

• The Second Jain Council was held at Vallabhi (Gujarat) in 512 CE under the chairmanship of Devardhi Kshamasramana.

• The purpose of the council was to compile and preserve the Jain canonical texts, which were at risk of being lost due to the declining oral tradition.

• During this council, the Jain Agamas (canonical texts) were written down and codified for the first time, ensuring the continuity of Jain teachings.

• This council marked a critical step in the preservation of Jain literature, as the teachings had previously been passed down orally.

• The council also sought to address disputes and ensure uniformity in Jain teachings, as the community was divided into two major sects: Digambara and Shwetambara.

Additional Information

• Jain Councils:

• The Jain community held several councils to preserve and compile Jain teachings. These councils occurred at different times and locations throughout history.

• The First Jain Council was held at Pataliputra around the 4th century BCE under the patronage of King Chandragupta Maurya.

• The Third Jain Council focused on resolving sectarian disputes and clarifying the differences between the Digambara and Shwetambara sects.

• Each council played a significant role in ensuring the continuity and preservation of Jain spiritual texts and teachings.

• Devardhi Kshamasramana:

• He was a prominent Jain monk and the leader of the Second Jain Council.

• He took significant steps to preserve Jain teachings by compiling them into written texts, which were known as the Agamas.

• His efforts ensured the survival of Jain scriptures, which were under threat due to diminishing oral tradition.

• Jain Agamas:

• The Jain Agamas are the sacred texts of Jainism, containing teachings of the Tirthankaras.

• These texts were preserved through oral tradition until the Second Jain Council, when they were first written down.

• The Agamas consist of various categories, including Angas, Upangas, and Chheda Sutras, which provide guidelines for ethical living and spiritual practices.

• Division of Jainism:

• During the Second Jain Council, the Jain community was already divided into two sects: Digambara and Shwetambara.

• Digambara monks believe in complete renunciation, including the rejection of clothing, while Shwetambara monks wear white garments.

• The council aimed to address and reconcile differences between these sects, although the division persisted.

Important Points

• Historical Significance:

• The Second Jain Council was instrumental in preserving the oral tradition of Jain teachings by codifying them into written texts.

• It contributed to the development and dissemination of Jain philosophy and ethics.

• The council ensured that Jain doctrines remained accessible to future generations, safeguarding the religious and cultural heritage of Jainism.

• Impact on Jain Literature:

• The written compilation of Jain Agamas provided a structured framework for Jain teachings and practices.

• This initiative helped unify the community and maintain the authenticity of Jain scriptures.

• The texts became a vital source for understanding Jain philosophy, rituals, and way of life.

**Q41. Answer: (a) 64**

Shortcut Trick

The mean proportional between two numbers a and b is given directly by the square root of their product.

=> Mean proportional = √(a × b)

=> Mean proportional = √(16 × 256)

=> Mean proportional = √16 × √256

=> Mean proportional = 4 × 16 = 64

Therefore The correct answer is 64.

Alternate Method

Mean Proportional Relation

16 : x :: x : 256

16

x

256

× 4

× 4

x = √(16 × 256) = 64

Given:

First number (a) = 16

Second number (b) = 256

Formula Used:

If x is the mean proportional between a and b, then the proportion is written as:

=> a : x = x : b

=> $x^2 = a \times b$

=> $x = \sqrt{(a \times b)}$

Calculation:

=> $x = \sqrt{(16 \times 256)}$

=> $x = \sqrt{16} \times \sqrt{256}$

=> $x = 4 \times 16$

=> x = 64

Therefore The correct answer is 64.

Additional Information

Mean Proportional

The mean proportional between two numbers a and b is x, where $x^2 = a \times b$ or $x = \sqrt{(ab)}$.

Third Proportional

The third proportional to a and b is c, where a : b :: b : c. It is calculated using the formula $c = b^2 \div a$.

Fourth Proportional

The fourth proportional to a, b, and c is d, where a : b :: c : d. It is computed as $d = (b \times c) \div a$.

Duplicate & Triplicate Ratio

The duplicate ratio of a : b is $a^2 : b^2$, and the triplicate ratio is $a^3 : b^3$.

**Q42. Answer: (d) 12**

Shortcut Trick

The mode of a data set is simply the value that appears with the maximum frequency.

In the given data: 12, 14, 14, 15, 12, 16, 12, 10, 19, 11

By observation, the number 12 appears the most (3 times).

Therefore The correct answer is 12 marks.

Alternate Method

Given:

Marks scored by 10 students: 12, 14, 14, 15, 12, 16, 12, 10, 19, 11

Formula Used:

Mode = The observation having the highest frequency

0

1

2

3

10

1

11

1

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12
3
MODE
14
2
15
1
16
1
19
1
Marks Scored
Frequency
Calculations:
=> Let us arrange the given marks in ascending order to easily count their frequencies:
=> 10, 11, 12, 12, 12, 14, 14, 15, 16, 19
=> Frequency of 10 = 1
=> Frequency of 11 = 1
=> Frequency of 12 = 3
=> Frequency of 14 = 2
=> Frequency of 15, 16, 19 = 1 each
=> Since the mark 12 occurs the maximum number of times (3 times), it is the mode.
Therefore The correct answer is 12 marks.
Additional Information
Mean
The arithmetic average of a set of given numbers. Formula: Mean = Sum of all observations ÷ Total number of observations.
Median
The middlemost value of a sorted data set. If the total observations (n) is odd, Median = ((n+1)÷2)^(th) term. If n is even, Median is the average of the (n÷2)^(th) and (n÷2 + 1)^(th) terms.
Empirical Relationship
For a moderately skewed distribution, the relationship between Mean, Median, and Mode is given by: Mode = 3 × Median − 2 × Mean.

**Q43. Answer: (d) 972 m²**

Shortcut Trick
Total Surface Area (TSA) of a cuboid is simply twice the sum of the products of its dimensions taken two at a time.
TSA = 2 × (lb + bh + hl)
TSA = 2 × (18 × 12 + 12 × 9 + 9 × 18)
TSA = 2 × (216 + 108 + 162) = 2 × 486
TSA = 972
Therefore The correct answer is 972 m².
Alternate Method
Given:
Length (l) = 18 m
Breadth (b) = 12 m
Height (h) = 9 m
Formula Used:
Total Surface Area (TSA) = 2(lb + bh + hl)
l = 18 m
b = 12 m
h = 9 m
Calculations:

=> Area of base and top = 2 × (lb) = 2 × (18 × 12) = 2 × 216 = 432 m²

=> Area of side walls = 2 × (bh) = 2 × (12 × 9) = 2 × 108 = 216 m²

=> Area of front and back walls = 2 × (hl) = 2 × (9 × 18) = 2 × 162 = 324 m²

=> Total Surface Area = 432 + 216 + 324

=> Total Surface Area = 972 m²

Therefore The correct answer is 972 m².

Additional Information

Volume of a Cuboid

It is the total three-dimensional space occupied by the cuboid. Formula: V = l × b × h.

Lateral Surface Area

It represents the area of the four walls, excluding the top and bottom faces. Formula: LSA = 2h(l + b).

Longest Diagonal of a Cuboid

It is the length of the longest rod that can be placed perfectly inside the cuboid. Formula: Diagonal = √(l² + b² + h²).

**Q44. Answer: (c) 27.25**

Shortcut Trick

Calculate 65% of 65 by squaring 65 and dividing by 100: 4225 ÷ 100 = 42.25

Calculate 3/5 of 25 directly: 3 × 5 = 15

Find the required difference: 42.25 − 15 = 27.25

Therefore The correct answer is 27.25.

Alternate Method

Given:

First value = 65% of 65

Second value = 3/5 of 25

Calculations:

=> First value = (65 ÷ 100) × 65

=> First value = 4225 ÷ 100

=> First value = 42.25

=> Second value = (3 ÷ 5) × 25

=> Second value = 3 × 5

=> Second value = 15

=> Difference = First value − Second value

=> Difference = 42.25 − 15

=> Difference = 27.25

Therefore The correct answer is 27.25.

Additional Information

BODMAS Rule

BODMAS stands for Brackets, Orders (powers/roots), Division, Multiplication, Addition, and Subtraction. Operations must be strictly performed in this sequence.

Percentage to Fraction Conversion

To convert any percentage to a fraction or decimal, simply divide the value by 100. For example, x% = x ÷ 100.

Squaring Numbers Ending in 5

To quickly square a number ending in 5 (e.g., n5), multiply the tens digit 'n' by the next integer (n + 1) and place 25 at the end. For 65²: 6 × 7 = 42, giving 4225.

**Q45. Answer: (b) 72^o**

Shortcut Trick

In a rectangle, the diagonals bisect each other and are equal in length, making OP = OS.

The vertically opposite angles at the intersection are equal, so angle POS = angle QOR = 36°.

In the isosceles ΔPOS, the angles opposite to the equal sides are equal (angle OPS = angle OSP).

The sum of angles in a triangle is 180°, so angle OPS = (180° − 36°) ÷ 2 = 144° ÷ 2 = 72°.

Therefore The correct answer is 72°.

Alternate Method

36°

36°

x

P

Q

R

S

O

Given:

Rectangle PQRS with diagonals PR and QS intersecting at point O.

angle QOR = 36°

Concept Used:

Diagonals of a rectangle are equal in length and bisect each other perfectly.

Vertically opposite angles are exactly equal to each other.

The sum of the internal angles of any triangle is 180°.

Calculation:

=> angle POS = angle QOR = 36° (Vertically opposite angles)

=> In a rectangle, the diagonals bisect each other and are completely equal, meaning OP = OS.

=> Because OP = OS, ΔPOS becomes an isosceles triangle where angles opposite the equal sides are also equal.

=> Hence, angle OPS = angle OSP.

=> In ΔPOS, the sum of all angles is 180°

=> angle OPS + angle OSP + angle POS = 180°

=> 2 × angle OPS + 36° = 180°

=> 2 × angle OPS = 180° − 36°

=> 2 × angle OPS = 144°

=> angle OPS = 72°

Therefore The correct answer is 72°.

Additional Information

Properties of a Rectangle

A rectangle is a quadrilateral where all four interior angles equal 90°. Its opposite sides are parallel and equal, and its diagonals are of identical length and perfectly bisect each other.

Isosceles Triangle Rule

In any triangle, if two sides are equal in length, the angles directly opposite to those sides are also equal. This property frequently applies when determining angles within intersected rectangles.

Vertically Opposite Angles

Whenever two intersecting straight lines cross each other, the angles located directly opposite each other at the intersection point (the vertex) are vertically opposite and always equal.

**Q46. Answer: (d) 125000**

Shortcut Trick

Let the total registered voters be x.

Valid votes = x × (90/100) × (82/100)

Winning margin = (51% − 49%) = 2% of valid votes

x × (90/100) × (82/100) × (2/100) = 1845

x = (1845 × 1000000) ÷ 14760 = 125000

Therefore The correct answer is 125000.

Alternate Method

Total Voters = 100 units

90% polled

Polled = 90 units

82% valid

Valid = 73.8 units

2% margin

Margin = 1.476 units

1.476 units = 1845

Given:

Total voters polled = 90%

Invalid votes = 18% of polled votes

Winner's vote share = 51% of valid votes

Winning margin = 1845 votes

Calculations:

=> Let the total number of registered voters be 100 units.

=> Total polled votes = 90% of 100 units = 90 units.

=> Valid votes = (100 − 18)% of 90 units = 82% of 90 units = 73.8 units.

=> Votes of winning candidate = 51% of valid votes.

=> Votes of losing candidate = (100 − 51)% = 49% of valid votes.

=> Margin of victory = (51 − 49)% = 2% of valid votes.

=> Margin in units = 2% of 73.8 units = 0.02 × 73.8 = 1.476 units.

=> According to the question, 1.476 units = 1845.

=> 1 unit = 1845 ÷ 1.476 = 1250.

=> Total registered voters (100 units) = 100 × 1250 = 125000.

Therefore The correct answer is 125000.

Additional Information

Successive Percentage Application

When multiple percentages are applied in a chain sequence (e.g., total → polled → valid), use the continuous product ratio: Final Value = Base × (1 − P1/100) × (1 − P2/100).

Election Base Change Rule

Always identify the correct reference base. If a candidate gets 51% of "valid votes", the margin (2%) is calculated entirely on valid votes. If the candidate gets 51% of "total votes", the margin is computed over the total registered voters.

Winning Margin Shortcut

In a two-candidate election without any third party, the winning margin is simply the direct difference between the percentage share of the winner and the loser, multiplied by the common base.

**Q47. Answer: (a) −43**

Shortcut Trick

Apply BODMAS rule directly to solve the expression:

First calculate division: (−60) ÷ (−6) = 10

Then calculate multiplication: (−4) × 6 = −24

Add the results to the remaining terms:

=> −9 − 10 + (−24) = −43

Therefore The correct answer is −43.

Alternate Method

Given:

(−9) − (−60) ÷ (−6) + (−4) × 6

Formula Used:

BODMAS Rule (Brackets, Orders, Division, Multiplication, Addition, Subtraction)

Calculations:

=> (−9) − [(−60) ÷ (−6)] + [(−4) × 6]

=> (−9) − (10) + (−24)

=> −9 − 10 − 24

=> −19 − 24

=> −43

Therefore The correct answer is −43.

Additional Information

BODMAS Rule

It defines the order of operations: Brackets, Orders, Division, Multiplication, Addition, and Subtraction. Always perform division and multiplication before addition and subtraction.

Sign Rules for Multiplication & Division

When operating on numbers with the same sign, the result is positive (− ÷ − = +). When signs are different, the result is negative (+ × − = −).

Sign Rules for Addition & Subtraction

When adding multiple negative numbers, add their absolute values and keep the negative sign (e.g., −a − b − c = −(a + b + c)).

**Q48. Answer: (d) 13**

Shortcut Trick

To check divisibility by 13, form groups of 3 digits from right to left: 716, 710, and 501.

Find the difference between the sum of groups in odd places and even places.

Difference = (501 + 716) − 710.

Difference = 1217 − 710 = 507.

Since 507 is completely divisible by 13 (13 × 39 = 507), the whole number is divisible by 13.

Therefore The correct answer is 13.

Alternate Method

Given:

Number = 71,67,10,501

Method Used:

Basic elimination using odd/even logic and long division.

Calculations:

=> The given number 71,67,10,501 ends in 1, meaning it is an odd number.

=> Even numbers can never perfectly divide an odd number, so 16 and 20 are eliminated immediately.

=> Now, check divisibility by 19 using basic division:

=> 71,67,10,501 ÷ 19 yields a quotient of 3,77,21,605 with a remainder of 6. Thus, 19 is eliminated.

=> Finally, check divisibility by 13:

=> 71,67,10,501 ÷ 13 = 5,51,31,577 with exactly 0 remainder.

Therefore The correct answer is 13.

Additional Information

Divisibility Rule of 7, 11, and 13

Form groups of 3 digits starting from the rightmost digit. Find the difference between the sum of odd-placed and even-placed groups. If this difference is divisible by 7, 11, or 13, the original number is divisible by that respective prime.

Divisibility Rule of 16

A number is divisible by 16 if the number formed by its last 4 digits is completely divisible by 16.

Divisibility Rule of 19

Multiply the unit digit of the number by 2 and add it to the remaining truncated number. If the resulting sum is divisible by 19, then the original number is divisible by 19.

**Q49. Answer: (c) 289/110**

Shortcut Trick

According to BODMAS, solve the innermost fraction first: 1 + 3/8 = 11/8.

The reciprocal of 11/8 is 8/11, so the expression simplifies directly to: 5/2 + 8/11 − 3/5.

The LCM of the denominators 2, 11, and 5 is 110.

Convert and combine the numerators: (275 + 80 − 66) / 110 = 289 / 110.

Therefore The correct answer is 289/110.

Alternate Method

Given:

Expression: 5/2 + (1 / (1 + 3/8)) − 3/5

Calculations:

=> First, simplify the term inside the bracket: 1 + 3/8

=> 1 + 3/8 = (8 + 3) / 8 = 11/8

=> The expression becomes: 5/2 + (1 / (11/8)) − 3/5

=> We know that 1 / (a/b) = b/a, so 1 / (11/8) = 8/11

=> Expression = 5/2 + 8/11 − 3/5

=> Now, find the LCM of the denominators 2, 11, and 5.

=> LCM(2, 11, 5) = 110

=> Rewrite the fractions with the common denominator 110:

=> (5 × 55) / 110 + (8 × 10) / 110 − (3 × 22) / 110

=> 275/110 + 80/110 − 66/110

=> (275 + 80 − 66) / 110

=> (355 − 66) / 110

=> 289 / 110

Therefore The correct answer is 289/110.

Additional Information

BODMAS Rule

Order of operations: Brackets, Orders, Division, Multiplication, Addition, and Subtraction. Must be strictly followed to simplify equations correctly.

Fraction Addition & Subtraction

To add or subtract fractions with different denominators, compute the Least Common Multiple (LCM) of the denominators to create a common base.

Reciprocal of a Fraction

The reciprocal of a fraction a/b is b/a. When 1 is divided by a fraction, the result is directly its reciprocal.

**Q50. Answer: (b) 6 ft**

Shortcut Trick

For a right-angled triangle with a 30° angle, the ratio of the perpendicular to the hypotenuse is 1 : 2.

Let the standing broken height be 1 unit, making the fallen upper part 2 units.

Total original height = 1 + 2 = 3 units.

Given 3 units = 18 ft => 1 unit = 6 ft.

Therefore The correct answer is 6 ft.

Alternate Method

Original top position

30°

x

18 − x

18 ft

A

B

C

Given:

Total height of the vertical post = 18 ft

Let the height at which the post is broken (AB) = x ft

Length of the broken upper part forming the hypotenuse (AC) = (18 − x) ft

Angle formed by the upper part with the ground at point C = 30°

Formula Used:

In a right-angled triangle, sin(θ) = Perpendicular ÷ Hypotenuse

Calculations:

=> In right ΔABC, sin(30°) = AB ÷ AC

=> 1 / 2 = x / (18 − x)

=> 18 − x = 2x

=> 3x = 18

=> x = 6

Therefore The correct answer is 6 ft.

Additional Information

Standard Trigonometric Ratios

For a 30°-60°-90° right triangle, the sides opposite to the respective angles are always in the fixed ratio of 1 : √3 : 2.

Angle of Elevation vs Depression

The angle of elevation is formed when looking upward from the horizontal, whereas the angle of depression is formed when looking downward. Because the horizontal lines of sight are parallel, these alternate interior angles are always equal.

Pythagoras Theorem

In any right-angled triangle, the square of the hypotenuse (longest side) equals the sum of the squares of the perpendicular and the base: $H^2 = P^2 + B^2$.

**Q51. Answer: (b) 4 days**

Shortcut Trick

Total work is constant: 5m × 16 = 3w × 15 => 80m = 45w => m/w = 9/16

Efficiency of 1 man (m) = 9 units/day, and 1 woman (w) = 16 units/day.

Total Work = 5 × 9 × 16 = 720 units.

Required time for (9w + 4m) = 720 ÷ (9 × 16 + 4 × 9) = 720 ÷ 180 = 4 days.

Therefore The correct answer is 4 days.

Alternate Method

Given:

=> 5 men can complete the work in 16 days.

=> Time taken by 1 man = 5 × 16 = 80 days.

=> 3 women can complete the work in 15 days.

=> Time taken by 1 woman = 3 × 15 = 45 days.

| Person | Days | Total Work | Efficiency |
|---|---|---|---|
| 1 Man | 80 | 720 | 9 |
| 1 Woman | 45 | 16 | |

Calculations:

=> Let Total Work be the LCM of 80 and 45 = 720 units.

=> Efficiency of 1 man = 720 ÷ 80 = 9 units/day.

=> Efficiency of 1 woman = 720 ÷ 45 = 16 units/day.

=> Efficiency of 9 women = 9 × 16 = 144 units/day.

=> Efficiency of 4 men = 4 × 9 = 36 units/day.

=> Combined efficiency of (9 women + 4 men) = 144 + 36 = 180 units/day.

=> Time required = Total Work ÷ Combined Efficiency = 720 ÷ 180 = 4 days.

Therefore The correct answer is 4 days.

Additional Information

Chain Rule (MDH Concept)

If M1 men can do W1 work in D1 days working H1 hours per day, and M2 men can do W2 work in D2 days working H2 hours per day, then (M1 × D1 × H1) ÷ W1 = (M2 × D2 × H2) ÷ W2.

Efficiency and Time Relation

Efficiency is inversely proportional to the time taken to complete a given work. If A is twice as efficient as B, A will take half the time B takes to complete the work.

Total Work Concept

Total Work is the product of the number of workers, their individual efficiency, and the number of days they work. It remains constant across different groups working on the same task.

**Q52. Answer: (a) Rs. 158.80**

Shortcut Trick

Number of remaining mirrors to be sold = 92 − 35 = 57

Total Selling Price (SP) = 57 × 4.40 = Rs. 250.80

Profit = Total SP − Total CP = 250.80 − 92 = Rs. 158.80

Therefore The correct answer is Rs. 158.80.

Alternate Method
Given:
Total cost price of 92 mirrors (CP) = Rs. 92
Number of broken mirrors = 35
Selling price per remaining mirror = Rs. 4.40
Formula Used:
Profit = Total Selling Price (SP) − Total Cost Price (CP)
CP = Rs. 92
Profit = Rs. 158.80
Total SP = Rs. 250.80
Profit Calculation
Calculations:
=> Number of mirrors remaining for sale = 92 − 35 = 57
=> Total Selling Price (SP) = 57 × 4.40
=> Total Selling Price (SP) = Rs. 250.80
=> Profit = Total SP − Total CP
=> Profit = 250.80 − 92
=> Profit = Rs. 158.80
Therefore The correct answer is Rs. 158.80.
Additional Information
Profit and Loss
Profit occurs when the Selling Price (SP) is greater than the Cost Price (CP). Profit = SP − CP.
Profit Percentage
Profit % = (Profit ÷ CP) × 100.
Loss and Loss Percentage
Loss occurs when Cost Price (CP) > Selling Price (SP). Loss = CP − SP. Loss % = (Loss ÷ CP) × 100.

**Q53. Answer: (b) 12.6%**

Shortcut Trick
For successive discounts of x% and y%, the single equivalent discount percentage is given directly by the formula:
Equivalent Discount = x + y − (x × y) ÷ 100
Given x = 8 and y = 5
Equivalent Discount = 8 + 5 − (8 × 5) ÷ 100 = 13 − 40 ÷ 100
Equivalent Discount = 13 − 0.4 = 12.6%
Therefore The correct answer is 12.6%.
Alternate Method
−8% Discount
−5% Discount
MP = 100
Price = 92
SP = 87.4
Net Equivalent Discount = 12.6%
Given:
First successive discount = 8%
Second successive discount = 5%
Calculations:
=> Let the initial Marked Price (MP) of the item be 100.
=> After applying the first discount of 8%, the new price = 100 − (8% of 100) = 100 − 8 = 92.
=> The second discount of 5% is calculated on this new price of 92.
=> Second discount amount = 5% of 92 = (5 × 92) ÷ 100 = 460 ÷ 100 = 4.6.
=> Final Selling Price (SP) = 92 − 4.6 = 87.4.
=> Total equivalent discount amount = Initial MP − Final SP = 100 − 87.4 = 12.6.

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=> Since the base MP was considered 100, the equivalent discount percentage is exactly 12.6%.

Therefore The correct answer is 12.6%.

Additional Information

Equivalent Discount for Three Successive Discounts

For three successive discounts of x%, y%, and z%, first find the equivalent discount of x% and y% (say D1%). Then apply the successive formula again using D1% and z% to find the final net discount.

Buy X Get Y Free

This promotional offer is a direct form of discount where the Discount Percentage = [Free Items ÷ Total Items] × 100. For example, 'Buy 3 Get 1 Free' yields a discount of (1 ÷ 4) × 100 = 25%.

Relation between Markup, Discount, and Profit

Selling Price (SP) = Marked Price (MP) × [1 − (Discount % ÷ 100)]. Similarly, SP = Cost Price (CP) × [1 + (Profit % ÷ 100)]. Equating the two gives the relationship between CP, MP, Profit, and Discount.

**Q54. Answer: (d) 50% loss**

Shortcut Trick

Given, 22 × SP = 11 × CP

Ratio of SP to CP = 11 ÷ 22 = 1 ÷ 2

Loss = CP − SP = 2 − 1 = 1 unit

Loss % = (Loss ÷ CP) × 100 = (1 ÷ 2) × 100 = 50%

Therefore The correct answer is 50% loss.

Alternate Method

Given:

Selling Price (SP) of 22 books = Cost Price (CP) of 11 books.

Formula Used:

Loss = CP − SP

Loss % = (Loss ÷ CP) × 100

Cost Price vs Selling Price Ratio

Total Cost Price (CP) = 2 Units

SP = 1 Unit

Loss = 1 Unit

Loss % = (1 ÷ 2) × 100 = 50%

Calculations:

=> Let the CP of 1 book be Rs. 1.

=> Then, CP of 22 books = Rs. 22.

=> As per the given condition, SP of 22 books = CP of 11 books = Rs. 11.

=> Since CP is greater than SP, there is a loss.

=> Loss = CP of 22 books − SP of 22 books

=> Loss = 22 − 11 = Rs. 11.

=> Loss % = (Loss ÷ CP) × 100

=> Loss % = (11 ÷ 22) × 100

=> Loss % = 50%

Therefore The correct answer is 50% loss.

Additional Information

Profit and Loss Percentages

Both profit and loss are generally calculated on the Cost Price (CP) unless specified otherwise. Profit % = (Profit ÷ CP) × 100 and Loss % = (Loss ÷ CP) × 100.

Marked Price (MP) and Discount

Discount is a reduction always calculated on the Marked Price (MP). The Selling Price (SP) after a discount is derived as SP = MP − Discount. The equivalent discount of two successive discounts x% and y% is (x + y − xy ÷ 100)%.

Dishonest Dealer Concept

If a merchant sells goods at Cost Price but uses false weights, the actual profit is determined by the difference in weight. Profit % = [(True Weight − False Weight) ÷ False Weight] × 100.

**Q55. Answer: (d) 525/31 hours**

Shortcut Trick

Total Work (Capacity) = LCM of (12, 30, 18) = 180 units.

Combined efficiency = (180 ÷ 12) + (180 ÷ 30) + (180 ÷ 18) = 15 + 6 + 10 = 31 units/hour.

Time taken by A, B, and C together = Total Work ÷ Combined Efficiency = 180 ÷ 31.

180 ÷ 31 = 5 25/31 hours.

Therefore The correct answer is 5 25/31 hours.

Alternate Method

Given:

Time taken by Pipe A = 12 hours

Time taken by Pipe B = 30 hours

Time taken by Pipe C = 18 hours

Formula Used:

Total Work = LCM of time taken by individual pipes.

Combined Time = Total Work ÷ Total Efficiency

| Pipe | Hours | Total Work | Efficiency |
|---|---|---|---|
| A | 12 | 180 | 180 ÷ 12 = 15 |
| B | 30 | 180 ÷ 30 = 6 | |
| C | 18 | 180 ÷ 18 = 10 | |

Calculations:

=> Total efficiency of A, B, and C = 15 + 6 + 10 = 31 units/hour

=> Time taken by all three pipes together = Total Work ÷ Total efficiency

=> Time taken = 180 ÷ 31

=> Time taken = 5 25/31 hours

Therefore The correct answer is 5 25/31 hours.

Additional Information

Pipes & Cisterns Rule

If an inlet pipe can fill a tank in x hours, then the part of the tank filled in 1 hour is 1/x. This acts as positive efficiency.

Outlet Pipe Rule

If an outlet pipe empties a full tank in y hours, its 1 hour work is taken as negative i.e., −1/y.

Net Work Done

If both inlet and outlet pipes are opened together, the net 1 hour work is given by (1/x) − (1/y).

**Q56. Answer: (a) 13**

Shortcut Trick

Let the present ages be F (Father) and S (Son).

Given 7 years ago: (F − 7) = 2 × (S − 7) + 20 => F − 2S = 13

Assume after y years, the Father will be twice the Son's age: (F + y) = 2 × (S + y)

Simplifying the future condition gives: F − 2S = y

Since we already established that F − 2S = 13, the required time y must be 13.

Therefore The correct answer is 13 years.

Alternate Method

Given:

=> 7 years ago, the Father's age was 20 more than twice the Son's age.

Formula Used:

=> Future Age = Present Age + Number of Years

7 Years AgoSon: xDad: 2x + 20+7 yrsPresentSon: x + 7Dad: 2x + 27+y yrsAfter y yearsSon: x + y + 7Dad: 2x + y + 27Future Dad = 2 × Future Son

Calculations:

=> Let the age of the son 7 years ago be x years.

=> Then, Father's age 7 years ago = (2x + 20) years.

=> Present age of the son = (x + 7) years.

=> Present age of the father = (2x + 20 + 7) = (2x + 27) years.

=> Let after y years from now, the father's age will be twice the son's age.

=> After y years, Son's age = (x + y + 7) years.

=> After y years, Father's age = (2x + y + 27) years.

=> Equating according to the given future condition: 2x + y + 27 = 2 × (x + y + 7)

=> 2x + y + 27 = 2x + 2y + 14

=> Canceling 2x from both sides gives: y + 27 = 2y + 14

=> 2y − y = 27 − 14

=> y = 13

Therefore The correct answer is 13 years.

Additional Information

Constant Age Difference

The difference between the ages of two individuals always remains constant throughout their lifetime. If person A is 5 years older than person B today, A will always be 5 years older than B in any past or future time period.

Linear Equation Formation

For simple translation of word problems, the word 'times' refers to multiplication, while 'more than' or 'after' implies addition. Always assign variables to the smallest unknown or past values to construct the simplest possible equation.

Ratio-Based Age Method

If the ratio of current ages is p : q and after t years the ratio changes to m : n, we can solve directly by equating the age gaps vertically or by applying the cross-multiplication method formula: (p − m) / (q − n).

**Q57. Answer: (c) 5644/51 %**

Shortcut Trick

Successive discounts of 20% and 25% equal a single equivalent discount of 40%.

Initial Cost Price = 60% of Rs. 8000 = Rs. 4800.

Total Cost Price = Initial CP + Transportation = 4800 + 300 = Rs. 5100.

Profit = Selling Price − Total Cost Price = 8000 − 5100 = Rs. 2900.

Profit % = (2900 ÷ 5100) × 100 = 2900 ÷ 51 = 56 ^(44)/51%.

Therefore The correct answer is 56 ^(44)/51%.

Alternate Method

Given:

Marked Price (MP) = Rs. 8,000

Successive discounts = 20% and 25%

Transportation cost = Rs. 300

Selling Price (SP) = Rs. 8,000

Formula Used:

Total CP = Initial CP + Overhead expenses

Profit = SP − Total CP

Profit % = (Profit ÷ Total CP) × 100

Marked Price (MP) = Rs. 8000

Discount = 40% (Rs. 3200)

Initial CP = Rs. 4800

Transport = Rs. 300

• Total CP = Rs. 5100

Profit = Rs. 2900

• Final Selling Price (SP) = Rs. 8000

Calculations:

=> Initial Cost Price = 8000 × (100 − 20)/100 × (100 − 25)/100

=> Initial Cost Price = 8000 × (80 ÷ 100) × (75 ÷ 100)

=> Initial Cost Price = 8000 × (4 ÷ 5) × (3 ÷ 4) = Rs. 4,800

=> Total Cost Price = 4800 + 300 = Rs. 5,100

=> Profit = Selling Price − Total Cost Price

=> Profit = 8000 − 5100 = Rs. 2,900

=> Profit % = (2900 ÷ 5100) × 100

=> Profit % = 2900 ÷ 51 = 56 ^(44)/51%

Therefore The correct answer is 56 ^(44)/51%.

Additional Information

Successive Discounts

When two discounts of x% and y% are given successively, the single equivalent discount percentage is given by [x + y − (x × y) ÷ 100]%.

Effective Cost Price

The total effective Cost Price is always calculated by adding all overhead expenses (such as transportation, repairs, and installation) to the initial purchasing price.

Profit Calculation Base

Profit and Loss percentages are mathematically evaluated on the Total Cost Price uniformly, unless explicitly stated to be evaluated on the Selling Price.

**Q58. Answer: (d) Rs. 384**

Shortcut Trick

Since the rate is given per month and the time is given in months, we can calculate the total effective interest rate directly.

Total Effective Rate = 4% × 8 = 32%

Simple Interest = 32% of 1200

SI = (32 × 1200) ÷ 100 = 384

Therefore The correct answer is Rs. 384.

Alternate Method

Given:

Principal (P) = Rs. 1,200

Rate of Interest (R) = 4% per month

Time (T) = 8 months

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Start (0 months)

P = Rs. 1200

End (8 months)

SI = ?

Rate = 4% per month

Time = 8 months

Total Interest = 32%

Calculations:

=> SI = (1200 × 4 × 8) ÷ 100

=> SI = (4800 × 8) ÷ 100

=> SI = 38400 ÷ 100

=> SI = 384

Therefore The correct answer is Rs. 384.

Additional Information

Unit Consistency in Interest Calculation

Always ensure that the Rate (R) and Time (T) are exactly in the same unit. If the given rate is per annum, convert the time to years. If the rate is per month, keep the time in months before applying the simple interest formula.

Amount Formula

The total amount (A) evaluated after adding the simple interest to the initial principal is calculated directly as A = P + SI, which can also be written as A = P × (1 + RT ÷ 100).

Compound Interest (CI)

Unlike simple interest, compound interest periodically calculates interest on both the initial principal and the accumulated interest

of the previous periods. The standard formula for CI is $A = P \times (1 + R \div 100)^n$.

**Q59. Answer: (b) Rs. 750**

Shortcut Trick

Total ratio parts = 16 + 85 + 54 = 155 parts

Difference in ratio parts of Y and Z = 85 − 54 = 31 parts

Required difference = (31 ÷ 155) × Total Profit

Required difference = (1 ÷ 5) × Rs. 3750 = Rs. 750

Therefore The correct answer is Rs. 750.

Alternate Method

Given:

Investment ratio of X, Y, and Z = 16 : 85 : 54

Total profit earned at the end of the year = Rs. 3,750

Formula Used:

When the investment duration is identical for all partners, the profit sharing ratio is equal to the investment ratio.

Individual Profit = (Individual Ratio Part ÷ Total Ratio Parts) × Total Profit

16 units

X

85 units

Y

54 units

Z

Diff = 31 units

Total Profit = 155 units = Rs. 3750

Calculations:

=> Let the profit shares of X, Y, and Z be 16 units, 85 units, and 54 units respectively.

=> Total profit in units = 16 + 85 + 54 = 155 units

=> Difference between the profit units of Y and Z = 85 units − 54 units = 31 units

=> Required difference = (31 ÷ 155) × Rs. 3750

=> Required difference = (1 ÷ 5) × Rs. 3750 = Rs. 750

Therefore The correct answer is Rs. 750.

Additional Information

Simple vs Compound Partnership

In simple partnership, capital is invested for the same time period and profit is distributed exactly in the ratio of the investments. In compound partnership, varying time periods are involved, so profit is distributed in the ratio of (Capital × Time).

Active and Sleeping Partners

An active partner manages the daily business and usually receives a fixed percentage or salary before the remaining profit is divided. A sleeping partner simply invests capital and receives a share only from the distributed profit pool.

Rule for Three Partners

If three partners invest capitals C1, C2, and C3 for time periods T1, T2, and T3 respectively, their general profit sharing ratio becomes P1 : P2 : P3 = (C1 × T1) : (C2 × T2) : (C3 × T3).

**Q60. Answer: (d) 97**

Shortcut Trick

The unit digit of 769501 is 1 (an odd number).

Even numbers (96 and 90) cannot divide an odd number, so they are instantly eliminated.

A number divisible by 105 must end in 0 or 5, which eliminates 105.

By elimination, 97 is the only possible divisor left. (Verification: 769501 ÷ 97 = 7933)

Therefore The correct answer is 97.

Alternate Method

Given:

Dividend = 769501

Options = 105, 96, 90, 97

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Method Used:

Basic divisibility rules and prime factorization checking.

Calculations:

=> Let us check Option 1: 105. Any multiple of 105 must end with the digit 0 or 5. Since 769501 ends in 1, it is not divisible by 105.

=> Let us check Option 2: 96. It is an even number. An even number can never perfectly divide an odd number. Hence, 96 is eliminated.

=> Let us check Option 3: 90. Any multiple of 90 must end in 0. Thus, 90 is eliminated.

=> Let us check Option 4: 97. Let's perform direct long division.

=> 769501 ÷ 97

=> 97 × 7 = 679 (Remainder: 769 − 679 = 90)

=> Bring down 5: 905 ÷ 97 = 9 with remainder (905 − 873) = 32

=> Bring down 0: 320 ÷ 97 = 3 with remainder (320 − 291) = 29

=> Bring down 1: 291 ÷ 97 = 3 with remainder (291 − 291) = 0

=> The quotient is 7933 and the remainder is 0, perfectly dividing the number.

Therefore The correct answer is 97.

Additional Information

Divisibility by 5 and 10

A number is exactly divisible by 5 if its unit digit is either 0 or 5. It is divisible by 10 only if its unit digit is exactly 0.

Odd and Even Divisibility

An even divisor always produces an even multiple, meaning an odd number can never be cleanly divided by an even number. This is one of the quickest elimination techniques in competitive exams.

Prime Number Divisibility

For large prime numbers like 97, divisibility is best verified through direct long division or by applying negative/positive osculators. However, when other options are easily eliminated via basic rules, solving the prime division becomes unnecessary.

**Q61. Answer: (b) 30**

Shortcut Trick

The product of two consecutive numbers is always close to the square of either number.

The square root of 870 is approximately 29.49.

This means the two consecutive numbers are 29 and 30.

Checking their product: 29 × 30 = 870.

The greater of the two numbers is 30.

Therefore The correct answer is 30.

Alternate Method

Given:

The product of two consecutive natural numbers is 870.

Method Used:

Quadratic equation formulation and factorisation.

Calculations:

=> Let the smaller natural number be x.

=> The greater consecutive natural number will be (x + 1).

=> Product = x × (x + 1) = 870

=> $x^2 + x - 870 = 0$

=> $x^2 + 30x - 29x - 870 = 0$

=> $x(x + 30) - 29(x + 30) = 0$

=> $(x - 29)(x + 30) = 0$

=> $x = 29$ or $x = -30$

=> Since x must be a natural number, it cannot be negative. Therefore, x = 29.

=> The greater number = x + 1 = 29 + 1 = 30.

Therefore The correct answer is 30.

Additional Information

Consecutive Integers

Integers that follow each other in continuous order without any gaps. They are generally represented as n, n+1, n+2, etc.

Natural Numbers

The set of positive counting numbers starting from 1 (1, 2, 3, ...). It does not include zero or negative integers.

Quadratic Factorisation

The method of solving $ax^2 + bx + c = 0$ by splitting the middle term into two terms such that their product is ac and their sum is b.

**Q62. Answer: (b) Rs. 33,335**

Shortcut Trick

Effective SI % for 1st case = 6.4% × 6.5 = 41.6%

Effective SI % for 2nd case = 7.6% × (20/3) = 152/3%

Required Amount % = Principal (100%) + SI % = 100% + 152/3% = 452/3%

Given, 41.6% of sum = Rs. 9,204

Amount = (9204 ÷ 41.6) × (452/3) = 221.25 × (452/3) = 73.75 × 452 = Rs. 33,335

Therefore The correct answer is Rs. 33,335.

Alternate Method

Given:

SI1 = Rs. 9,204, R1 = 6.4%, T1 = 6&frac{1}{2} years = 6.5 years

R2 = 7.6%, T2 = 6&frac{2}{3} years = 20/3 years

Formula Used:

SI = (P × R × T) ÷ 100

Amount = P + SI

Principal (P) 6.5 yrs @ 6.4% SI = Rs. 9,204 20/3 yrs @ 7.6% Amount = ?

Calculations:

=> SI1 = (P × 6.4 × 6.5) ÷ 100

=> 9204 = (P × 41.6) ÷ 100

=> P = (9204 × 100) ÷ 41.6 = 22125

=> Therefore, the principal sum is Rs. 22,125.

=> Now, finding the SI for the second case:

=> SI2 = (22125 × 7.6 × 20/3) ÷ 100

=> SI2 = (22125 × 152/3) ÷ 100

=> SI2 = (7375 × 152) ÷ 100

=> SI2 = 1121000 ÷ 100 = 11210

=> Amount = Principal + SI2

=> Amount = 22125 + 11210 = 33335

Therefore The correct answer is Rs. 33,335.

Additional Information

Simple Interest (SI)

Calculated on the original principal amount for the total duration. Formula: SI = (P × R × T) ÷ 100.

Amount Payable

The total sum of money payable at the end of the term, being the sum of Principal and Interest. Formula: A = P + SI.

Effective Rate Concept

The cumulative percentage of simple interest generated over time T is (R × T)%. This allows for direct comparisons between multiple periods or rates.

**Q63. Answer: (c) 51.48**

Shortcut Trick

Mass = Volume × Density

Mass = (4/3) × π × ($R^3 - r^3$) × Density

Mass = (4/3) × (22/7) × ($11^3 - 8^3$) × 15 g

Mass = (88/21) × 819 × 15 = 88 × 39 × 15 = 51480 g

Mass in kg = 51480 ÷ 1000 = 51.48 kg

Therefore The correct answer is 51.48 kg.

Alternate Method
Given:
Density of the metal = 15 g/cm³
Internal radius (r) = 8 cm
External radius (R) = 11 cm
Formula Used:
Volume of a hollow spherical shell = (4/3) × π × ($R^3 - r^3$)
Mass = Volume × Density
r = 8 cm
R = 11 cm
Hollow Spherical Shell Cross-Section
Calculations:
=> $R^3 = 11^3 = 1331$ cm³
=> $r^3 = 8^3 = 512$ cm³
=> $R^3 - r^3 = 1331 - 512 = 819$ cm³
=> Volume = (4/3) × (22/7) × 819
=> Volume = (88/21) × 819 = 88 × 39 = 3432 cm³
=> Mass in grams = 3432 × 15 = 51480 g
=> Mass in kg = 51480 ÷ 1000 = 51.48 kg
Therefore The correct answer is 51.48 kg.
Additional Information
Volume of a Solid Sphere
The total space occupied by a complete solid sphere is given by V = (4/3) × π × $R^3$.
Surface Area of a Sphere
The total surface area of a complete sphere is given by SA = 4 × π × $R^2$.
Volume of a Hemisphere
A hemisphere is exactly half of a full sphere, so its volume is V = (2/3) × π × $R^3$.

**Q64. Answer: (c) 9583**

Shortcut Trick
Ratio of LCM to HCF = 7 : 1
Difference in ratio parts = 7 − 1 = 6 parts.
Given difference = 222 => 6 parts = 222 => 1 part (HCF) = 37.
LCM = 7 parts = 7 × 37 = 259.
Product of the two numbers = LCM × HCF = 259 × 37 = 9583.
Therefore The correct answer is 9583.
Alternate Method
Given:
LCM of two numbers = 7 × HCF
LCM − HCF = 222
Formula Used:
Product of two numbers = LCM × HCF
HCF
1x
LCM
7x
Difference (6x) = 222
1x = 37
Calculations:
=> Let the HCF of the two numbers be x.
=> Then, LCM = 7x
=> According to the question, 7x − x = 222

=> 6x = 222

=> x = 222 ÷ 6 = 37

=> So, HCF = 37 and LCM = 7 × 37 = 259

=> Product of two numbers = HCF × LCM

=> Product = 37 × 259 = 9583

Therefore The correct answer is 9583.

Additional Information

Product of Two Numbers

For any two numbers a and b, their product is always equal to the product of their HCF and LCM (a × b = HCF × LCM).

Co-prime Factors

If the HCF of two numbers is H, the numbers can be expressed as Hx and Hy, where x and y are co-prime to each other. The LCM is then given by H × x × y.

HCF & LCM of Fractions

HCF of fractions = (HCF of numerators) ÷ (LCM of denominators) | LCM of fractions = (LCM of numerators) ÷ (HCF of denominators).

**Q65. Answer: (b) 154**

Shortcut Trick

The average of the first n consecutive odd natural numbers is always equal to n.

Here, we are given the first 154 odd natural numbers.

Substituting n = 154 into our shortcut directly gives the average.

Therefore The correct answer is 154.

Alternate Method

1

1st Term

307

154th Term

154

Average

First 154 odd numbers

Given:

The sequence contains the first 154 odd natural numbers.

Formula Used:

Last term of an Arithmetic Progression (AP): l = a + (n − 1) × d

Average of an AP = (First term + Last term) ÷ 2

Calculations:

=> The first odd natural number (a) = 1

=> The common difference between odd numbers (d) = 2

=> Total number of terms (n) = 154

=> Last term (l) = 1 + (154 − 1) × 2

=> l = 1 + 153 × 2

=> l = 1 + 306 = 307

=> Average = (1 + 307) ÷ 2

=> Average = 308 ÷ 2 = 154

Therefore The correct answer is 154.

Additional Information

Average of first n natural numbers

The average of the first n consecutive natural numbers is given by the formula (n + 1) ÷ 2.

Average of first n even natural numbers

The average of the first n consecutive even natural numbers is calculated using the formula (n + 1).

Sum of first n odd natural numbers

The total sum of the first n consecutive odd natural numbers is always equal to $n^2$.

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Average of any Arithmetic Progression

If a series forms an Arithmetic Progression (AP) with a constant common difference, the average is simply the middle value, found using (First term + Last term) ÷ 2.

**Q66. Answer: (b) 18 km/hr**

Shortcut Trick

Since the distance is constant, speed is inversely proportional to time.

Time Ratio = T1 : T2 = 5 : 10 = 1 : 2

Speed Ratio = S1 : S2 = 2 : 1

Given S1 (2 units) = 36 km/hr

=> S2 (1 unit) = 36 ÷ 2 = 18 km/hr

Therefore The correct answer is 18 km/hr.

Alternate Method

Start

Destination

Time = 5 hr, Speed = 36 km/hr

Time = 10 hr, Speed = ?

Distance (D) = Constant

Given:

Initial Speed (S1) = 36 km/hr

Initial Time (T1) = 5 hours

New Time (T2) = 10 hours

Formula Used:

Distance = Speed × Time

Calculations:

=> Distance (D) = S1 × T1

=> D = 36 × 5 = 180 km

Now, to cover the same distance in 10 hours:

=> New Speed (S2) = D ÷ T2

=> S2 = 180 ÷ 10

=> S2 = 18 km/hr

Therefore The correct answer is 18 km/hr.

Additional Information

Speed, Distance and Time Relationship

Speed and Time are inversely proportional when the distance remains constant. i.e., S1 × T1 = S2 × T2.

Conversion of Units

To convert km/hr to m/s, multiply the speed by 5 ÷ 18. To convert m/s to km/hr, multiply by 18 ÷ 5.

Average Speed

Average Speed = Total Distance ÷ Total Time. If a certain distance is covered at speed x and an equal distance is covered at speed y, then Average Speed = (2xy) ÷ (x + y).

**Q67. Answer: (b) Rs. 21,216**

Shortcut Trick

For the equation 3A = 9B = 4C, the direct ratio is obtained by dividing the LCM of the coefficients (36) by each individual coefficient.

A : B : C = 36/3 : 36/9 : 36/4 = 12 : 4 : 9

Total units = 12 + 4 + 9 = 25 units

25 units = Rs. 44,200 => 1 unit = Rs. 1768

A's share = 12 units = 12 × 1768 = Rs. 21,216

Therefore The correct answer is Rs. 21,216.

Alternate Method

Given:

Total amount to be divided = Rs. 44,200

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Relation between shares: 3A = 9B = 4C

Total Amount = Rs. 44,200 (25 parts)

A (12 units)

B (4)

C (9 units)

Rs. 21,216

Rs. 7,072

Rs. 15,912

Calculations:

=> Let 3A = 9B = 4C = k

=> A = k/3, B = k/9, C = k/4

=> The ratio of their shares A : B : C = k/3 : k/9 : k/4

=> To simplify, multiply the entire ratio by the LCM of denominators 3, 9, and 4, which is 36.

=> A : B : C = (1/3 × 36) : (1/9 × 36) : (1/4 × 36)

=> A : B : C = 12 : 4 : 9

=> Total ratio parts = 12 + 4 + 9 = 25 parts

=> We know that the total 25 parts correspond to Rs. 44,200

=> 1 part = 44200 ÷ 25 = Rs. 1768

=> Share of A = 12 parts = 12 × 1768

=> Share of A = Rs. 21,216

Therefore The correct answer is Rs. 21,216.

Additional Information

Inverse Ratio Property

If aX = bY = cZ, then the ratio X : Y : Z is found by taking the inverse of the given coefficients (1/a : 1/b : 1/c) and multiplying by their LCM to convert them into whole numbers.

Proportional Division

When a given sum (S) is divided among multiple parts in the ratio p : q : r, the value of the first part is calculated as [p ÷ (p + q + r)] × S.

Compound Ratio

The compound ratio of two ratios a:b and c:d is given by ac : bd. This mathematical concept is highly useful when determining overall impact or combined proportional changes.

**Q68. Answer: (a) $8x^2 - 6x - 1$**

Shortcut Trick

Expand terms directly by multiplying:

=> $3x^2 - 6x + 5x^2 - 20 + 19$

=> $(3x^2 + 5x^2) - 6x + (-20 + 19)$

=> $8x^2 - 6x - 1$

Therefore The correct answer is $8x^2 - 6x - 1$.

Alternate Method

Given:

Expression = $x(3x - 6) + 5(x^2 - 4) + 19$

Formula Used:

Distributive property: $a(b + c) = ab + ac$

Calculations:

=> Expand the brackets by multiplying terms inside.

=> $(x \times 3x) - (x \times 6) + (5 \times x^2) - (5 \times 4) + 19$

=> $3x^2 - 6x + 5x^2 - 20 + 19$

=> Bring the like terms together to simplify.

=> $(3x^2 + 5x^2) - 6x + (19 - 20)$

=> $8x^2 - 6x - 1$

Therefore The correct answer is $8x^2 - 6x - 1$.

Additional Information

BODMAS Rule

It stands for Brackets, Orders, Division, Multiplication, Addition, and Subtraction. Always expand the brackets first before proceeding with addition or subtraction outside.

Distributive Property

The rule stating a(b + c) = ab + ac allows multiplying a single external term across multiple terms situated inside parentheses without modifying their internal signs.

Like Terms

These are algebraic expressions where the variables and their exact powers match perfectly. Only like terms can be directly added or subtracted (e.g., $3x^2 + 5x^2 = 8x^2$).

**Q69. Answer: (a) 14.48**

Shortcut Trick

Memorizing squares up to 30 helps solve simplification questions instantly.

$\sqrt{289} = 17$ (since $17^2 = 289$)

$\sqrt{0.0324} = 0.18$ ($18^2 = 324$; 4 decimal places in root reduces to 2)

$\sqrt{7.29} = 2.7$ ($27^2 = 729$; 2 decimal places in root reduces to 1)

Value = 17 + 0.18 − 2.7 = 14.48

Therefore The correct answer is 14.48.

Alternate Method

Given:

$\sqrt{289} + \sqrt{0.0324} - \sqrt{7.29}$

Calculations:

Converting the decimal values into fractions for easier extraction of square roots:

=> $\sqrt{289} + \sqrt{(324 \div 10000)} - \sqrt{(729 \div 100)}$

=> $17 + (18 \div 100) - (27 \div 10)$

=> 17 + 0.18 − 2.7

First, add the positive numbers:

=> 17.18 − 2.70

=> 14.48

Therefore The correct answer is 14.48.

Additional Information

Square Root of Decimals

When finding the square root of a perfect square decimal, count the total number of decimal places. The resulting square root will have exactly half as many decimal places. For example, 6 decimal places will result in 3 decimal places in the square root.

Fractional Method

Another reliable way to find the square root of a decimal is to convert it into a fraction using the rule $\sqrt{(a \div b)} = \sqrt{a} \div \sqrt{b}$. Example: $\sqrt{0.0144} = \sqrt{(144 \div 10000)} = 12 \div 100 = 0.12$.

Important Squares to Memorize

For banking and competitive exams, memorizing squares up to 30 is crucial. Some key squares include $18^2 = 324$, $24^2 = 576$, $25^2 = 625$, $27^2 = 729$, and $28^2 = 784$.

**Q70. Answer: (d) 31.95**

Shortcut Trick

Total Distance = 168 + 100 + 371 = 639 km

Total Time = (168 ÷ 21) + (100 ÷ 20) + (371 ÷ 53) = 8 + 5 + 7 = 20 hr

Average Speed = Total Distance ÷ Total Time = 639 ÷ 20 = 31.95 km/hr

Therefore The correct answer is 31.95 km/hr.

Alternate Method

Given:

Distance D1 = 168 km, Speed S1 = 21 km/hr

Distance D2 = 100 km, Speed S2 = 20 km/hr

Distance D3 = 371 km, Speed S3 = 53 km/hr

Formula Used:
Time = Distance ÷ Speed
Average Speed = Total Distance ÷ Total Time
Total Distance = 639 km
168 km
21 km/hr
Time = 8 hr
100 km
20 km/hr
Time = 5 hr
371 km
53 km/hr
Time = 7 hr
Total Time = 20 hr
Average Speed = 639 ÷ 20 = 31.95 km/hr
Calculations:
=> Time for first part, T1 = 168 ÷ 21 = 8 hours
=> Time for second part, T2 = 100 ÷ 20 = 5 hours
=> Time for third part, T3 = 371 ÷ 53 = 7 hours
=> Total Time = 8 + 5 + 7 = 20 hours
=> Total Distance = 168 + 100 + 371 = 639 km
=> Average Speed = Total Distance ÷ Total Time
=> Average Speed = 639 ÷ 20 = 31.95 km/hr
Therefore The correct answer is 31.95 km/hr.
Additional Information
Average Speed for Two Equal Distances
If a person covers two equal distances at speeds x and y, the average speed is given by (2xy) ÷ (x + y).
Average Speed for Three Equal Distances
If a person covers three equal distances at speeds x, y and z, the average speed is given by (3xyz) ÷ (xy + yz + zx).
Relative Speed
For objects moving in the same direction, relative speed = S1 − S2. For objects moving in opposite directions, relative speed = S1 + S2.
Unit Conversion
To convert km/hr to m/s, multiply by (5 ÷ 18). To convert m/s to km/hr, multiply by (18 ÷ 5).

**Q71. Answer: (b) DJF : GGA**

The position and positional values or English Alphabets are:
Now,
CSL : FPG
KGX : NDS
Let's check each Option One by One.
Option 1) MMX : PQS
Option 2) DJF : GGA
Option 3) CBP : WVL
Option 4) NGN : QJJ
So, Only DJF : GGA follows the pattern of given letter cluster.
Hence, the correct answer is 'Option 2'

**Q72. Answer: (c) YVWU**

The logic followed here is:
For, KHIG is related to HEFD
For, DABZ is related to AXYW

Similarly, for BYZX
So, BYZX will be related to YVWU
Hence, the correct answer is "Option 3".

**Q73. Answer: (a) LID**

The logic followed here is:
Option 1) LID
Option 2) ROK
Option 3) MJF
Option 4) FCY
Here, 'LID' is odd among the given options.
Hence, the correct answer is "Option 1".

**Q74. Answer: (c) Four**

Given: Seven boxes T, U, V, W, X, Y and D are kept one over the other but not necessarily in the same order.
1) Only two boxes are kept below W.
2) Only one box is kept above Y.
3) Only one box is kept between Y and U.
4) T is kept immediately above X.
5) D is kept at some place below V.

| V |
|---|
| Y |
| D |
| U |
| W |
| T |
| X |

So, there are 'Four' boxes are kept between V and T.
Hence, the correct answer is "Option 3".

**Q75. Answer: (a) 6**

The logic followed here is:
thus, "6" will replace the question mark in the given series.
Hence, the correct option is "Option 1".

**Q76. Answer: (a) kj**

The logic followed here is:
keep your goal → yt ru kj
mind your business → kj gb mi
Here,
The word common in both phrases is Your and the only code common to both is kj,
So, "your" must be coded as kj.
Hence, the correct answer is "Option 1".

**Q77. Answer: (b) 2**

Given: (Left) 1338 2325 3627 5513 1764 (Right)
Now,
The new set of reversed numbers is: 8331, 5232, 7263, 3155, 4671.
Second digit of the Second Largest Number (7263): 2
Second digit of the Smallest Number (3155): 1
Resultant = 2 x 1 = 2.

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There are 2 the resultant if the second digit of the second largest number is multiplied to the second digit of the smallest number.

Hence, the correct answer is 'Option 2'.

**Q78. Answer: (a) Only conclusion (II) follows**

Given Statements:

All pencils are erasers.

Some erasers are crayons.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some pencils are crayons:

But — the statement “Some crayons are erasers” does not necessarily mean that those crayons which are pencils are the ones that are also erasers.

It may or may not happen.

Hence, Conclusion (I) does NOT follow.

(II) Some erasers are pencils:

“Some crayons are erasers” <=> “Some erasers are crayons.”

This is logically valid (conversion rule in syllogism).

Hence, Conclusion (II) follows.

So, Only conclusion (II) follows.

Hence, the correct answer is "Option 1".

**Q79. Answer: (b) TNN : WMP**

• The position and positional values or English Alphabets are:

Now,

ITM : LSO

SSV : VRX

Let's check each Option One by One.

Option 1) SUK : VTL

Option 2) TNN : WMP

Option 3) WQJ : ZRL

Option 4) FTF : ISI

So, Only TNN : WMP follows the pattern of given letter cluster.

Hence, the correct answer is 'Option 2'

**Q80. Answer: (a) 50**

Given:

Sheghal's rank from the top = 33rd

Sheghal's rank from the bottom = 18th

Total students = Rank from top + Rank from bottom − 1

So, Total = 33 + 18 − 1 = 50

Hence, the correct answer is "Option 1".

**Q81. Answer: (d) 1279.8**

BODMAS Table:

Given equation: 9 + 5 ÷ 130 − 10 × 22 = ?

Now, if ‘+’ and ‘÷’ and ‘−’ and ‘×’ are interchanged, then:

=> 9 ÷ 5 + 130 × 10 − 22 = ?

=> 1.8 + 1300 − 22 = ?

=> 1301.8 - 22 = ?

=> 1279.8

Hence, the correct answer is "Option 4".

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**Q82. Answer: (c) OHM**

The logic followed here is:

Option 1) RKQ

Option 2) VOU

Option 3) OHM

Option 4) TMS

Here, 'OHM' is odd among the given options.

Hence, the correct answer is "Option 3".

**Q83. Answer: (b) Two**

Given: Six people A, B, C, D, E and F are sitting in a straight line. All are facing towards North.

1) B is seated third from the extreme right end of the line.

2) Only two people are seated between B and E.

3) C is sitting second from the right of B.

4) F is an immediate neighbour of B and C.

5) A is sitting to the immediate right of D.

So, There are Two people are sitting between D and F.

Hence, the correct answer is "Option 2".

**Q84. Answer: (d) Three**

Given: (Left) 5 * 8 > 4 1 4 \ 4 $ ^ 3 ? 5 2 % / > 9 2 4 (Right)

Now,

Number is immediately preceded by a symbol and also immediately followed by another number.

So, Needed pattern is: - Symbol - Number - Number.

There are 3 Number is immediately preceded by a symbol and also immediately followed by another number.

Hence, the correct answer is 'Option 4'.

**Q85. Answer: (c) Only conclusion (II) follows.**

Given Statements:

All scissors are crayons.

Some crayons are erasers.

The least possible Venn diagram for the given statement is:

Conclusions:

(1) Some scissors are erasers:

But — the statement “Some crayons are erasers” does not necessarily mean that those crayons which are scissors are the ones that are also erasers.

It may or may not happen.

Hence, Conclusion (I) does NOT follow.

(II) Some erasers are crayons:

“Some crayons are erasers” <=> “Some erasers are crayons.”

This is logically valid (conversion rule in syllogism).

Hence, Conclusion (II) follows.

Hence, the correct answer is "Option 3".

**Q86. Answer: (d) Three**

Given: Six friends T, V, W, X, Y and Z are sitting around a circular table, facing the centre.

1) V sits second to the right of Y.

2) Y sits to the immediate left of T.

3) X sits second to the left of W.

Here, There are Three people siting between Z and V when counted from the left of V.

Hence, the correct answer is "Option 4".

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**Q87. Answer: (b) 7**

Now,

'HALF' is coded as '2586'

| H | A | L | F |
|---|---|---|---|
| 2 | 5 | 8 | 6 |

'FLAG' is coded as '7862'

| F | L | A | G |
|---|---|---|---|
| 7 | 8 | 6 | 2 |

Letters A, F, and L are common in these two words. Similarly, the numbers 2, 6 and 8 are common.

"G" is a unique letter, so its code is 7.

So, 7 is the code for 'G' in the given code language.

Hence, the correct answer is "Option 2".

**Q88. Answer: (c) 66, 33**

The logic followed here is:

Logic: 2nd number = 1st number ÷ 2

78, 39

=> 78 ÷ 2 = 39

84, 42

=> 84 ÷ 2 = 42

Now, checking the options:

Option 1) 94, 48

=> 94 ÷ 2 ≠ 48

Option 2) 52, 23

=> 52 ÷ 2 ≠ 23

Option 3) 66, 33

=> 66 ÷ 2 = 33

Option 4) 58, 19

=> 58 ÷ 2 ≠ 19

Hence, the correct option is "Option 3"

**Q89. Answer: (b) Two**

Given numbers:6854376

| Given numbers | 6 | 8 | 5 | 4 | 3 | 7 | 6 |
|---|---|---|---|---|---|---|---|
| Odd digit → (+1) Even digit → (-4) | (-4) | (-4) | (+1) | (-4) | (+1) | (+1) | (-4) |
| Resultant numbers | 2 | 4 | 6 | 0 | 4 | 8 | 2 |

Thus, two number are there which appear more than once "2" and "4".

Hence, the correct answer is "Option 2".

**Q90. Answer: (b) 3 km north**

Given:

Heerat starts from point A and walks 2 km towards east.

She then takes a left turn and walks 2 km.

She takes another left turn and walks 2 km.

She takes a final left turn and walks 5 km to reach a point B.

So, She should drive 3 km to North in order to reach Point A again.

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Hence, the correct answer is "Option 2".

**Q91. Answer: (d) RU-PS**

The logic followed here is:
Option 1) MP-KO
Option 2) PS-NR
Option 3) UX-SW
Option 4) RU-PS
Here, 'RU-PS' is odd among the given options.
Hence, the correct answer is "Option 4".

**Q92. Answer: (b) 98**

The logic followed here is:
thus, "98" will replace the question mark in the given series.
Hence, the correct option is "Option 2".

**Q93. Answer: (a) STJ -9**

The logic followed here is:
So, 'STJ -9' will replace the question mark in the given series.
Hence, the correct answer is "Option 1".

**Q94. Answer: (b) 3 km to North**

Given:
Suresh starts from Point A and drives 7 km towards West.
He then takes a right turn, drives 3 km, turns right and drives 11 km.
He then takes a right turn and drives 6 km.
He takes a final right turn, drives 4 km and stops at Point P
So, He should drive 3 km to North in order to reach Point A again.
Hence, the correct answer is "Option 2".

**Q95. Answer: (c) 500**

BODMAS Table:
Given equation: 63 × 9 ÷ 3 − 3 × 24 + 22 ÷ 11 + 9 = ?
Now, if '+' and '-' and '×' and '÷' are interchanged, then:
63 + 9 − 3 ÷ 3 + 24 × 22 − 11 × 9
=> 63 + 9 − 1 + 528 − 99 = ?
=> 72 − 1 + 528 − 99 = ?
=> 599 − 99 = 500.
Hence, the correct answer is "Option 3".

**Q96. Answer: (b) Mother's brother**

Family Chart:
Decoding the Symbols:

| **Symbol** | • | • | × | ÷ |
|---|---|---|---|---|
| Meaning | Sister | Brother | Wife | Father |

Given: F- H x L+ O +Y
It means:
F is the Brother of H
H is the Wife of L
L is the Father of O
O is the Sister of Y.
So, F is the 'Mother's brother' of Y.
Hence, the correct answer is "Option 2".

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**Q97. Answer: (d) 69**

Given: 129 students

Lalit's position from the right end = 33rd

Lalit's position from the left end = 129 − 33 + 1 = 97

Sahil's position from the left end = 27th

So, Number of students between Lalit and Sahil = = (97 − 27) − 1= 70 − 1 = 69.

Hence, the correct answer is "Option 4".

**Q98. Answer: (d) 22**

BODMAS Table:

Given equation: 40 × 4 + 12 ÷ 6 − 4 = ?

Now, if '+' and '-' and '×' and '÷' are interchanged, then:

=> 40 ÷ 4 − 12 + 6 × 4 = ?

=> 10 − 12 + 24 = 22.

Hence, the correct answer is "Option 4".

**Q99. Answer: (d) 446**

The logic followed here is:

thus, "446" will replace the question mark in the given series.

Hence, the correct option is "Option 4".

**Q100. Answer: (b) ZCT 43**

The logic followed here is:

So, ZCT 43 will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

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