RRB NTPC (UG) CBT-I Official Paper (Held On: 22 Aug, 2025 Shift 1) (Previous Year Paper)

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

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GENERAL AWARENESS

Q1. What is the condition for total internal reflection to occur?

(a) Light must travel from a rarer medium to a denser medium at an angle of 90°.
(b) Light must travel from a denser to a rarer medium at an angle greater than the critical angle.
(c) Light must strike the boundary at 90° to the normal separating any two mediums of different refractive indices.
(d) The refractive indices of both media must be equal.

Q2. What is 'Google Beam' introduced under Project Starline?

(a) A language translation tool for real-time communication
(b) An AI-powered video communication platform aiming to redefine virtual interactions
(c) A new satellite launched by Google for global internet coverage
(d) A hardware device for enhancing internet speed in rural areas

Q3. What was the main objective of India’s First Five Year Plan (1951–56)?

(a) Growth of IT services
(b) Privatisation of PSUs
(c) Heavy industrialisation
(d) Agricultural development

Q4. Who was honoured with the Padma Bhushan in 2025 for their contributions to Indian cinema?

(a) Aamir Khan
(b) Shekhar Kapur
(c) Mukesh Khanna
(d) Subhash Ghai

Q5. Why is wheat grown in the north-western plains of India?

(a) Because it lies close to the coastal water bodies
(b) Because it receives heavy rainfall during the monsoon
(c) Because the region has fertile alluvial soil and cool winters
(d) Because the region has red soil with limited annual rainfall

Q6. Which of the following elements provides access to system settings, installed programs, and power options from the desktop?

(a) Taskbar
(b) File Explorer
(c) Start Menu
(d) Notification Area

Q7. What did the Supreme Court decide in the Kesavananda Bharati case (1973) about the powers of Parliament to amend the Constitution of India?

(a) The President of India has the ultimate authority to approve or reject constitutional amendments independently.
(b) The Parliament cannot amend any part of the Constitution under any circumstances.
(c) The Parliament can amend the Constitution, but it cannot change or destroy its basic structure or essential features.
(d) The Parliament has unlimited power to amend any part of the Constitution, including the Fundamental Rights.

Q8. In which of the following cases did the Supreme Court uphold the Right to Privacy as a Fundamental Right in 2017?

(a) Shreya Singhal vs. Union of India
(b) Indira Sawhney vs. Union of India
(c) Puttaswamy vs. Union of India
(d) Navtej Singh Johar vs. Union of India

Q9. Which mode of transport is most suitable for transporting heavy and bulky goods over long distances?

(a) Railways
(b) Pipelines
(c) Roadways
(d) Airways

Q10. Which of the following best defines impulse in mechanics?

(a) The product of mass and velocity
(b) The product of force and the time for which it acts
(c) The rate of change of momentum multiplied by the distance
(d) The change in displacement over time

Q11. Which of the following statements regarding the Ryotwari settlement is correct?

1.It was developed by Thomas Munro.
2. The settlement was made directly with the cultivators, not zamindars.
3.It was tested on a small scale in the annexed territories of Tipu.
4. Finding it successful, it was then applied in the Ganga plains.
Select the correct combination:

(a) 1 and 2 only
(b) 1 only
(c) 1, 2 and 3 only
(d) 1, 2, 3 and 4

Q12. What was the other name of Chandragupta II, the renowned ruler of the Gupta dynasty?

(a) Dhruvasena
(b) Suryadeva
(c) Karmaputra
(d) Vikramaditya

Q13. Amir Khusrau is known for contributing to which two languages?

(a) Sanskrit and Tamil
(b) Bengali and Punjabi
(c) Marathi and Gujarati
(d) Persian and Hindavi

Q14. According to the Waqf (Amendment) Bill, 2025, within how many days can an appeal be made in the High Court on the order of the Waqf Tribunal?

(a) 120 days
(b) 70 days
(c) 90 days
(d) 50 days

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Q15. Which of the following players was named the Men's Player of the Year at the All India Football Federation (AIFF) Awards in May 2025?

(a) Gurpreet Singh Sandhu
(b) Sunil Chhetri
(c) Sandesh Jhingan
(d) Subhasish Bose

Q16. Jhumur, a traditional folk dance, originated in which of the following Indian states?

(a) Assam
(b) Punjab
(c) Kerala
(d) Gujarat

Q17. The Human Development Index emphasises people-centric development. Who is credited with creating the HDI alongside Amartya Sen?

(a) Manmohan Singh
(b) Jean Drèze
(c) Kaushik Basu
(d) Mahbub ul Haq

Q18. Which of the following Committees is a Standing Committee of the Parliament?

(a) Delimitation Commission
(b) Joint Parliamentary Committee on 2G Spectrum
(c) Select Committee on a Bill
(d) Public Accounts Committee

Q19. Which of the following institutes proposed development of world’s smallest semiconductors chip in 2025?

(a) Indian Institute of Science
(b) IIT Delhi
(c) DRDO Research Lab
(d) BARC

Q20. Which constitutional Articles ensure the writ jurisdiction of the Supreme Court and High Courts for enforcing fundamental rights, including RTI?

(a) Articles 51 and 356
(b) Articles 14 and 15
(c) Articles 21 and 39
(d) Articles 32 and 226

Q21. How many Khelo India centres did the Delhi government propose to establish in June 2025?

(a) Six
(b) Eight
(c) Two
(d) Ten

Q22. What is the value of one roentgen (R) when expressed in SI units?

(a) 1.0×10^(−3) grays
(b) 2.58×10^(−4)coulombs per kilogram
(c) 1.6×10^(−19) coulombs
(d) 3.7×10*^(10)* disintegrations per second

Q23. The introduction of English education in India was promoted through which of the following documents?

(a) Charter Act of 1813
(b) Regulating Act
(c) Macaulay’s Minute

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(d) Pitts India Act

Q24. Which of the following was NOT a reason for the Paleolithic people to move from place to place?

(a) Failure of crops
(b) Resource exhaustion
(c) Movement of prey animals
(d) Seasonal changes

Q25. Littoral forests are most associated with which kind of ecosystem?

(a) Wetland ecosystem
(b) Tundra ecosystem
(c) Grassland ecosystem
(d) Desert ecosystem

Q26. What was the main motive of British colonial rule in India?

(a) Social development of India
(b) Industrialisation of India
(c) Welfare of Indian farmers
(d) Economic exploitation of India

Q27. The Women's Kabaddi World Cup scheduled for June 2025, was announced to be hosted in which location in India?

(a) Ahmedabad
(b) Rajgir
(c) Kolkata
(d) Chennai

Q28. What is the primary cause of southwest monsoon in India?

(a) Tidal effects
(b) Differential heating of land and sea
(c) Westerly winds from the Atlantic
(d) Local winds from the desert

Q29. On 25 April 2025, DRDO achieved a significant milestone by conducting a long-duration ground test of an active cooled scramjet subscale combustor. How long did this test last?

(a) 1,500 seconds
(b) 1,000 seconds
(c) 500 seconds
(d) 120 seconds

Q30. In which of the following years was the Swarnjayanti Gram Swarozgar Yojana (SGSY) launched with the aim to bring the assisted poor families (Swarozgaris) above the poverty line by organising them into Self Help Groups (SHGs) through a mix of bank credit and government subsidies?

(a) 1999
(b) 1994
(c) 1991
(d) 2003

Q31. Which of the following is responsible for causing convectional rainfall?

(a) Cyclonic movements
(b) Intense surface heating causing air to rise
(c) Mountains forcing air to rise
(d) Cold and warm air masses meeting

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Q32. Which Article of the Indian Constitution states that Directive Principles are not enforceable by any court?

(a) Article 36
(b) Article 37
(c) Article 38
(d) Article 39

Q33. According to Article 335 of the Constitution of India, claims of SCs and STs shall be taken into consideration in matters of:

(a) taxation policies
(b) religious freedom
(c) land acquisition
(d) public employment

Q34. The 12th edition of the Global Terrorism Report Index (GTI) 2025 was published by _____.

(a) The UN Counter-Terrorism Centre
(b) The United Nations Office to Counter Terrorism
(c) The Institute of Economic and Peace
(d) The United Nations Office on Drugs and Crime

Q35. What is the name of India's high-resolution weather forecasting system launched in May 2025?

(a) National Weather Grid
(b) Bharat Weather Network
(c) Bharat Forecasting System
(d) India Climate Monitor

Q36. Pondicherry was captured by the Dutch in 1693 but was returned to the French company by the Treaty of Ryswick in _____.

(a) 1741
(b) 1704
(c) 1699
(d) 1696

Q37. Which of the following is the most effective step for mitigating the impact of an earthquake?

(a) Seismic zoning and earthquake-resistant buildings
(b) Water harvesting
(c) Flood barriers
(d) Deforestation

Q38. Who introduced the Railways (Amendment) Bill that was passed in the Rajya Sabha in March 2025?

(a) Ashwini Vaishnaw
(b) Kiren Rijiju
(c) Sarbananda Sonowal
(d) Hardeep Singh Puri

Q39. Which keyboard button is used as a shortcut to rename a selected file or folder in Windows?

(a) F5
(b) F2
(c) Ctrl
(d) Esc

Q40. The Union Territories Laws (Amendment) Bill, which was introduced in the Lok Sabha on 17 December 2024, amends how many Acts?

(a) 3
(b) 4
(c) 2

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(d) 5

MATHEMATICS

Q41. A number, when decreased by 7%, gives 3720. The number is:

(a) 12000
(b) 8000
(c) 4000
(d) 2000

Q42. Simplify: $3((7/3)x^2-22x+19)-7(x^2+9x-14)$

(a) $-129x - 155$
(b) $-129x + 155$
(c) $129x + 155$
(d) $129x - 155$

Q43. The sum of five numbers is 655. The average of the first two numbers is 80 and the third number is 102. Find the average of the remaining two numbers.

(a) 196.5
(b) 182
(c) 183
(d) 197.5

Q44. A mobile phone is marked at Rs. 20,000. During a festive sale, a store offers two successive discounts — 15% first and then 10%. What is the final selling price of the mobile?

(a) Rs. 15,000
(b) Rs. 15,500
(c) Rs. 15,300
(d) Rs. 16,000

Q45. Which of the following numbers is divisible by 22?

(a) 7467614
(b) 6136901
(c) 6580350
(d) 8132950

Q46. Manisha bought a toy for Rs. 940, decorated it at a cost of Rs. 10 and sold the toy for Rs. 659. Find the loss or profit percentage.

(a) 582/19 %profit
(b) 582/19 %loss
(c) 582%loss
(d) 582/19 %profit

Q47. If 2 times the age of Ram is 14 years more than 6 times the age of Ramya, and 4 times the age of Ramya is 4 years less than the age of Ram, then what is the difference (in years) between the ages of Ram and Ramya?

(a) 15
(b) 17
(c) 13
(d) 14

Q48. If the third proportional of 4 and 22 be x, then what is the value of x?

(a) 122
(b) 121
(c) 123
(d) 119

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Q49. The value of √121+√0.0121-√7.84 is _____.

(a) 3.9
(b) 8.31
(c) 7.73
(d) 10.34

Q50. If the 6-digit number N01M22 is divisible by 11, then which of the options below can give a possible correct relation between M and N?

(a) M - N = 1
(b) M + N = -1
(c) M - N = 5
(d) M = N

Q51. If the difference between an interior angle and exterior angle of a regular polygon is 140°, then the number of sides of the polygon is equal to:

(a) 12
(b) 14
(c) 18
(d) 16

Q52. Find the simple interest (in Rs.) on Rs. 1,200 at an interest rate of 4% per month for 1 month.

(a) Rs. 8
(b) Rs. 24
(c) Rs. 4
(d) Rs. 48

Q53. Find the surface area (rounded off to the nearest integer) of a sphere of radius 6.5 cm. (Take π = 22/7)

(a) 534 cm^2
(b) 540 cm2
(c) 531 cm2
(d) 530 cm2

Q54. A man driving a car at a speed of 67 km/hr crosses a bridge in 3 minutes. Find the length of the bridge.

(a) 2.46 km
(b) 3.35 km
(c) 2.84 km
(d) 2.51 km

Q55. The HCF and LCM of two numbers are 11 and 792, respectively. If one number is 88, then find the other number.

(a) 99
(b) 97
(c) 93
(d) 89

Q56. A company offers three schemes of successive discounts.

First: 25%, 10%

Second: 20 %, 15%

Third: 30%, 5%

Which scheme is best for the company?

(a) First scheme
(b) Third scheme
(c) All the schemes are same
(d) Second scheme

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Q57. Five solid cubes, each of volume 3375 cm^3, are joined end to end to form a cuboid. What is the lateral surface area (in cm^2) of the cuboid?

(a) 2700
(b) 2409
(c) 2801
(d) 2694

Q58. Anjali can do a certain piece of work in 21 days. Anjali and Ayushi can together do the same work in 12 days, and Anjali, Ayushi and Ankita can do the same work together in 8 days. In how many days can Anjali and Ankita do the same work?

(a) 47/6
(b) 57/7
(c) 48/5
(d) 56/5

Q59. If M=√(1+cosA)/(1-cosA)-cosecA-cot A, and A is an acute angle, the value of M is

(a) 1
(b) 0
(c) 2
(d) -1

Q60. The sum of two numbers is 52 and their LCM is 627. The two numbers are:

(a) 19, 33
(b) 12, 40
(c) 17, 35
(d) 24, 28

Q61. In covering a distance of 156 km, Abhay takes 5 hours more than Sameer. If Abhay doubles his speed, then he would take 8 hours less than Sameer. Abhay's speed is:

(a) 16 km/hr
(b) 1 km/hr
(c) 6 km/hr
(d) 7 km/hr

Q62. Evaluate: (-9) - (-60) ÷ (-10) + (-2) × 6

(a) -27
(b) -30
(c) -26
(d) -29

Q63. The product of two positive numbers is 10125. If the first number is five times the second number, then the sum of the two numbers is:

(a) 265
(b) 286
(c) 264
(d) 270

Q64. If the interest earned during the 2^(nd) year on a certain sum is Rs. 5,214, and the rate of interest is 10% per annum compounded annually, then the sum is:

(a) Rs. 47,755
(b) Rs. 46,650
(c) Rs. 47,320
(d) Rs. 47,400

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Q65. A trader claims to sell pulses at a profit of 3%, but also dishonestly uses a weight which is 15% less than what is mentioned on it. Find the total percentage of profit earned by the trader. (Round off the answer to the nearest whole number.)

(a) 26%
(b) 20%
(c) 21%
(d) 16%

Q66. Kushal and Brijesh together invested Rs. 63,300 in a business. At the end of the year, out of a total profit of Rs. 17,600, Brijesh's share was Rs. 2,200. What was the difference between their investments?

(a) Rs. 48,876
(b) Rs. 45,979
(c) Rs. 47,475
(d) Rs. 46,154

Q67. Pipe A can fill a tank in 13 hours, pipe B can fill the same tank in 29 hours and pipe C can fill the same tank in 10 hours. The time taken by them to fill the same tank if they operate together is::

(a) 11582/797hours
(b) 3582/797hours
(c) 4582/797hours
(d) 10582/797hours

Q68. The average runs scored by a batsman in 23 matches is 42. In the next 10 matches, the batsman scored an average of 14 runs. Find his average runs scored (rounded off to two decimal places) in all the 33 matches.

(a) 33.52
(b) 32.52
(c) 35.52
(d) 34.52

Q69. The income of Raman is Rs. 60,500. He saves 26% of his income. If his income increases by 17% and expenditure increases by 50%, then his savings will:

(a) increase by Rs. 12,099
(b) decrease by Rs. 12,095
(c) decrease by Rs. 12,100
(d) increase by Rs. 12,098

Q70. Mr. Sharma, Mr. Gupta and Ms. Sinha invested Rs. 4,000, Rs. 8,000 and Rs. 6,000, respectively, in a business. Mr. Sharma left the business after 6 months. If after 8 months, there was a gain of Rs. 34,000, then what will be the share of Mr. Gupta?

(a) Rs. 12,000
(b) Rs. 20,000
(c) Rs. 16,000
(d) Rs. 14,000

GENERAL INTELLIGENCE AND REASONING

Q71. 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) GI-LE
(b) JL-OH
(c) MO-RK
(d) DF-IC

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Q72. What will come in the place of the question mark (?) in the following equation, if '÷' and '×' are interchanged and '−' and '+' are interchanged? 117 + 16 − 10 × 2 ÷ 2 − 68 + 10 × 5 − 9 = ?

(a) 124
(b) 96
(c) 168
(d) 186

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) INS
(b) QBA
(c) TYD
(d) UZE

Q74. Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order. Only F is kept above A. Only two boxes are kept between A and D. Only B is kept below C. G is not kept immediately above D. How many boxes are kept between B and E?

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

Q75. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

RUM ORJ LOG ILD ?

(a) FJA
(b) FIA
(c) FIB
(d) FJB

Q76. 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: Some kites are hats. No hat is a ant.

Conclusion (II): Some Kites are ants.

Conclusion (II): Some hats are kites.

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

Q77. Each of the digits in the number 7231456 is arranged in ascending order from left to right. What will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

(a) 7
(b) 10
(c) 8
(d) 5

Q78. Seven boxes F, G, H, M, N, O and P are kept one over the other but not necessarily in the same order.Only three boxes are kept below H. Only two boxes are kept between H and O. Only N is kept above G. F is kept at some place below M and at some place above P. Which box is kept at second position from the bottom?

(a) F
(b) P
(c) G
(d) N

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Q79. What should come in place of the question mark (?) in the given series?

1200, 1200, 1800, 3600, 9000, ?

(a) 18000
(b) 12000
(c) 15000
(d) 27000

Q80. Refer to the following number and symbol series and answer the question that follows. All numbers are single-digits. Counting to be done from left to right only.

(Left) & 1 # 6 * ^ @ 3 & $ 7 Ω $ 2 # 6 @ 2 % 9 (Right)

If all the symbols are dropped from the series, which of the following will be third from the left?

(a) 6
(b) 3
(c) 7
(d) 1

Q81. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

BURN - BNRU - NRUB

SONG - SGNO - GNOS

(a) RAIL - ARIL - LAIR
(b) CAME - CEMA - EMAC
(c) WINK - WNIK - KNIW
(d) CODE - COED - ODEC

Q82. 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 actors are dancers.

Some dancers are singers.

Conclusions:

(I) All dancers are actors.

(II) No singer is a dancer.

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

Q83. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only. (Note: All numbers are single digit numbers only.)

(Left) 4 7 + $ 1 * £ 3 & % 5 @ Ω 6 2 9 # 8 (Right)

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

(a) 5
(b) 2
(c) 3
(d) 4

Q84. Atul starts from his home and drives 5 km towards north. He then takes a left turn, drives 6 km, turns left, and drives 4 km. He then takes a right turn and drives 5 km and reaches his office. In which direction is the office with respect to his home? (Note: All turns are 90° turns only, unless specified.)

(a) North-west

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(b) East
(c) West
(d) North

Q85. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(196, 142, 338)

(145, 198, 343)

(a) (149, 152, 300)
(b) (183, 209, 392)
(c) (184, 130, 318)
(d) (164, 178, 352)

Q86. Select the pair that follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.

TYP : UZQ

ETQ : FUR

(a) WER : ZFS
(b) ELA : FCD
(c) UIP : VJR
(d) OUT : PVU

Q87. What should come in place of ? in the given series based on the English alphabetical order?

BJS CLT DNU EPV ?

(a) GRV
(b) GSV
(c) FRV
(d) FRW

Q88. FNJG is related to DLHE in a certain way based on the English alphabetical order. In the same way, IQMJ is related to GOKH. To which of the given options is MUQN related, following the same logic?

(a) SKOL
(b) SKLO
(c) KSOL
(d) KSLO

Q89. What should come in place of the question mark (?) in the given series?

195 189 180 174 165 159 ?

(a) 149
(b) 153
(c) 155
(d) 150

Q90. Seven people A, B, C, D, E, F and G are sitting in a row, facing north. Only two people sit between D and C. Only G sits to the right of E. Only one person sits between C and E. A sits at some place to the right of F but at some place to the left of B. How many people sit to the right of A?

(a) 4
(b) 3
(c) 5
(d) 2

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Q91. If + means ‘subtraction’, − means ‘division’, ÷ means ‘multiplication’, × means ‘addition’, then what will come in place of the question mark (?) in the following equation?

9 − 3 × 756 + 84 ÷ 3 = ?

(a) 509
(b) 510
(c) 508
(d) 507

Q92. Prabash starts from Point A and drives 6 km towards east. He then takes a left turn, drives 4 km, turns left and drives 9 km. He then takes a left turn and drives 7 km. He takes a final left turn, drives 3 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (Note: All turns are 90-degree turns only unless specified.)

(a) 2 km to the north
(b) 4 km to the north
(c) 3 km to the north
(d) 1 km to the north

Q93. In a certain code language, ‘GLUE’ is coded as ‘4627’ and ‘LOAD’ is coded as ‘1375’. What is the code for ‘L’ in the given code language?

(a) 3
(b) 7
(c) 6
(d) 1

Q94. 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 pair.)

(a) TP-AX
(b) GC-OK
(c) HD-PL
(d) NJ-VR

Q95. In a certain code language, ‘DEAR’ is coded as ‘4627’ and ‘TURN’ is coded as ‘1375’. What is the code for ‘R’ in the given code language?

(a) 5
(b) 7
(c) 1
(d) 6

Q96. Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order. Only three boxes are kept below G. Only two boxes are kept between G and B. Only A is kept above F. E is kept at some place below D and at some place above C. How many boxes are kept above E?

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

Q97. Seven people, A, B, C, D, P, Q and R, are sitting in a row, facing north. Only two people sit between Q and R. Only D sits to the right of A. Only one person sits between R and A. B sits at some place to the right of P but at some place to the left of C. How many people sit between C and P?

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

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Q98. D is married to N. K is the daughter of X. X is the father of D. D is the mother of G. G is the brother of I. I is the sister of E. I is married to H. How is X related to E?

(a) Husband's father
(b) Mother's father
(c) Father's father
(d) Father

Q99. If 2 is added to each odd digit and 1 is subtracted from each even digit in the number 2736158, what will be the sum of the digits that are third from the left and third from the right in the new number thus formed?

(a) 7
(b) 8
(c) 10
(d) 12

Q100. What should come in place of the question mark (?) in the given series?

31 42 57 76 99 ?

(a) 126
(b) 127
(c) 125
(d) 128

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) Light must travel from a denser to a rarer medium at an angle greater than the critical angle.

The correct answer is Light must travel from a denser to a rarer medium at an angle greater than the critical angle..

Key Points

• Total Internal Reflection (TIR) occurs when light travels from a denser medium (e.g., water or glass) to a rarer medium (e.g., air) and strikes the boundary at an angle greater than the critical angle.

• The critical angle is the minimum angle of incidence at which light is refracted along the boundary instead of passing into the second medium.

• If the angle of incidence exceeds the critical angle, the light is completely reflected back into the denser medium.

• The phenomenon depends on the refractive indices of the two media, and the critical angle can be calculated using the formula: sin θ_c = n2/n1, where n1 and n2 are the refractive indices of the denser and rarer media, respectively.

• The condition mentioned in the correct option is essential for applications like fiber optics and optical instruments.

Additional Information

• Critical Angle:

• The critical angle is unique for different pairs of media. For example, the critical angle for light traveling from water (n = 1.33) to air (n = 1) is approximately 48.6°.

• Light striking at an angle less than the critical angle will be refracted into the rarer medium.

• Applications of Total Internal Reflection:

• Optical fibers: Total internal reflection is the principle behind the transmission of light signals in fiber optics, enabling high-speed communication.

• Mirage formation: TIR explains how mirages occur in deserts due to varying air densities.

• Prisms: Prisms use TIR for light reflection in instruments like binoculars and periscopes.

• Statement Analysis:

• Statement 1: "Light must travel from a rarer medium to a denser medium at an angle of 90º." – Incorrect. TIR does not occur in this case; light is refracted instead.

• Statement 2: "Light must travel from a denser to a rarer medium at an angle greater than the critical angle." – Correct. This is the condition for TIR.

• Statement 3: "Light must strike the boundary at 90º to the normal separating any two mediums of different refractive indices." – Incorrect. At 90°, light travels perpendicularly and is transmitted without reflection.

• Statement 4: "The refractive indices of both media must be equal." – Incorrect. TIR requires different refractive indices for the two media.

Important Points

• Fiber Optics: TIR is the backbone of modern telecommunication systems using optical fibers, as it ensures minimal signal loss.

• Examples: Diamonds exhibit brilliance due to TIR of light within the gem.

• Relevance: TIR is crucial for understanding phenomena in physics, engineering, and medical technologies.

• Innovation: Devices like endoscopes use TIR for internal imaging in medical diagnostics.

Q2. Answer: (b) An AI-powered video communication platform aiming to redefine virtual interactions

The correct answer is An AI-powered video communication platform aiming to redefine virtual interactions.

Key Points

• Google Beam is a feature of Project Starline, which is an advanced AI-powered video communication platform developed by Google to enhance virtual interactions.

• The primary goal of Project Starline is to make virtual meetings feel more natural and lifelike, utilizing advanced technologies such as 3D imaging, machine learning, and spatial audio.

• Google Beam specifically focuses on creating a holographic video experience, allowing users to see and hear their counterparts in 3D, giving the impression that they are sitting right across from each other.

• The technology combines real-time 3D modeling, specialized hardware, and AI algorithms to achieve its immersive experience. This innovation is particularly beneficial for sectors like healthcare, education, and remote work.

• First unveiled at the Google I/O event in May 2021, Project Starline, including Google Beam, has been undergoing trials and testing in select industries to refine its capabilities.

Additional Information

• Technological Aspects of Project Starline:

• Project Starline integrates technologies like 3D depth cameras and high-resolution displays to create a realistic holographic communication experience.

• The setup includes a specialized booth equipped with multiple cameras and sensors to capture and render a user’s 3D image in real time.

• Spatial audio and lighting effects are synchronized with the video to make the interaction feel authentic and immersive.

• Applications of Google Beam:

• The platform has significant potential in the healthcare industry, enabling doctors to conduct remote consultations with a lifelike presence.

• In education, it can provide immersive learning experiences by facilitating realistic one-on-one or group interactions between teachers and students.

• Businesses can use this technology for better virtual meetings and collaborations, especially in global organizations where travel is impractical.

• Comparison with Traditional Communication Tools:

• Unlike video conferencing platforms such as Zoom or Teams, Project Starline creates a 3D holographic experience that significantly reduces the feeling of distance.

• It eliminates typical issues like camera angles and screen boundaries, offering a more natural interaction.

• Challenges and Limitations:

• The system requires specialized hardware and a dedicated setup, which may limit its initial availability and accessibility to large organizations or specialized sectors.

• High data processing and bandwidth requirements may be another constraint in deploying this technology widely.

Important Points

• Revolution in Communication: Project Starline marks a significant step forward in how we perceive virtual communication, bridging the gap between physical and virtual presence.

• Future Scope: With advancements in AI and hardware, Google Beam has the potential to revolutionize remote work, education, and telemedicine on a global scale.

• Industry Collaborations: Google is working with various partners to test and refine the technology for broader applications.

• Innovative Design: The platform's design is centered around natural human interaction, ensuring minimal learning curves for users.

Q3. Answer: (d) Agricultural development

The correct answer is Agricultural development.

Key Points

• The First Five-Year Plan of India (1951–56) focused primarily on Agricultural development. It emphasized increasing food production to address the issue of food scarcity and laid the foundation for agricultural modernization.

• The Plan was launched under the leadership of Jawaharlal Nehru, the first Prime Minister of India, and was based on the Harrod-Domar model, which prioritized investment in the agricultural sector.

• Agriculture contributed significantly to the Indian economy at that time, accounting for a majority of the GDP and employing the largest portion of the population. Hence, its development was a critical need.

• Key initiatives under the First Five-Year Plan included the establishment of major irrigation projects like the Bhakra-Nangal Dam, DVC (Damodar Valley Corporation), and Hirakud Dam to improve water supply for agriculture.

• The Plan achieved success with a growth rate of 3.6%, surpassing the target of 2.1%, largely due to favorable monsoons and the focus on agricultural productivity.

Additional Information

• Heavy Industrialization:

• Although industrialization was a part of subsequent Five-Year Plans, the First Plan did not focus heavily on it. Industrial development gained prominence during the Second Five-Year Plan, which emphasized the growth of the public sector and heavy industries under the leadership of Dr. P.C. Mahalanobis.

• Examples of industries promoted later include steel plants in Bhilai, Durgapur, and Rourkela.

• Privatization of PSUs:

• Privatization of Public Sector Undertakings (PSUs) was not a focus during the First Five-Year Plan. In fact, the Plan emphasized the role of the public sector in national development.

• Privatization gained momentum in India much later, during the 1990s, as part of economic reforms under the Liberalization, Privatization, and Globalization (LPG) policy.

• Growth of IT Services:

• The development of Information Technology (IT) services was not a focus in the First Five-Year Plan. IT services began developing much later in India, particularly in the 1980s and 1990s, with cities like Bengaluru emerging as IT hubs.

• Major initiatives in IT were introduced as part of economic liberalization, which encouraged private sector involvement and investment in technology.

• First Five-Year Plan Highlights:

• Objective: To address challenges like food shortages, poverty, and inflation.

• Sector Allocation: 44.6% of the total budget was allocated to agriculture and irrigation.

• Achievements: Successful implementation of irrigation projects and agricultural modernization.

• Outcome: Laid the foundation for future economic and social development in India.

Important Points

• Five-Year Plans in India:

• India adopted the concept of Five-Year Plans from the Soviet Union, aiming for systematic economic development.

• These plans were developed and monitored by the Planning Commission, which was established in 1950 by Jawaharlal Nehru.

• The First Plan prioritized agriculture as India was primarily an agrarian economy with food shortages.

• Subsequent plans shifted focus to industrialization, infrastructure, and social development.

• Bhakra-Nangal Dam:

• One of the largest dam projects undertaken during the First Five-Year Plan.

• Located on the Sutlej River, it provides irrigation, hydropower, and flood control in northern India.

• Damodar Valley Corporation (DVC):

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• Established in 1948, DVC aimed to control floods, provide irrigation, and generate hydropower in the Damodar River basin.

• It served as a model for integrated resource management during the First Plan.

Q4. Answer: (b) Shekhar Kapur

The correct answer is Shekhar Kapur.

Key Points

• Shekhar Kapur was honored with the Padma Bhushan in the year 2025 for his outstanding contributions to Indian cinema.

• The Padma Bhushan is the third-highest civilian award in India, which recognizes distinguished service of a high order to the nation in any field.

• Shekhar Kapur is an internationally acclaimed filmmaker, known for his work in critically acclaimed movies such as "Bandit Queen," "Elizabeth," and "Elizabeth: The Golden Age."

• He is celebrated for his cinematic storytelling, which often explores complex characters and deep historical narratives, earning him several accolades globally.

• The award was conferred upon him for his immense contribution to the Indian film industry, as well as his efforts to bring Indian cinema to the global stage.

Additional Information

• Shekhar Kapur:

• Born on 6 December 1945, Shekhar Kapur is an Indian filmmaker and actor known for his work in both Bollywood and Hollywood.

• His film "Bandit Queen" (1994) won the National Film Award for Best Feature Film in Hindi and gained international acclaim for its depiction of the life of Phoolan Devi.

• He directed the Oscar-winning historical drama "Elizabeth" (1998) and its sequel "Elizabeth: The Golden Age" (2007).

• Shekhar Kapur has also been a UNICEF ambassador and has contributed to several global humanitarian causes.

• Padma Bhushan Award:

• The Padma Bhushan is one of the highest civilian awards in India, instituted in 1954.

• It is awarded to individuals for their exceptional service in various fields like arts, literature, science, public affairs, sports, and social work, among others.

• The awardees are announced annually on Republic Day, and the awards are presented by the President of India.

• Other Notable Contributions of Shekhar Kapur:

• He served as the jury president of the Cannes Film Festival in 2010, showcasing his influence in global cinema.

• In addition to filmmaking, Kapur has been involved in several environmental and social initiatives, advocating for sustainable development and water conservation.

• He is also known for his work in documentaries, including a project on the Dalai Lama.

• Padma Awards:

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

• These awards are aimed at recognizing individuals who have contributed significantly to their respective fields and have brought pride to the nation.

• Some other notable recipients of the Padma Bhushan include Ratan Tata, Sachin Tendulkar, and Asha Bhosle.

Q5. Answer: (c) Because the region has fertile alluvial soil and cool winters

The correct answer is Because the region has fertile alluvial soil and cool winters.

Key Points

• The north-western plains of India are known for their fertile alluvial soil, which is deposited by rivers like the Ganga, Yamuna, Sutlej, and their tributaries. This soil is rich in nutrients, making it highly suitable for wheat cultivation.

• Wheat requires a cool climate during its growing season, which the north-western plains provide during winter. The temperatures range between 10°C to 15°C, ideal for wheat germination and growth.

• The region experiences adequate irrigation facilities due to an extensive network of canals, ensuring water availability for wheat crops even during the dry season.

• Wheat is a rabi crop, meaning it is sown in winter and harvested in spring. The low rainfall during the wheat-growing season in the north-western plains prevents waterlogging, which is detrimental to the crop.

• The geographical location provides an advantage, as the plains have a flat topography, facilitating large-scale mechanized farming, which is beneficial for wheat cultivation.

Additional Information

• Alluvial Soil:

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• Alluvial soil is formed by the deposition of silt, sand, and clay by rivers. It is highly fertile and ideal for growing crops like wheat, rice, sugarcane, and pulses.
• The north-western plains have deep alluvial deposits, supporting extensive agricultural activities.
• Wheat Crop:
• Wheat is a rabi crop, sown in October-November and harvested in March-April.
• It requires a temperature range of 10°C to 15°C during germination and 20°C to 25°C during maturity.
• Wheat needs around 50-75 cm of annual rainfall, making the climate of the north-western plains ideal for its growth.
• India is the second-largest producer of wheat globally, with major contributions from states like Punjab, Haryana, and Uttar Pradesh.
• Irrigation in North-Western Plains:
• The plains have a well-developed canal irrigation system, including the Indira Gandhi Canal and Bhakra Nangal Dam system.
• This ensures a consistent water supply for wheat cultivation, especially during the dry winter months.
• Other Crops in the Region:
• Besides wheat, the north-western plains are also suitable for growing crops like rice, sugarcane, mustard, and cotton.
• The availability of fertile soil and water resources makes this region an agricultural hub.

Important Points

• Red Soil and Limited Rainfall:
• Red soil, commonly found in southern and eastern India, is not as fertile as alluvial soil and is not ideal for wheat cultivation.
• Limited rainfall in regions with red soil also makes it unsuitable for water-intensive crops like wheat.
• Coastal Proximity:
• Coastal regions are not conducive for wheat farming due to high humidity and saline soil.
• Wheat thrives in inland regions with less humidity and well-drained soil, such as the north-western plains.
• Rainfall in Monsoon:
• Wheat is a rabi crop and does not require heavy monsoon rains, which can damage the crop.
• Instead, it requires controlled irrigation during its growing season.

Q6. Answer: (c) Start Menu

The correct answer is Start Menu.

Key Points

• The Start Menu is a core component of the Windows operating system and serves as a central hub for accessing system settings, installed programs, and power options directly from the desktop.
• Introduced in Windows 95, the Start Menu has evolved through various Windows versions to include features like search functionality, quick access to programs, and system utilities.
• The Start Menu provides easy navigation to essential system settings, such as Control Panel, Settings, and Power Options, enabling users to manage system configurations efficiently.
• It displays a list of installed applications, making it convenient for users to launch programs and access frequently used tools.
• The Start Menu also includes the power options (such as Shut Down, Restart, and Sleep), allowing users to manage the system state effortlessly.

Additional Information

• Taskbar:
• The Taskbar is located at the bottom of the screen in Windows operating systems.
• It provides quick access to open applications and pinned programs but does not directly offer access to system settings or power options.
• Features include the Notification Area, system tray, and quick launch icons.
• File Explorer:
• File Explorer is a file management application in Windows used to browse, access, and organize files and folders on the computer.
• It does not provide direct access to system settings or power options.
• Commonly used for tasks like copying, moving, and deleting files.
• Notification Area:
• The Notification Area, also known as the system tray, displays icons for background applications, system notifications, and shortcuts like volume control and network status.
• While it provides quick access to certain system features, it does not serve as a hub for accessing system settings, installed programs, or power options.

• Evolution of the Start Menu:

• Over the years, the Start Menu has been enhanced with features like live tiles in Windows 8 and search integration in Windows 10.

• Windows 11 introduced a more streamlined design and centralized layout for the Start Menu.

• Power Options:

• Power options are essential for managing the computer's energy consumption, allowing users to shut down, restart, or put the system into sleep mode.

• These options are conveniently located within the Start Menu, ensuring easy access.

Important Points

• Windows Versions:

• Each Windows version since Windows 95 has included a Start Menu, with design modifications enhancing user experience.

• Windows 8 temporarily replaced the Start Menu with the Start Screen, but it returned in Windows 10 due to user demand.

• Accessibility:

• The Start Menu is accessible via the Windows key or by clicking the Start icon located on the Taskbar.

• It can be customized with pinned applications, shortcuts, and folders for quick access.

• Search Integration:

• The Start Menu incorporates a search bar, allowing users to quickly locate files, programs, or system settings.

• This feature streamlines navigation and enhances productivity.

Q7. Answer: (c) The Parliament can amend the Constitution, but it cannot change or destroy its basic structure or essential...

The correct answer is The Parliament can amend the Constitution, but it cannot change or destroy its basic structure or essential features..

Key Points

• The Kesavananda Bharati v. State of Kerala case (1973) is one of the most significant judgments in Indian constitutional history.

• The Supreme Court laid down the "Basic Structure Doctrine", which restricts the power of the Parliament to amend the Constitution in a way that alters its fundamental structure.

• According to the judgment, while the Parliament has the authority under Article 368 of the Indian Constitution to amend any part of the Constitution, it cannot alter or destroy its basic structure or essential features.

• The basic structure includes principles such as the supremacy of the Constitution, separation of powers, fundamental rights, and the rule of law.

• This doctrine ensures that the core principles of the Indian Constitution remain preserved, even as the Constitution evolves through amendments.

Additional Information

• Kesavananda Bharati Case (1973):

• This landmark case was filed by Swami Kesavananda Bharati, challenging the Kerala government's land reform laws.

• The case questioned the extent of Parliament's power to amend the Constitution.

• The Supreme Court ruled by a slim majority of 7:6 that the basic structure of the Constitution cannot be amended, even by the Parliament.

• Basic Structure Doctrine:

• The doctrine was introduced to safeguard the core principles of the Constitution from being eroded by amendments.

• Some elements identified as part of the basic structure include:

• Supremacy of the Constitution

• Rule of law

• Judicial review

• Fundamental rights

• Federalism

• Article 368 of the Constitution:

• It provides the Parliament with the power to amend the Constitution, subject to certain procedural requirements.

• Amendments can be made by a special majority (two-thirds of the members present and voting) and, in some cases, require ratification by at least half of the state legislatures.

• Impact of the Judgment:

• This decision has created a balance between the amending power of the Parliament and the protection of the Constitution's fundamental principles.

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• It has strengthened the role of the judiciary in reviewing constitutional amendments and preserving the democratic ethos of the Indian Constitution.

Important Points

• Important Judgments Related to Basic Structure Doctrine:

• Indira Nehru Gandhi v. Raj Narain (1975): The Supreme Court applied the basic structure doctrine to strike down a constitutional amendment that affected the independence of the judiciary and the principle of free and fair elections.

• Minerva Mills v. Union of India (1980): The Court reaffirmed that the power of judicial review is a part of the basic structure of the Constitution.

• L. Chandra Kumar v. Union of India (1997): The Supreme Court held that the power of judicial review over legislative action is part of the basic structure.

• Significance of the Doctrine:

• It acts as a safeguard against arbitrary amendments by the Parliament.

• It ensures the continuity and stability of the foundational principles of the Constitution.

• The doctrine has been instrumental in maintaining the balance of power between the legislature, executive, and judiciary.

Q8. Answer: (c) Puttaswamy vs. Union of India

The correct answer is Puttaswamy vs. Union of India.

Key Points

• The Puttaswamy vs. Union of India case, decided in 2017, was a landmark judgment by the Supreme Court of India. It affirmed the Right to Privacy as a Fundamental Right under the Constitution of India.

• The case was led by Justice K.S. Puttaswamy, a retired judge, who challenged the Aadhaar scheme on the grounds of privacy infringement.

• The judgment ruled that the Right to Privacy is protected as an intrinsic part of the Right to Life and Personal Liberty under Article 21 and as part of the freedoms guaranteed by Part III of the Constitution.

• A nine-judge bench unanimously agreed that privacy is a fundamental right, overturning previous judgments that denied this status.

• This case laid the foundation for future decisions related to privacy, data protection, and individual rights in India. It set a precedent for protecting citizens' privacy against state and private encroachments.

Additional Information

• Shreya Singhal vs. Union of India:

• This case, decided in 2015, struck down Section 66A of the Information Technology Act, 2000, which was deemed unconstitutional for violating the freedom of speech and expression under Article 19(1)(a).

• It did not address the Right to Privacy. Hence, this option is incorrect.

• Indira Sawhney vs. Union of India:

• This landmark case from 1992 dealt with the issue of reservation quotas for socially and educationally backward classes and upheld the Mandal Commission recommendations.

• It was not related to the Right to Privacy. Hence, this option is incorrect.

• Navtej Singh Johar vs. Union of India:

• Decided in 2018, this case struck down Section 377 of the Indian Penal Code, decriminalizing consensual homosexual acts.

• While it emphasized dignity and privacy, the judgment did not specifically focus on the Right to Privacy as a fundamental right. Hence, this option is incorrect.

• Right to Privacy:

• The concept of privacy is rooted in the Universal Declaration of Human Rights (UDHR), which India is a signatory to.

• It gained prominence in Indian jurisprudence after the Puttaswamy case, ensuring safeguards against misuse of personal data and state surveillance.

• The judgment has implications for laws related to data protection, surveillance, and Aadhaar, shaping India's digital privacy framework.

Important Points

• Article 21:

• Enshrines the Right to Life and Personal Liberty, which includes the Right to Privacy.

• It serves as the basis for protecting individual autonomy and dignity in India.

• Impact of Puttaswamy Judgment:

• Influenced legislation related to data protection and privacy, such as the Personal Data Protection Bill.

• The judgment has been cited in subsequent cases, including those concerning Aadhaar and internet shutdowns.

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• Judicial Bench:

• The case was decided by a nine-judge bench, illustrating its constitutional significance.

• It overturned previous judgments like Kharak Singh vs. State of Uttar Pradesh, which denied privacy as a fundamental right.

Q9. Answer: (a) Railways

The correct answer is Railways.

Key Points

• Railways is the most suitable mode of transport for heavy and bulky goods over long distances because it is cost-effective and efficient for transporting large volumes of goods.

• It provides a reliable and safe means of transport for commodities such as coal, steel, cement, and agricultural produce.

• Railways are equipped with specialized freight wagons that can carry heavy loads and ensure the goods' safety during transit.

• It is an environmentally friendly mode of transport with lower carbon emissions compared to roadways or airways.

• Railway networks are well-developed in countries like India, the United States, and China, which makes them a vital part of the economy and trade.

Additional Information

• Pipelines:

• Used to transport liquids like oil, natural gas, and water.

• Efficient for specific industries but not suitable for general heavy and bulky goods.

• Roadways:

• Flexible and accessible for short to medium distances.

• Not cost-effective for heavy goods or long-distance transportation due to higher fuel and maintenance costs.

• Airways:

• Best for fast and time-sensitive deliveries but very expensive.

• Not suitable for bulky and heavy goods due to weight limitations and high freight charges.

• Advantages of Railways:

• Railways can carry goods in bulk over long distances at a lower cost per unit compared to road or air transport.

• They are vital for the economic development of a country as they facilitate the movement of raw materials and finished goods.

• Examples include the Indian Railways, which is one of the largest railway networks in the world, and the Trans-Siberian Railway in Russia, which connects Europe and Asia.

Important Points

• Economic Importance of Railways:

• The railways contribute significantly to reducing transportation costs, thereby lowering the overall cost of goods.

• In India, the Dedicated Freight Corridor (DFC) is an ambitious project aimed at improving the efficiency of goods transport via rail.

• Environmental Benefits:

• Railways are more energy-efficient and produce significantly less pollution compared to road and air transport.

• Countries are increasingly investing in electrified rail networks to further reduce greenhouse gas emissions.

Q10. Answer: (b) The product of force and the time for which it acts

The correct answer is The product of force and the time for which it acts.

Key Points

• Impulse in mechanics refers to the product of force and the time interval over which the force acts. This is a correct statement.

• Mathematically, impulse (J) can be expressed as $J = F \times \Delta t$, where F is the force applied, and Δt is the time duration for which the force acts.

• Impulse is a vector quantity, which means it has both magnitude and direction.

• The unit of impulse in the SI system is Newton-second (Ns).

• Impulse is directly related to the change in momentum of an object, as per Newton's second law of motion: $J = \Delta p$, where Δp is the change in momentum.

• The concept of impulse is crucial in understanding collisions, as it explains how force and time contribute to the changes in the momentum of objects during impacts.

Additional Information

• Option 1: The product of mass and velocity:

• The product of mass and velocity is the definition of momentum, not impulse. This is an incorrect statement.

• Momentum (p) is given by the formula p = mv, where m is the mass, and v is the velocity of the object.

• Option 2: The product of force and the time for which it acts:

• This is the correct definition of impulse in mechanics. Impulse explains how a force acting over time changes an object's momentum.

• Option 3: The rate of change of momentum multiplied by the distance:

• This is an incorrect statement. The rate of change of momentum is related to force, not impulse. Additionally, there is no direct connection to distance in the definition of impulse.

• Option 4: The change in displacement over time:

• This refers to velocity, not impulse. Velocity is defined as the rate of change of displacement over time. This statement is incorrect in the context of the question.

• Applications of Impulse:

• Impulse is commonly used in analyzing collisions, such as in sports (e.g., cricket, baseball, or football) and car crashes.

• It helps in understanding how airbags reduce injuries in car accidents by increasing the time of impact, thereby reducing the force exerted on passengers.

Important Points

• Impulse-Momentum Theorem:

• The impulse experienced by an object is equal to the change in its momentum, i.e., J = Δp = p_(final) - p_(initial).

• This principle is widely used in physics to understand and solve problems related to forces and motion, such as collisions and rocket propulsion.

• Key Examples:

• In cricket, when a batsman hits the ball, the bat exerts a force on the ball over a short time, generating impulse and changing the ball's momentum.

• In a car crash, seat belts and airbags extend the time of impact, reducing the force experienced by passengers and preventing severe injuries.

• Practical Applications:

• Impulse is used in sports to enhance performance, for instance, by calculating the force applied by a player to a ball for maximum efficiency.

• It is also utilized in engineering and safety designs to mitigate the effect of impacts, such as in construction helmets or crash barriers.

Q11. Answer: (c) 1, 2 and 3 only

The correct answer is 1, 2, and 3 only.

Key Points

• The Ryotwari settlement was developed by Thomas Munro, a British administrator. He introduced this system in the Madras Presidency in 1820. Under this system, the revenue settlement was made directly with the individual cultivators or ryots, bypassing the zamindars. Hence, statement 1 is correct.

• The settlement was made directly with the cultivators under the Ryotwari system. Unlike the Zamindari system, where zamindars acted as intermediaries, the Ryotwari system established a direct relationship between the British government and the farmers. This ensured that the farmers were responsible for paying land revenue directly to the state. Hence, statement 2 is correct.

• The Ryotwari system was tested on a small scale in the annexed territories of Tipu Sultan. These territories, which came under British control after Tipu's defeat, served as experimental grounds for the new settlement system. It was considered a success and later expanded. Hence, statement 3 is correct.

• The assertion that the Ryotwari system was applied in the Ganga plains is incorrect. The Ryotwari system was primarily implemented in regions such as Madras, Bombay, and parts of Assam. The Ganga plains were primarily under the Zamindari settlement. Hence, statement 4 is incorrect.

• Therefore, the correct answer is 1, 2, and 3 only.

Additional Information

• Ryotwari System:

• Introduced during British rule, this system focused on direct revenue collection from farmers or cultivators (ryots).

• The system was implemented in areas where there were no large landlords or zamindars, such as Madras, Bombay, and parts of Assam.

• The revenue rates were fixed based on the fertility and productivity of the land and were subject to periodic revisions.

• It ensured that the cultivators had ownership rights over the land as long as they paid the required revenue.

• Zamindari System:

• Another land revenue system implemented by the British in regions such as Bengal, Bihar, and Uttar Pradesh.

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• In this system, zamindars acted as intermediaries between the British government and the cultivators, collecting revenue from farmers and paying it to the state.
• This system often led to exploitation of farmers by zamindars, as they charged high rents.
• Mahalwari System:
• Introduced in North India, especially in Punjab, Uttar Pradesh, and parts of Madhya Pradesh.
• Under this system, land revenue was collected from groups of villages (mahal) rather than individual cultivators.
• The headman of the mahal was responsible for collecting revenue on behalf of the group.
• Comparison of Land Revenue Systems:
• The Ryotwari system emphasized direct settlement, which reduced intermediaries but placed the burden of revenue payment directly on the cultivators.
• The Zamindari system involved intermediaries, leading to exploitation but ensured a structured revenue collection process.
• The Mahalwari system combined aspects of both, focusing on group settlements and revenue collection.
• Historical Impact:
• The Ryotwari system provided ownership rights to cultivators but failed during famines as farmers struggled to pay fixed revenue.
• The Zamindari system led to the rise of powerful landlord classes but also increased the exploitation of farmers.
• All systems significantly influenced land revenue policies in colonial India, shaping socio-economic conditions of the time.

Important Points
• Thomas Munro:
• He was the Governor of Madras Presidency from 1820 to 1827.
• Played a key role in the development and implementation of the Ryotwari system.
• Revenue Collection:
• Under Ryotwari, revenue collection was based on the land's productivity, making it variable.
• The fixed revenue rates became a burden during periods of drought or famine.
• Regions of Implementation:
• Ryotwari was prominent in Madras, Bombay, and Assam.
• Zamindari dominated Bengal, Bihar, and Uttar Pradesh.
• Mahalwari was implemented in Punjab and northern regions.
• Colonial Policies:
• These systems were designed primarily to maximize revenue for the British government.
• They had long-term implications for agricultural practices and rural economies in India.

Q12. Answer: (d) Vikramaditya

The correct answer is Vikramaditya.

Key Points
• Chandragupta II, a prominent ruler of the Gupta dynasty, was also known by the title Vikramaditya. This title symbolized his valor and administrative excellence.
• He ruled during the period of 375–415 CE, a time considered the Golden Age of India due to advancements in science, art, and culture.
• The title Vikramaditya is often associated with ideal kingship and has been used for other rulers in Indian history, but Chandragupta II was particularly renowned for this epithet.
• Chandragupta II expanded the Gupta Empire significantly, defeating powerful adversaries like the Saka rulers and annexing regions such as Malwa, Gujarat, and parts of Rajasthan.
• His reign was marked by prosperity, peace, and the flourishing of trade and culture, with the Gupta period being known for its advancements in literature, architecture, and science.

Additional Information
• Gupta Dynasty:
• The Gupta Empire was founded by Chandragupta I around 320 CE. It is regarded as one of the most influential empires in Indian history.
• The period of the Gupta dynasty is often referred to as the Golden Age of India due to the remarkable achievements in art, literature, architecture, and science.
• Significant rulers of the Gupta dynasty include Chandragupta I, Samudragupta, and Chandragupta II.
• Contributions of Chandragupta II:
• He encouraged cultural and intellectual advancements, patronizing scholars like Kalidasa, one of India's greatest poets and

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playwrights.

• The famous Iron Pillar of Delhi, known for its rust-resistant composition, is attributed to his reign.

• Under his rule, the empire's trade flourished, connecting India to regions like Southeast Asia and the Mediterranean.

• Other Titles:

• Vikramaditya is a title that has been conferred upon various rulers in Indian history, signifying valor, wisdom, and ideal kingship.

• While Chandragupta II is most famously associated with this title, other rulers, such as King Bhoja and Samudragupta, were also referred to as Vikramaditya.

• Defeat of Saka Rulers:

• Chandragupta II is credited with defeating the Saka rulers, also known as the Western Kshatrapas, and annexing their territories.

• This victory marked a significant expansion of the Gupta Empire and established its dominance in western India.

Important Points

• Golden Age of India: The Gupta period is termed the Golden Age due to unprecedented achievements in science, mathematics, astronomy, literature, and architecture.

• Kalidasa's Works: Renowned works such as Shakuntala and Meghaduta were composed during Chandragupta II's reign.

• Iron Pillar of Delhi: This pillar stands as a testament to the advanced metallurgical skills of the Gupta period.

• Trade Expansion: Chandragupta II's reign witnessed extensive trade with Roman Empire, Southeast Asia, and China, enhancing cultural exchanges.

• Gupta Coins: Coins from this era were made of gold and silver and depicted the prosperity and artistic excellence of the time.

Q13. Answer: (d) Persian and Hindavi

The correct answer is Persian and Hindavi.

Key Points

• Amir Khusrau was a renowned Sufi musician, poet, and scholar in medieval India, often referred to as the "Parrot of India".

• He is known for his significant contributions to Persian and Hindavi (an early form of Hindi and Urdu), which laid the foundation for the development of Urdu language.

• He wrote extensively in Persian, composing various poems, riddles, and prose, which enriched Indo-Persian literature.

• Khusrau is credited with introducing Hindavi into his works, blending Persian and local Indian languages, creating a fusion of linguistic traditions.

• His works in Hindavi include riddles, songs, and couplets, making him a pioneer in developing the vernacular tradition in Indian literature.

Additional Information

• Persian Language:

• Persian was widely used as the court language during the Delhi Sultanate and Mughal period.

• Amir Khusrau's Persian poetry includes Ghazals, Masnavis, and Rubaiyat, showcasing themes of love, spirituality, and philosophy.

• His Persian works include Tughluq Nama, Qiran-us-Sa'dain, and Khazain-ul-Futuh.

• Persian became a medium for administrative purposes and literary creativity during Khusrau's era.

• Hindavi Language:

• Hindavi was an early form of Hindi and Urdu, and Amir Khusrau is regarded as one of its early proponents.

• Khusrau's Hindavi works include riddles, folk songs, and couplets that reflect the socio-cultural milieu of his time.

• His Hindavi compositions were enjoyed by both the elite and the common people, popularizing local dialects in literature.

• Hindavi later evolved into modern Hindi and Urdu, forming the basis of contemporary North Indian languages.

• Amir Khusrau's Legacy:

• He is credited with creating the qawwali genre, blending Persian and Indian musical traditions.

• Khusrau introduced new instruments like the tabla and popularized the sitar during his time.

• His contributions to literature and music earned him the title of "Father of Urdu Literature".

• He was a disciple of Sufi saint Nizamuddin Auliya, and his works reflect a deep spiritual essence.

Important Points

• Other Options:

• Sanskrit and Tamil: These languages have ancient roots and are unrelated to Khusrau's works. They were primarily used for religious and classical literature in India.

• Bengali and Punjabi: These regional languages have distinct literary traditions and were not influenced by Khusrau's contributions.

• Marathi and Gujarati: These languages belong to different linguistic families and regions than those influenced by Khusrau.
• Significance of Khusrau's Work:
• His innovative blending of Persian and Hindavi laid the foundation for the syncretic culture of India.
• Through literature and music, Khusrau played a crucial role in fostering cultural harmony during his era.
• His works continue to be celebrated in Indian classical music and poetry.

Q14. Answer: (c) 90 days

The correct answer is 90 days.

Key Points

• The Waqf (Amendment) Bill, 2025 introduces reforms to enhance the transparency and efficiency of Waqf Boards and Tribunals in India.
• According to the provisions of this amendment, any person aggrieved by the decision of the Waqf Tribunal can file an appeal in the respective High Court.
• The time period for filing such an appeal has been specifically set at 90 days from the date of the Tribunal's order.
• This 90-day period ensures that parties have a reasonable amount of time to prepare their case and approach the High Court for justice.
• By setting a uniform timeline, the amendment aims to standardize legal proceedings and reduce delays in addressing disputes related to Waqf properties.

Additional Information

• Waqf Act:
• The Waqf Act, 1995 was enacted to provide a framework for the administration of Waqf properties in India.
• A Waqf is a permanent dedication of movable or immovable properties by a person professing Islam for religious or charitable purposes.
• The Act established Waqf Boards to manage and oversee Waqf properties across the country.
• Waqf Tribunals:
• Waqf Tribunals were constituted under the Waqf Act to address disputes related to Waqf properties.
• They have the authority to resolve conflicts involving the listing of properties as Waqf, encroachments, or other administrative issues.
• The Tribunal's decisions are binding, but the High Court can review them under the appeals process.
• Significance of Appeals:
• Allowing appeals to the High Court ensures a higher level of judicial scrutiny and provides aggrieved parties with an opportunity to seek justice.
• The 90-day appeal period balances the need for timely redressal with the practicalities of preparing a legal case.
• Other Amendments in the Waqf (Amendment) Bill, 2025:
• The Bill enhances the powers of Waqf Boards to prevent illegal encroachments on Waqf properties.
• It introduces stricter penalties for unauthorized use or sale of Waqf assets.
• Provisions for increased transparency, such as mandatory digital record-keeping of Waqf properties, have also been included.

Important Points

• Time Period for Appeals:
• The 90-day period is consistent with the timelines provided for appeals in several other statutes, ensuring uniformity.
• Delays beyond this period require the appellant to provide valid reasons, which the High Court may or may not accept.
• Waqf Properties in India:
• India has a vast number of Waqf properties, making effective administration critical for their religious and charitable purposes.
• The reforms under the Waqf (Amendment) Bill, 2025 aim to protect these assets from misuse or mismanagement.
• Judicial Oversight:
• The provision for appeals to the High Court underlines the importance of judicial oversight in safeguarding the interests of stakeholders.
• It ensures that decisions made by Waqf Tribunals can be reviewed for fairness and legal compliance.

Q15. Answer: (d) Subhasish Bose

The correct answer is Subhasish Bose.

Key Points

• Subhasish Bose was named the Men's Player of the Year at the All India Football Federation (AIFF) Awards held in May 2025.
• This recognition is considered a prestigious accolade in Indian football, highlighting excellence in performance over the past

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season.

• Subhasish Bose is a defender who has consistently shown strong performances both for his club and the national team, making him a standout player in Indian football.

• His contributions to the game include his defensive skills, leadership on the field, and ability to inspire his teammates during crucial matches.

• The selection process for the award involves evaluating players' performances in domestic and international fixtures, and Subhasish Bose emerged as the top performer.

Additional Information

• All India Football Federation (AIFF):

• The AIFF is the governing body for football in India, established in 1937 and affiliated with FIFA and the Asian Football Confederation (AFC).

• It organizes and oversees key tournaments such as the Indian Super League (ISL), I-League, and various domestic competitions.

• Subhasish Bose:

• Born on August 18, 1995, in West Bengal, India, Bose is a professional football player known for his defensive prowess.

• He has played for top clubs in the Indian Super League (ISL), including ATK Mohun Bagan, and has represented the Indian national team.

• He is celebrated for his versatility, being able to play as both a left-back and center-back.

• AIFF Awards:

• The AIFF Awards are an annual event recognizing exceptional performances in Indian football, including categories for Men's Player of the Year, Women's Player of the Year, and Emerging Players.

• The awards are determined by a panel of experts and are based on players' performances at both national and international levels.

• Other Notable AIFF Award Winners:

• Sunil Chhetri, the captain of the Indian football team, has won the Men's Player of the Year award multiple times for his stellar performances.

• Gurpreet Singh Sandhu, the goalkeeper, has also been a recipient of the award in previous years, showcasing his exceptional goalkeeping skills.

Important Points

• Men's Player of the Year Award:

• This award is one of the most prestigious accolades in Indian football and is awarded annually by the AIFF.

• The winner is chosen based on their performance in domestic leagues and international matches.

• Criteria for Selection:

• Performance metrics such as goals scored, defensive contributions, and leadership skills are considered.

• The player's impact on their team's success is also a key factor in the evaluation process.

Q16. Answer: (a) Assam

The correct answer is Assam.

Key Points

• Jhumur is a traditional folk dance originating from the state of Assam, located in northeastern India.

• It is performed primarily by the tea tribes and other indigenous communities in Assam, especially in the tea gardens.

• This dance form is an expression of joy and celebration, often performed during festivals, community gatherings, and other important occasions.

• The dancers wear traditional attire, including brightly colored sarees, and adorn themselves with unique jewelry, reflecting the rich cultural heritage of Assam.

• Jhumur dance is usually accompanied by traditional musical instruments like the dhol, flute, and cymbals, creating a lively and rhythmic performance.

Additional Information

• Assam:

• Located in the northeastern region of India, Assam is known for its tea plantations, wildlife, and cultural diversity.

• The state is home to various indigenous communities, each contributing to its unique cultural identity.

• Assam is also known for other traditional dance forms such as Bihu, which is performed during the Bihu festival to celebrate the harvest season.

• Tea Tribes of Assam:

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• The tea tribes are an integral part of Assam's workforce, predominantly employed in the tea gardens.

• They have their distinct language, culture, and traditions, and Jhumur dance is a significant part of their cultural expression.

• Features of Jhumur Dance:

• The dance is performed in groups, often in a circular formation, with synchronized movements and rhythmic steps.

• The performers sing traditional folk songs while dancing, which adds an emotional and cultural depth to the performance.

• Musical Accompaniment:

• Traditional instruments like the dhol (drum), flute, and cymbals are played to provide a lively and rhythmic background for the dance.

• The music and dance together create a mesmerizing experience, showcasing the rich cultural heritage of Assam.

Important Points

• Other Folk Dances in India:

• Bhangra and Gidda - Punjab: Known for their high-energy movements and vibrant music, these dances are performed during celebrations and harvest festivals.

• Mohiniyattam - Kerala: A classical dance form characterized by graceful movements and traditional attire.

• Garba and Dandiya Raas - Gujarat: Popular during the Navratri festival, these dances involve rhythmic clapping and the use of sticks.

Q17. Answer: (d) Mahbub ul Haq

The correct answer is Mahbub ul Haq.

Key Points

• Mahbub ul Haq, a Pakistani economist, is credited alongside Amartya Sen for creating the Human Development Index (HDI).

• The Human Development Index (HDI) was introduced in the first Human Development Report (HDR) published in 1990 by the United Nations Development Programme (UNDP).

• The HDI focuses on measuring a country's development by combining three key dimensions: life expectancy, education level, and standard of living.

• Mahbub ul Haq conceptualized this index to shift the focus of development economics from national income accounting to people-centered policies.

• Amartya Sen, an Indian economist, contributed by providing the theoretical framework emphasizing capabilities and freedoms as essential aspects of human development.

Additional Information

• Human Development Index (HDI):

• The HDI is a composite index that measures average achievement in three basic dimensions of human development:

• Health: Measured by life expectancy at birth.

• Education: Measured by mean years of schooling for adults aged 25 years or more and expected years of schooling for children entering school.

• Standard of Living: Measured by gross national income (GNI) per capita (adjusted for purchasing power parity).

• Mahbub ul Haq:

• He was a renowned Pakistani economist and policy-maker, born in 1934 and passed away in 1998.

• Haq's work on the HDI was inspired by his vision to create a development model that prioritizes human welfare over mere economic growth.

• He also served as the Director of the Human Development Report Office at the UNDP.

• Amartya Sen:

• Sen is an Indian economist and philosopher, awarded the Nobel Prize in Economic Sciences in 1998.

• His capability approach emphasizes the importance of enabling individuals to achieve well-being through freedom of choice.

• Sen's theoretical contributions were crucial for the development of the HDI framework.

• Importance of HDI:

• The HDI provides a broad measure of human development that goes beyond economic performance indicators like GDP.

• It helps policymakers understand the multidimensional aspects of development and design people-centered policies.

• Countries are ranked on a scale of 0 to 1, where higher values indicate better human development.

Important Points

• Criticism of HDI:

• The HDI has been criticized for being too simplistic, as it does not consider other critical dimensions like environmental sustainability, political freedom, and inequality.

• Despite its limitations, the HDI remains a widely used and influential tool for assessing and comparing human development

across countries.

• UNDP and Human Development Reports:

• The United Nations Development Programme (UNDP) publishes annual Human Development Reports to provide insights into global and regional development trends.

• These reports use the HDI as a central measure to assess progress and highlight challenges in achieving sustainable human development.

Q18. Answer: (d) Public Accounts Committee

The correct answer is Public Accounts Committee.

Key Points

• Public Accounts Committee (PAC) is one of the most important Standing Committees of the Indian Parliament.

• It was first constituted in 1921 under the provisions of the Government of India Act, 1919.

• The PAC examines the appropriation accounts and the finance accounts of the Government of India and scrutinizes the reports of the Comptroller and Auditor General (CAG).

• The committee consists of 22 members: 15 from Lok Sabha and 7 from Rajya Sabha. Members are elected annually by Parliament.

• The PAC ensures that public funds are spent efficiently and according to the law. It acts as a watchdog over the government's financial performance.

Additional Information

• Delimitation Commission:

• The Delimitation Commission is a temporary body established by the Government of India to redraw the boundaries of constituencies based on the latest census data.

• It is constituted under the provisions of the Delimitation Act, and its recommendations cannot be challenged in court.

• This commission is not a Standing Committee and is dissolved after completing its work.

• Joint Parliamentary Committee (JPC):

• A Joint Parliamentary Committee is formed for a specific purpose, such as investigating major issues or scandals (e.g., 2G Spectrum Scam).

• It is an ad hoc committee and not a permanent Standing Committee. It ceases to exist once the task assigned to it is completed.

• Select Committee on a Bill:

• A Select Committee is constituted for detailed examination of specific bills before they are presented for final approval in Parliament.

• It is also an ad hoc committee and dissolves once its work is completed.

• Standing Committees:

• Standing Committees are permanent committees of Parliament and include committees like the Public Accounts Committee, Estimates Committee, and Committee on Public Undertakings.

• These committees work throughout the year and contribute to parliamentary oversight over the executive.

Important Points

• Role of PAC:

• The PAC reviews the audit reports submitted by the Comptroller and Auditor General (CAG).

• It ensures accountability by examining whether government expenditures comply with parliamentary approval.

• The PAC does not have the power to question the government's policy decisions but focuses on financial irregularities and inefficiency.

• Other Standing Committees:

• Examples of Standing Committees include the Estimates Committee, Committee on Public Undertakings, and various Department-related Parliamentary Standing Committees.

• These committees play a crucial role in policy review, budget scrutiny, and legislative analysis.

Q19. Answer: (a) Indian Institute of Science

The correct answer is Indian Institute of Science.

Key Points

• Indian Institute of Science (IISc), based in Bangalore, Karnataka, has been at the forefront of advanced research in semiconductor technologies.

• In 2025, IISc proposed the development of the world's smallest semiconductor chip, which is expected to revolutionize the electronics industry by enabling more compact and powerful devices.

• This initiative focuses on nanoelectronics and integrates cutting-edge techniques such as quantum computing and advanced

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material science.

• The project aligns with India's aim to strengthen its semiconductor manufacturing capabilities under the Make in India program and achieve self-reliance in technology.

• Semiconductors are crucial for applications like AI, IoT, data processing, and telecommunications, and IISc's innovation is expected to contribute significantly to these fields.

Additional Information

• Indian Institute of Science (IISc):

• IISc was established in 1909 and is one of India's premier institutes for advanced scientific and technological research.

• Located in Bangalore, it has contributed significantly to fields such as material science, engineering, and biotechnology.

• It collaborates globally with leading academic and industrial organizations to foster innovation and technology advancement.

• Semiconductors:

• Semiconductors are materials that have electrical conductivity between conductors (like metals) and insulators.

• They are essential in electronic devices, including transistors, microprocessors, and sensors.

• Advanced semiconductors enable smaller, faster, and more energy-efficient electronic systems.

• India's Semiconductor Mission:

• The Indian government launched the Semiconductor Mission to boost semiconductor manufacturing and reduce dependence on imports.

• The mission aims to provide financial support for research, design, and manufacturing of semiconductors.

• Global partnerships are being pursued to enhance India's technological capabilities in the semiconductor domain.

• Applications of Semiconductor Chips:

• Used in smartphones, laptops, industrial machinery, medical devices, and automotive systems.

• Semiconductor chips are integral to emerging technologies like Artificial Intelligence (AI) and Internet of Things (IoT).

• Miniaturized chips promise enhanced performance and reduced power consumption in next-generation devices.

Important Points

• Global Semiconductor Industry:

• The global semiconductor market is projected to grow significantly, driven by technologies like 5G networks, electric vehicles, and cloud computing.

• Countries like USA, China, Taiwan, and South Korea currently dominate semiconductor production.

• India is focusing on building its semiconductor ecosystem to reduce dependence on imports and boost economic growth.

• Quantum Computing and Semiconductors:

• Quantum computing uses principles of quantum mechanics to perform computations at unprecedented speeds.

• Semiconductors play a crucial role in developing quantum processors and related technologies.

Q20. Answer: (d) Articles 32 and 226

The correct answer is Articles 32 and 226.

Key Points

• Article 32: This article empowers the Supreme Court to issue writs for the enforcement of fundamental rights. It is often referred to as the "heart and soul of the Constitution" as described by Dr. B.R. Ambedkar.

• Article 226: This article empowers the High Courts to issue writs for the enforcement of fundamental rights as well as for any other purpose, making it broader in scope compared to Article 32.

• Both these articles are crucial in ensuring the protection and enforcement of fundamental rights enshrined in Part III of the Indian Constitution.

• Under these provisions, courts can issue writs such as Habeas Corpus, Mandamus, Prohibition, Certiorari, and Quo Warranto, ensuring judicial intervention in cases of rights violations.

• Additionally, the Right to Information (RTI) is considered a fundamental right under Article 19(1)(a) of the Indian Constitution, which guarantees the right to freedom of speech and expression. Articles 32 and 226 provide the legal framework to enforce this right.

Additional Information

• Writs under Articles 32 and 226:

• Habeas Corpus: Protects an individual's right to liberty by directing the release of a person unlawfully detained.

• Mandamus: Orders a public authority to perform a duty it is bound to do.

• Prohibition: Prevents lower courts or tribunals from exceeding their jurisdiction.

• Certiorari: Quashes the order of a lower court or tribunal which exceeds its jurisdiction or violates procedural fairness.

• Quo Warranto: Challenges the legality of a person's claim to a public office.

• Scope of Article 32:
• Article 32 applies exclusively to the Supreme Court.
• It deals with cases concerning the violation of fundamental rights.
• It is a guaranteed remedy, meaning that the Supreme Court is bound to act if fundamental rights are violated.
• Scope of Article 226:
• Article 226 applies to High Courts and has a broader scope than Article 32.
• High Courts can issue writs not only for the enforcement of fundamental rights but also for any other legal right.
• The jurisdiction of High Courts is wider but subject to territorial and other constraints.
• Right to Information (RTI):
• The RTI Act, 2005, allows Indian citizens to request information from public authorities, enhancing transparency and accountability.
• It is linked to Article 19(1)(a), which guarantees the right to freedom of speech and expression.
• Under Articles 32 and 226, individuals can approach courts if their right to information is denied.

Important Points

• Articles 32 and 226: Comparison:
• Article 32 is a fundamental right, while Article 226 is a constitutional provision.
• Article 32 provides remedies for fundamental rights violations, while Article 226 extends to other legal rights as well.
• Under Article 226, High Courts have jurisdiction over matters within their respective states, whereas Article 32 gives the Supreme Court jurisdiction over the entire country.
• Judicial Activism:
• The powers under Articles 32 and 226 are instrumental for judicial activism in India.
• These articles empower courts to ensure the implementation of constitutional rights and address grievances of individuals.

Q21. Answer: (a) Six

The correct answer is Six.

Key Points

• In June 2025, the Delhi government proposed the establishment of six Khelo India centres to promote sports and provide training facilities for young athletes.
• The initiative aligns with the national Khelo India Programme, which aims to identify and nurture sports talent across India.
• The Khelo India centres are intended to focus on grassroots-level sports and provide training under qualified coaches to enhance the skills and performance of budding athletes.
• The proposal includes setting up centres for various sports disciplines to ensure inclusivity and to cater to the interests of athletes across different sports.
• This move by the Delhi government reflects its commitment to fostering a sports culture and ensuring adequate infrastructure for the development of sports in the region.

Additional Information

• Khelo India Programme:
• Launched in 2018 by the Ministry of Youth Affairs and Sports, this scheme aims to revive the sports culture in India at the grassroots level.
• It provides financial assistance of up to Rs. 5 lakh per annum per athlete for 8 years to nurture young talent.
• The programme includes initiatives like the Khelo India School Games (KISG) and Khelo India University Games to identify talent at school and university levels.
• Objectives of Khelo India Centres:
• To provide world-class training facilities to young athletes.
• To ensure talent identification and grooming at the local level.
• To develop sports infrastructure in urban and rural areas.
• Delhi Government's Sports Initiatives:
• The Delhi government has been focusing on upgrading sports facilities and encouraging youth participation in sports.
• It has launched several campaigns to promote physical fitness and sports awareness among school students and the general public.
• Impact of Khelo India Centres:
• These centres are expected to boost India's performance in international sports competitions by creating a larger pool of skilled athletes.
• They will also contribute to the overall health and fitness of the youth, reducing lifestyle-related health issues.

Important Points

• Sports Infrastructure in India:

• India has been steadily improving its sports infrastructure by building and renovating stadiums, training centres, and other facilities.

• Significant events like the Commonwealth Games (2010) and Asian Games have led to the development of world-class sports venues in cities like Delhi.

• Future of Sports in India:

• With initiatives like Khelo India, the Indian government aims to increase the country's medal tally in international events like the Olympics and Asian Games.

• These programmes also aim to build a sustainable sports ecosystem that includes coaches, physiotherapists, and support staff.

Q22. Answer: (b) 2.58×10^(−4)coulombs per kilogram

The correct answer is 2) 2.58×10-4 coulombs per kilogram.

Key Points

• The roentgen (R) is a unit of exposure for X-rays and gamma rays. It measures the amount of ionization produced in air by these types of radiation.

• In the International System of Units (SI), exposure is quantified in terms of charge per unit mass, specifically in coulombs per kilogram (C/kg).

• The value of 1 roentgen is defined as 2.58×10-4 coulombs per kilogram (C/kg) in SI units. This is the amount of electric charge produced by gamma or X-rays in 1 kg of air under standard conditions.

• Option 1 (1.0×10-3 grays) is incorrect because gray (Gy) is a unit of absorbed dose, not exposure. It measures energy absorbed per kilogram of matter, unlike roentgen, which measures ionization in air.

• Option 3 (1.6×10-19 coulombs) is incorrect because this value refers to the charge of an electron, unrelated to the roentgen unit.

• Option 4 (3.7×1010 disintegrations per second) is incorrect because it represents the activity of a radioactive source, measured in becquerels (Bq), not exposure.

Additional Information

• Roentgen (R):

• Named after Wilhelm Röntgen, who discovered X-rays in 1895.

• It is a historical unit used to measure exposure to ionizing radiation in air.

• One roentgen corresponds to the amount of radiation that produces 2.58×10-4 C/kg of air.

• SI Units for Radiation:

• The coulomb per kilogram (C/kg) is the SI unit for exposure, replacing the roentgen in modern systems.

• Other related units include the gray (Gy) for absorbed dose and the sievert (Sv) for dose equivalent, which considers biological effects.

• Comparison of Units:

• Gray (Gy): Measures energy deposited by radiation in a material, 1 Gy = 1 joule/kg.

• Roentgen (R): Measures ionization in air, 1 R = 2.58×10-4 C/kg.

• Becquerel (Bq): Measures activity, indicating the number of disintegrations per second.

• Applications:

• The roentgen is used in medical imaging and radiation safety to quantify exposure.

• It helps in calibrating radiation detection devices and ensuring safe levels of radiation in environments like hospitals and nuclear facilities.

Important Points

• Ionizing Radiation:

• Includes X-rays, gamma rays, and other high-energy particles capable of ionizing atoms in matter.

• Measured in units like roentgen (R), gray (Gy), and sievert (Sv), depending on the context (exposure, absorbed dose, or biological effect).

• Radiation Safety Standards:

• Limits on radiation exposure are established by organizations like the International Commission on Radiological Protection (ICRP).

• Occupational exposure for radiation workers is typically limited to 20 mSv/year averaged over five years.

• Key Conversions:

• 1 R = 2.58×10-4 C/kg.

• 1 Gy = 100 rad (older unit of absorbed dose).

• 1 Sv = 100 rem (older unit of dose equivalent).

Q23. Answer: (c) Macaulay's Minute

The correct answer is Macaulay's Minute.

Key Points

• Macaulay's Minute, written by Thomas Babington Macaulay in 1835, emphasized the introduction of English education in India. He argued for the replacement of traditional Indian education systems with English-based education.

• The Minute proposed creating a class of Indians who were "Indian in blood and color, but English in taste, opinions, morals, and intellect," to act as intermediaries between the British rulers and Indian society.

• This document led to the establishment of English as the medium of instruction in schools and colleges, particularly in higher education institutions.

• The Minute was critical in shaping the colonial education policy, moving away from indigenous systems of knowledge and prioritizing European literature and sciences.

• Lord William Bentinck, the Governor-General of India at the time, officially adopted Macaulay's recommendations, making English the primary language for education and administration in India.

Additional Information

• Charter Act of 1813:

• The Charter Act of 1813 was one of the earliest legislations to officially recognize the importance of education in India.

• It allocated Rs. 1 lakh annually for the promotion of education and authorized the Christian missionaries to spread English education.

• However, it did not lay down a clear framework for the implementation of English education, leaving it as a general policy.

• Regulating Act:

• The Regulating Act of 1773 primarily focused on administrative reforms and did not directly address education.

• Its purpose was to regulate the functioning of the East India Company and ensure accountability in governance.

• Pitts India Act:

• The Pitts India Act of 1784 was another administrative reform act, aiming to improve the control of the British Crown over the East India Company.

• It did not include any provisions related to education or the introduction of English in India.

• Impact of Macaulay's Minute:

• The Minute led to the establishment of institutions like Delhi College and Calcutta Medical College, which adopted English as the medium of instruction.

• The focus shifted towards Western literature, science, and philosophy, sidelining traditional Indian systems of education.

• This policy contributed significantly to the formation of an educated middle class in India, which later played a vital role in the Indian independence movement.

Important Points

• Macaulay's Views:

• Macaulay believed that English education would modernize India and create a class of individuals capable of bridging the gap between the British rulers and Indian society.

• His views sparked debates on the impact of colonial education, with critics arguing that it undermined Indian culture and traditional knowledge systems.

• Long-Term Impact:

• The introduction of English education significantly influenced the socio-political landscape of India, fostering a new wave of intellectual and political thought.

• It also contributed to the growth of nationalist movements by enabling Indians to study Western political philosophies and ideologies.

• Historical Context:

• The Minute was written during the early 19th century, a period marked by British attempts to consolidate their control over India through socio-cultural interventions.

• It reflected the colonial belief in the superiority of Western culture and its ability to 'civilize' colonized societies.

Q24. Answer: (a) Failure of crops

The correct answer is Failure of crops.

Key Points

• Paleolithic people were hunter-gatherers and relied on hunting animals and gathering edible plants for their survival. They did not practice agriculture, so the concept of crop failure did not apply to them. Hence, the statement "Failure of crops" is incorrect.

• Paleolithic people moved from place to place due to resource exhaustion. Once resources like food or water in a particular area were depleted, they would migrate to other locations to sustain themselves. Hence, resource exhaustion was a reason for their movement.

• The movement of prey animals was a significant factor for the mobility of Paleolithic people. As they were dependent on hunting, they followed animal herds for sustenance. Hence, movement of prey animals was a reason for their movement.

• Seasonal changes also influenced the movement of Paleolithic people. They migrated to regions with a favorable climate or where seasonal resources like fruits and water were available. Hence, seasonal changes were a reason for their movement.

• The Paleolithic era was marked by a nomadic lifestyle, as they did not settle permanently in one place. Their movement was primarily driven by the availability of resources rather than agricultural practices.

Additional Information

• Paleolithic Era (Old Stone Age):

• The Paleolithic era is the earliest period of human history, lasting approximately from 2.5 million years ago to around 10,000 BCE.

• During this period, humans used stone tools and lived a nomadic lifestyle.

• They depended entirely on natural resources, such as hunting animals, fishing, and gathering edible plants and fruits.

• Reasons for Movement:

• Resource exhaustion: Once resources like food, water, and firewood were depleted in a region, they migrated to other locations.

• Movement of prey animals: As hunters, they followed herds of animals like deer, bison, and mammoths.

• Seasonal changes: Movement was influenced by the changing seasons to ensure survival in favorable conditions.

• Agriculture's Role in Settled Life:

• Agriculture was introduced during the Neolithic Age (New Stone Age), around 10,000 years ago.

• It led to a shift from a nomadic lifestyle to settled agricultural communities.

• The cultivation of crops and domestication of animals provided a stable food supply, reducing the need for constant movement.

• Distinct Characteristics of the Paleolithic Era:

• Tools: Tools were made of stone, bones, and wood. Examples include hand axes, scrapers, and spears.

• Shelter: People lived in caves or temporary shelters made of animal hides and branches.

• Fire: The discovery of fire was a major milestone, providing warmth, protection, and a means to cook food.

• Art: Early humans created cave paintings and carvings, such as those found in Lascaux, France.

Q25. Answer: (a) Wetland ecosystem

The correct answer is Wetland ecosystem.

Key Points

• Littoral forests are primarily located around the shores of lakes, rivers, and coastal regions, which makes them a part of the wetland ecosystem.

• These forests are characterized by their unique vegetation, which grows in shallow water or waterlogged soils. Examples include mangroves, reeds, and marsh grasses.

• Littoral forests play a critical role in maintaining the ecological balance. They provide a habitat for diverse flora and fauna, including various aquatic species, birds, and amphibians.

• These ecosystems are also known for their role in carbon sequestration, shoreline stabilization, and as natural buffers against floods and storms.

• The presence of littoral forests is vital for protecting aquatic ecosystems from erosion and pollution, as they act as natural filters for sediments and pollutants.

Additional Information

• Wetland Ecosystem:

• Wetlands are areas where water covers the soil, or is present at or near the surface, for varying periods of time during the year.

• They include marshes, swamps, bogs, and fens, as well as lakes, rivers, and coastal estuaries.

• Wetlands are among the most productive ecosystems in the world and are crucial for maintaining biodiversity.

• They act as natural water filters, flood protectors, and provide essential habitats for fish, birds, and other wildlife.

• Other Ecosystems Mentioned:

• Tundra Ecosystem: Found in the Arctic and alpine regions, characterized by low temperatures, permafrost, and limited vegetation such as mosses and lichens.

• Grassland Ecosystem: Dominated by grasses and shrubs, these ecosystems are found in regions with moderate rainfall. Examples include the prairies in North America and savannas in Africa.

• Desert Ecosystem: Characterized by extreme aridity, deserts are dominated by sparse vegetation, such as cacti and

drought-resistant shrubs. Examples include the Sahara Desert and the Thar Desert.

• Mangroves as Littoral Forests:

• Mangroves are a specific type of littoral forest found in tropical and subtropical coastal areas.

• They are adapted to survive in saline and brackish waters and play a crucial role in protecting coastlines from erosion.

• Examples include the Sundarbans in India and Bangladesh, which are home to the Royal Bengal Tiger.

• Importance of Littoral Forests:

• They serve as nurseries for fish and other aquatic species, which are vital for local economies dependent on fishing.

• They help in stabilizing shorelines and preventing soil erosion caused by waves and tides.

• Littoral forests are rich in biodiversity and are considered hotspots for conservation efforts.

Important Points

• Global Wetlands:

• The Ramsar Convention, established in 1971, aims to protect and conserve wetlands of international importance.

• India has 75 Ramsar sites as of 2023, covering a total area of over 1.3 million hectares.

• Threats to Littoral Forests:

• Human activities such as deforestation, pollution, and coastal development pose significant threats to these ecosystems.

• Climate change and rising sea levels further endanger littoral forests, particularly mangroves.

Q26. Answer: (d) Economic exploitation of India

The correct answer is Economic exploitation of India.

Key Points

• The primary motive of British colonial rule in India was economic exploitation. The British aimed to utilize India's vast resources and manpower for the benefit of their economy and industries.

• India was transformed into a supplier of raw materials like cotton, jute, and tea for British industries and a market for finished goods manufactured in Britain. This resulted in the destruction of India's traditional industries.

• The British implemented policies like high land revenue systems such as the Zamindari system, which resulted in the exploitation of Indian farmers. This system led to widespread poverty and indebtedness among peasants.

• The development of railways, ports, and communication systems in India was largely aimed at facilitating the export of raw materials and import of British goods, rather than for the benefit of the Indian population.

• British economic policies, such as the imposition of high tariffs on Indian textiles, destroyed India's handicraft industry and led to the deindustrialization of the Indian economy.

Additional Information

• Social Development of India:

• The British did not prioritize social development in India. While some educational institutions were established, their primary aim was to create a class of Indians who could assist in administrative work.

• The introduction of English education and Western ideas had both positive and negative impacts, but these were incidental rather than deliberate efforts to promote social development.

• Industrialization of India:

• Contrary to industrialization, British policies led to the deindustrialization of India. Traditional industries like textiles, shipbuilding, and metalworks were destroyed due to competition from British manufactured goods.

• While some modern industries were introduced, such as railways and telegraphs, these developments primarily served British economic interests.

• Welfare of Indian Farmers:

• The British policies were exploitative towards Indian farmers. High taxes and exploitative systems like the Zamindari and Ryotwari systems forced farmers into debt and poverty.

• Famines were frequent during British rule due to inadequate agricultural policies and lack of food security measures.

• British Colonial Policies:

• The British imposed a drain of wealth policy, whereby India's wealth was transferred to Britain in the form of revenues, profits from trade, and salaries of British officials.

• India's economy was subordinated to the needs of British industries, leading to the stagnation of Indian agriculture and industries.

Important Points

• Drain of Wealth:

• The concept of the drain of wealth was highlighted by Indian nationalists like Dadabhai Naoroji. His book Poverty and Un-British Rule in India explained how wealth was systematically drained from India to Britain.

• Examples of this drain include the high salaries of British officials, profits from British businesses in India, and payments for British imports.

• Impact on Indian Society:

• The British policies led to widespread poverty and famine in India. The Great Bengal Famine of 1943 is one of the most tragic examples of British apathy towards Indian suffering.

• India's social fabric was also affected, as traditional systems of governance and community support were replaced by exploitative colonial structures.

• Infrastructure Development:

• The British did build infrastructure like railways, ports, and roads, but these were primarily aimed at facilitating the movement of goods for British economic interests rather than for Indian development.

• For instance, the Indian Railways were designed to transport raw materials from the hinterlands to ports for export.

Q27. Answer: (b) Rajgir

The correct answer is Rajgir.

Key Points

• The Women’s Kabaddi World Cup scheduled for June 2025 has been announced to be hosted in Rajgir, Bihar. Rajgir has been chosen due to its historical and cultural significance.

• Rajgir, located in the Nalanda district of Bihar, is known for its rich history and has been a prominent location for hosting significant events in India.

• This decision is expected to promote sports tourism in Bihar and help the region gain recognition on the global sports map.

• The event will attract international athletes and fans, creating an opportunity for the state to showcase its cultural heritage and hospitality.

• Special arrangements, including infrastructure development for the event, are being planned to ensure smooth execution and enhance the spectator experience.

Additional Information

• Rajgir:

• Rajgir is a historical city in the state of Bihar, known for its association with Buddhism and Jainism. It was the ancient capital of the Magadha Kingdom.

• The city is a popular tourist destination due to attractions like the Vishwa Shanti Stupa, hot springs, and the ruins of ancient Nalanda University.

• It is well-connected by road and rail, making it an ideal location for hosting international events.

• Kabaddi:

• Kabaddi is a popular team sport originating in India and is now played internationally.

• It involves two teams, where players take turns to raid the opponent's half, aiming to tag as many players as possible without being caught.

• The sport has a significant following in India and other South Asian countries and has gained popularity worldwide through events like the Pro Kabaddi League.

• Women’s Kabaddi World Cup:

• The Women’s Kabaddi World Cup is an international kabaddi tournament specifically for women, showcasing talents from different countries.

• The event promotes gender equality in sports and provides a platform for female athletes to demonstrate their skills.

• India has traditionally been a dominant force in kabaddi, and hosting such events bolsters the country’s image as a hub for the sport.

• Bihar’s Role in Sports:

• Bihar has been making efforts to promote sports through initiatives like building sports complexes and hosting national and international events.

• The state government has also been encouraging youth participation in sports through dedicated schemes and programs.

Important Points

• Infrastructure Development:

• The hosting of the Women’s Kabaddi World Cup is expected to drive investment in sports infrastructure in Rajgir and the surrounding regions.

• New facilities, including stadiums and training centers, are likely to be developed to meet international standards.

• Cultural Promotion:

• The event will provide an opportunity to showcase Bihar’s cultural heritage to a global audience.

• Traditional arts, cuisine, and handicrafts can also be promoted alongside the event, contributing to economic growth.

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• Global Recognition:

• Hosting the Women's Kabaddi World Cup reinforces India's position as a leader in the sport and highlights the country's commitment to gender-inclusive sports development.

• It will also strengthen Bihar's reputation as a capable host for international events.

Q28. Answer: (b) Differential heating of land and sea

The correct answer is Differential heating of land and sea.

Key Points

• The southwest monsoon in India is primarily caused by the differential heating of land and sea. During summer, the Indian subcontinent, especially the northern plains, heats up faster than the surrounding oceans, creating a low-pressure area over the land.

• The Indian Ocean, on the other hand, remains relatively cooler. This temperature difference causes moisture-laden winds to blow from the high-pressure area over the ocean to the low-pressure area over the land.

• The monsoon winds are further intensified by the Coriolis effect, which deflects winds to the right in the Northern Hemisphere. This shifts the winds from the southwest direction, giving them their name.

• The monsoon winds pick up moisture from the Arabian Sea and the Bay of Bengal, leading to heavy rainfall in various parts of India, especially along the western coast and northeastern states.

• The southwest monsoon is a critical climatic phenomenon for India as it provides about 75-90% of the annual rainfall in most regions, supporting agriculture and water resources.

Additional Information

• Option 1: Tidal effects

• Tidal effects are caused by the gravitational forces exerted by the Moon and the Sun on Earth's water bodies. While tides influence coastal ecosystems, they have no significant role in the formation of the southwest monsoon.

• Tides result in periodic changes in sea levels but do not contribute to large-scale wind patterns or precipitation.

• Option 3: Westerly winds from the Atlantic

• The westerly winds from the Atlantic Ocean primarily affect the weather patterns of Europe and North America. These winds are unrelated to the Indian monsoon system.

• The southwest monsoon in India is driven by seasonal wind patterns over the Indian Ocean and not by the westerly winds originating from the Atlantic.

• Option 4: Local winds from the desert

• While local winds like the loo (hot, dry winds) are significant during the summer in northern India, they are not responsible for the monsoon.

• Such winds have a localized impact and contribute to high temperatures but do not influence the large-scale monsoon system.

• Monsoon Onset and Withdrawal

• The southwest monsoon usually begins in June and lasts until September. It first hits the Kerala coast and then advances northward.

• The withdrawal of the monsoon begins in September, starting from the northwestern parts of India.

• Importance of the Monsoon

• The monsoon is vital for India's agriculture, which employs a significant portion of the population. Crops like rice, sugarcane, and cotton are dependent on monsoon rains.

• It also replenishes reservoirs, lakes, and groundwater, which are crucial for drinking water and hydroelectric power generation.

Important Points

• The southwest monsoon accounts for around 70-90% of India's total annual rainfall, making it a crucial climatic event for the country.

• The Inter-Tropical Convergence Zone (ITCZ), a low-pressure zone near the equator, shifts northward during summer, further aiding the monsoon winds.

• The Western Ghats and the Himalayas significantly influence monsoon rainfall distribution. The Western Ghats cause orographic rainfall, while the Himalayas block the monsoon winds, ensuring rain over the northern plains.

• Climate phenomena like El Niño and La Niña can impact the intensity of the monsoon. El Niño typically weakens the monsoon, leading to drought-like conditions in India.

• Indian Meteorological Department (IMD) monitors and predicts monsoon patterns, which are critical for agricultural planning and disaster management.

Q29. Answer: (b) 1,000 seconds

The correct answer is 1,000 seconds.

Key Points

• The Defence Research and Development Organisation (DRDO) conducted a significant long-duration ground test of an active cooled scramjet subscale combustor on 25 April 2025.

• The test lasted for an impressive duration of 1,000 seconds, marking a major milestone in India's efforts toward advanced propulsion technologies.

• A scramjet combustor is an advanced engine technology where the air-breathing propulsion system operates at supersonic speeds, significantly reducing fuel consumption and increasing efficiency.

• The successful test demonstrates India's growing capabilities in developing next-generation air-breathing propulsion systems, which are essential for hypersonic flight and space exploration.

• Such advancements are critical for defense applications and for strengthening India's position in global aerospace innovation.

Additional Information

• What is a Scramjet Engine?

• A scramjet engine (Supersonic Combustion Ramjet) is an advanced air-breathing propulsion system designed to operate at supersonic speeds.

• The main feature of scramjet technology is that it compresses incoming air for combustion without the need for a rotating compressor, unlike conventional jet engines.

• Scramjets are considered essential for achieving hypersonic speeds (Mach 5 and above), making them ideal for applications in defense and space exploration.

• Significance of the DRDO Test:

• The successful test of the scramjet combustor for 1,000 seconds ensures India's capability in developing indigenous hypersonic technologies.

• It showcases advancements in material science, thermal management, and propulsion engineering.

• The active cooled feature ensures that the engine can withstand the extreme temperatures generated during supersonic combustion.

• Applications of Scramjet Technology:

• Scramjet engines are crucial for hypersonic missiles, which can travel at speeds greater than Mach 5, rendering them difficult to intercept.

• They are used in space launch vehicles for cost-efficient satellite deployment.

• Scramjets are also being explored for future commercial hypersonic flights.

• Global Context:

• Countries like the United States, Russia, and China are also working on scramjet-based propulsion systems, emphasizing its strategic importance.

• India's achievement through DRDO places it among the few nations capable of developing such cutting-edge aerospace technologies.

Important Points

• Active Cooling System:

• It is a crucial component of the scramjet combustor, designed to manage the extreme heat generated during supersonic combustion.

• The system ensures the structural integrity of the combustor and enhances its operational efficiency.

• Hypersonic Technology Development Vehicle (HSTDV):

• The HSTDV is an ambitious project by DRDO to develop hypersonic cruise missiles and reusable space launch vehicles.

• The scramjet combustor test is a critical step in achieving the goals of the HSTDV program.

Q30. Answer: (a) 1999

The correct answer is 1999.

Key Points

• The Swarnjayanti Gram Swarozgar Yojana (SGSY) was launched in 1999 by the Government of India as a major initiative to promote self-employment in rural areas.

• The primary objective of the scheme was to bring assisted poor families (Swarozgaris) above the poverty line by providing them with income-generating assets and resources.

• It emphasized the formation of Self-Help Groups (SHGs), encouraging collective efforts among rural poor families for economic development.

• The scheme was implemented through a mix of bank credit and government subsidies, ensuring financial aid for entrepreneurial ventures.

• SGSY focused on key activities like skill development, capacity building, and marketing support to ensure the sustainability of self-employment initiatives.

• It was eventually restructured into the National Rural Livelihood Mission (NRLM) in 2011, which continues to empower rural communities.

Additional Information

• Key Features of SGSY:

• SGSY focused on the holistic development of rural households by combining resources like subsidies, credit, and training facilities.

• The scheme targeted the Below Poverty Line (BPL) population and assisted them in engaging in productive economic activities.

• It emphasized the formation of activity-based clusters to enhance economies of scale and provide better market linkages for rural products.

• Special attention was given to vulnerable sections like women, Scheduled Castes (SCs), Scheduled Tribes (STs), and disabled individuals.

• Financial assistance under SGSY comprised 75% subsidy by the government and the remaining 25% as a contribution from beneficiaries.

• National Rural Livelihood Mission (NRLM):

• In 2011, SGSY was restructured into NRLM, also known as Aajeevika, to strengthen rural livelihoods further.

• NRLM aims to create efficient and effective institutional platforms for the rural poor to improve their access to financial services and sustainable livelihoods.

• The mission focuses on enabling poor households to access livelihood opportunities and participate in the growth process of the economy.

• It promotes self-reliance among rural communities through participatory approaches and capacity-building initiatives.

• Self-Help Groups (SHGs):

• SHGs are small, informal groups of individuals (usually women) that come together for mutual support and economic empowerment.

• They pool their resources, provide small loans to members, and work collectively towards their shared goals.

• SHGs play a crucial role in financial inclusion by facilitating access to credit and savings for the rural poor.

• These groups also serve as platforms for skill development, entrepreneurship, and social change.

• Rural Development in India:

• India has undertaken numerous initiatives to address rural poverty and unemployment, including schemes like Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Deendayal Antyodaya Yojana (DAY-NRLM).

• These programs aim to provide livelihood opportunities, enhance skills, and promote entrepreneurship in rural areas.

• The focus is on improving the socio-economic status of marginalized communities and fostering inclusive growth.

Q31. Answer: (b) Intense surface heating causing air to rise

The correct answer is Intense surface heating causing air to rise.

Key Points

• Convectional rainfall occurs due to intense surface heating, which causes the air to rise vertically. This rising air cools and condenses to form clouds, resulting in rainfall.

• This type of rainfall is common in equatorial regions, where temperatures are high throughout the year, leading to frequent intense heating of the surface.

• It generally occurs in areas with low-pressure systems, where the heated air rises freely without obstruction.

• Convectional rainfall usually happens during the afternoon or early evening when the surface heating is at its peak.

• This process results in short-lived but intense rainfall, often accompanied by thunder and lightning due to the rapid condensation of moisture in the atmosphere.

Additional Information

• Cyclonic Movements:

• Cyclonic rainfall occurs due to the interaction of air masses in a cyclone, which results in lifting and cooling of warm, moist air.

• This type of rainfall is widespread and sustained, unlike convectional rainfall. (Incorrect for convectional rainfall)

• Mountains forcing air to rise:

• Orographic or relief rainfall occurs when moist air is forced to rise over mountains or elevated terrains.

• As the air rises, it cools and condenses, causing rainfall on the windward side of the mountain. (Incorrect for convectional rainfall)

• Cold and warm air masses meeting:

• This mechanism leads to frontal rainfall, which occurs at the meeting point of cold and warm air masses.

• Frontal rainfall is generally associated with temperate regions, and the rain is more widespread. (Incorrect for convectional

rainfall)

• Characteristics of convectional rainfall:

• It is highly localized and occurs over small areas.

• It is most prominent during the summer months when surface heating is at its maximum.

• Regions like the Amazon Basin and parts of Africa experience convectional rainfall regularly.

Important Points

• Global Examples:

• Equatorial regions such as the Amazon Rainforest, Congo Basin, and Indonesia experience convectional rainfall due to high temperatures and intense heating.

• Temperate regions may experience convectional rainfall during the summer months.

• Associated Weather Conditions:

• Convectional rainfall is often accompanied by thunderstorms, strong winds, and lightning due to the rapid upward movement of air.

• Cloud formations such as cumulonimbus clouds are common during convectional rainfall.

• Significance:

• This type of rainfall is crucial for sustaining tropical rainforests and supporting biodiversity in equatorial regions.

• It also plays a role in replenishing groundwater in localized areas.

Q32. Answer: (b) Article 37

The correct answer is Article 37.

Key Points

• Article 37 of the Indian Constitution explicitly states that the Directive Principles of State Policy (DPSP) are fundamental in governance but are not enforceable by any court of law.

• The DPSP are outlined in Part IV of the Indian Constitution and are intended to guide the government in formulating policies and laws to establish a just society.

• While these principles are non-justiciable, they act as a moral and ethical framework for lawmakers to ensure the welfare of citizens.

• Article 37 emphasizes that the implementation of these principles is crucial for achieving the goals set in the Preamble of the Constitution, such as justice, equality, and liberty.

• The non-enforceability of DPSP differentiates them from Fundamental Rights, which are outlined in Part III of the Constitution and are enforceable by courts.

Additional Information

• Directive Principles of State Policy (DPSP):

• DPSP are inspired by the Irish Constitution and reflect the ideals of socio-economic democracy.

• They aim to create a welfare state by addressing issues like health, education, poverty alleviation, women empowerment, and equitable distribution of resources.

• Examples of DPSP include provisions related to free legal aid, environmental protection, promotion of education, and fair distribution of wealth.

• Fundamental Rights vs. DPSP:

• Fundamental Rights are enforceable by courts and protect individual liberties, while DPSP provide guidelines for governance.

• In case of conflict, the judiciary often balances both, ensuring that neither is undermined significantly.

• Judiciary and DPSP:

• The Supreme Court of India has emphasized the importance of DPSP in cases like Minerva Mills vs. Union of India (1980) to ensure harmony between Fundamental Rights and DPSP.

• DPSP are considered dynamic and are often updated through amendments to reflect contemporary socio-economic issues.

• Examples of DPSP Implementation:

• Initiatives like National Rural Employment Guarantee Act (NREGA) and Right to Education Act align with the goals of DPSP.

• Environmental laws and policies in India are often inspired by the directive principles advocating sustainable development.

Important Points

• Historical Context: The DPSP were included in the Constitution to ensure socio-economic justice and were influenced by the ideals of Mahatma Gandhi and the Directive Principles of Irish Constitution.

• Constitutional Amendments: Various amendments, such as the 42nd Amendment Act (1976), have expanded the scope of DPSP.

• Examples: Articles 38, 39, 39A, 41, and 43 are key DPSP provisions addressing issues like equal pay, protection of children, and

judicial access.

Q33. Answer: (d) public employment

The correct answer is public employment.

Key Points

• Article 335 of the Constitution of India states that the claims of the Scheduled Castes (SCs) and Scheduled Tribes (STs) shall be considered in the matter of appointments to services and posts under the Union and the states.

• The Article ensures that the consideration of these claims is consistent with maintaining the efficiency of administration.

• It emphasizes the importance of addressing historical injustices faced by SCs and STs by providing them opportunities in public employment.

• Article 335 does not relate to taxation policies, religious freedom, or land acquisition. Its focus is primarily on public employment for marginalized communities.

• Thus, the provision aims at creating an inclusive and equitable public administration system, ensuring representation of SCs and STs while balancing administrative efficiency.

Additional Information

• Article 335:

• It is part of the special provisions in the Constitution to safeguard the interests of Scheduled Castes and Scheduled Tribes.

• The Article ensures that their claims in public employment are considered without compromising the quality and efficiency of the administration.

• This provision is a part of the broader framework to address social and economic inequalities prevalent in Indian society.

• Provisions for SCs and STs:

• The Constitution provides various provisions to uplift SCs and STs, such as reservations in educational institutions, public employment, and legislatures.

• Articles 15(4), 16(4), 330, 332, and 334 supplement the provisions of Article 335 to ensure social justice and equality for marginalized communities.

• Reservation in Public Employment:

• As per the current policy, 15% and 7.5% of vacancies in public sector jobs are reserved for Scheduled Castes and Scheduled Tribes, respectively.

• These reservations are aimed at improving representation and participation of SCs and STs in the administrative framework of the country.

• Efforts for Efficiency:

• While reservations are provided, the Constitution ensures that these measures do not lead to inefficiency in public administration.

• It is the responsibility of the government to balance social justice with administrative competency.

Important Points

• Historical Background:

• The provision under Article 335 was included to address systemic inequalities and historical discrimination faced by SCs and STs, ensuring their participation in governance.

• The reservation system was introduced post-independence as a tool to correct historical injustices and create an equitable society.

• Judicial Interpretations:

• The Supreme Court of India has upheld the validity of Article 335 in various judgments, emphasizing that reservation policies should not compromise administrative efficiency.

• For example, in the case of Indra Sawhney v. Union of India (1992), the Court highlighted the significance of balancing representation with efficiency.

• Challenges:

• Despite constitutional provisions, the representation of SCs and STs in higher echelons of administration remains low.

• Efforts are ongoing to address these gaps through policy reforms and enhanced implementation of reservation policies.

Q34. Answer: (c) The Institute of Economic and Peace

The correct answer is The Institute of Economic and Peace.

Key Points

• The Global Terrorism Index (GTI) is published annually by the Institute for Economics and Peace (IEP), which is an independent, non-partisan, and non-profit think tank.

• The GTI provides a comprehensive summary of global trends and patterns in terrorism, analyzing its impact on countries and

their citizens.

• The IEP, headquartered in Sydney, Australia, focuses on promoting peace through data-driven research and analysis.

• The GTI is based on data sourced from the Global Terrorism Database (GTD), maintained by the National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland.

• The 12th edition of the GTI in 2025 will continue to assess terrorism trends, measuring its economic impact, and providing insights into the drivers of terrorism globally.

Additional Information

• Institute for Economics and Peace (IEP):

• Founded in 2007, it specializes in developing metrics to analyze peace and its economic value.

• The IEP publishes reports such as the Global Peace Index, Global Terrorism Index, and Positive Peace Report.

• Its research aims to shift the focus from conflict resolution to peace-building.

• Global Terrorism Index (GTI):

• The GTI measures the impact of terrorism in terms of fatalities, incidents, injuries, and property damage.

• It uses a scoring system to rank countries based on their terrorism levels over a five-year period.

• The report highlights regions most affected by terrorism and provides policy recommendations to address these issues.

• Other Organizations Mentioned:

• UN Counter-Terrorism Centre: Established in 2011, it supports Member States in combating terrorism through capacity building.

• United Nations Office to Counter Terrorism: Created in 2017, it coordinates UN counter-terrorism efforts globally.

• United Nations Office on Drugs and Crime (UNODC): Focuses on combating drugs, organized crime, and terrorism through legal frameworks and enforcement support.

• Global Terrorism Database (GTD):

• The GTD is the most comprehensive unclassified database on terrorist events globally, spanning from 1970 to the present.

• It includes information on over 200,000 terrorist incidents, providing data for analysis in reports like the GTI.

Important Points

• Global Trends:

• Terrorism has had a significant impact globally, with regions like South Asia and Sub-Saharan Africa being most affected.

• The GTI analyzes how political instability, economic factors, and social conditions contribute to terrorism.

• It also examines the role of international cooperation and strategies in combating terrorism.

• Policy Implications:

• The GTI provides actionable insights to policymakers for improving security and peace-building measures.

• It highlights the importance of addressing root causes like poverty, inequality, and political grievances.

Q35. Answer: (c) Bharat Forecasting System

The correct answer is Bharat Forecasting System.

Key Points

• The Bharat Forecasting System is India's advanced high-resolution weather forecasting system, launched in May 2025.

• It is designed to enhance the accuracy of weather predictions and provide real-time updates regarding climatic changes.

• This system utilizes state-of-the-art technology, including advanced computational models, satellite data, and artificial intelligence, to improve the precision of forecasts.

• The system plays a vital role in disaster management, allowing authorities to take timely preventive actions during extreme weather conditions such as cyclones, floods, and heatwaves.

• The Bharat Forecasting System is a part of India's commitment to advancing climate science and ensuring better preparedness for climate-related challenges.

Additional Information

• High-Resolution Weather Forecasting:

• High-resolution models provide granular weather data that is essential for making localized and specific forecasts.

• Such systems are crucial for predicting events like urban flooding, intense rainfall, and thunderstorms with high accuracy.

• They also assist in agriculture planning by predicting rainfall patterns, drought conditions, and other climatic factors.

• Role of Technology in Weather Forecasting:

• Advanced computational systems, like supercomputers, are integral in running complex weather models.

• Use of Artificial Intelligence (AI) enhances predictive capabilities by analyzing vast amounts of historical weather data.

• Satellite imaging and remote sensing enable real-time monitoring of atmospheric conditions.

• Disaster Management and Weather Forecasting:

• Accurate weather forecasting helps in early warning systems, reducing the impact of natural disasters on human lives and infrastructure.

• It supports the development of contingency plans for events like cyclones, landslides, and heatwaves.

• Governments can allocate resources efficiently based on weather predictions.

• Global Comparisons:

• Countries like the USA and Japan have already developed advanced weather forecasting systems leveraging supercomputers and AI technologies.

• The European Centre for Medium-Range Weather Forecasts (ECMWF) is known for its high accuracy in global weather predictions.

• The Bharat Forecasting System positions India as a leader in climate technology in the Asia-Pacific region.

Q36. Answer: (c) 1699

The correct answer is 1699.

Key Points

• Pondicherry was captured by the Dutch in 1693. It became an important colonial settlement due to its strategic location.

• The Treaty of Ryswick, signed in 1697, marked the end of the Nine Years' War between France and the Grand Alliance.

• By the terms of the treaty, colonial possessions captured during the war were restored to their original owners. Hence, Pondicherry was returned to the French East India Company in 1699.

• This event highlighted the importance of diplomatic agreements in resolving territorial disputes during the colonial era.

• The French later developed Pondicherry as a significant trading post and administrative center in India.

Additional Information

• Treaty of Ryswick:

• The treaty was signed in Ryswick, a town near The Hague, Netherlands, in 1697.

• It ended the Nine Years' War (1688–1697) involving France, Spain, England, the Netherlands, and the Holy Roman Empire.

• The treaty restored territorial possessions to their pre-war status, emphasizing peace and diplomatic reconciliation.

• French Presence in India:

• The French East India Company was established in 1664 to compete with other European colonial powers in India.

• Pondicherry was one of the major settlements of the French in India, alongside Karaikal, Mahe, and Yanam.

• It served as the administrative capital of French territories in India until independence.

• Dutch Colonial Influence:

• The Dutch were prominent colonial players in Asia during the 17th century, with significant influence in India, Sri Lanka, and Southeast Asia.

• They captured Pondicherry from the French in 1693 but returned it as per the Treaty of Ryswick.

• Colonial Treaties:

• During the colonial era, treaties like the Treaty of Ryswick were instrumental in resolving conflicts between European powers over overseas territories.

• Such treaties often reshaped the geopolitical landscape of Asia, Africa, and the Americas.

Important Points

• French Colonial Legacy: Pondicherry retains its French heritage, evident in its architecture, cuisine, and culture.

• Strategic Importance: Pondicherry's coastal location made it a vital trading post during the colonial era.

• Historical Significance: The Treaty of Ryswick is a testament to the role of diplomacy in colonial politics, influencing territorial decisions across continents.

• Current Relevance: Pondicherry, now Puducherry, is a Union Territory of India and is known for its unique blend of Indian and French cultures.

Q37. Answer: (a) Seismic zoning and earthquake-resistant buildings

The correct answer is Seismic zoning and earthquake-resistant buildings.

Key Points

• Seismic zoning: Seismic zoning is the process of dividing geographic areas into zones based on their vulnerability to earthquakes. It uses geological and seismic data to determine regions prone to seismic activity, helping authorities and planners implement safety measures effectively.

• Earthquake-resistant buildings: Constructing buildings with earthquake-resistant designs and materials reduces the impact of seismic activity. Features such as reinforced concrete, cross-bracing, and base isolators ensure structural stability during earthquakes.

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• Building codes and regulations: Governments enforce building codes that mandate earthquake-resistant designs. These regulations ensure the safety of infrastructure and reduce casualties during natural disasters.

• Retrofitting structures: Retrofitting involves upgrading existing buildings to make them more resistant to earthquakes. This can include adding braces, dampers, or isolators to enhance stability.

• Awareness and preparedness: Educating the public and builders about seismic zones and the importance of earthquake-resistant construction is crucial. Awareness campaigns and drills help communities prepare for disasters effectively.

Additional Information

• Water harvesting: While water harvesting is a sustainable practice for conserving water, it is not directly related to mitigating the impact of earthquakes. It primarily addresses water scarcity and environmental sustainability.

• Flood barriers: Flood barriers are effective in preventing floods but do not contribute to mitigating the impact of earthquakes. They are designed to block water flow during heavy rains or storms.

• Deforestation: Deforestation increases the risk of soil erosion and landslides during earthquakes, making it detrimental rather than mitigating. Preserving forests helps maintain soil stability and minimizes disaster risks.

• Importance of seismic design: Countries like Japan, situated in high seismic zones, have adopted rigorous seismic design codes and technologies to reduce earthquake damage. Examples include the use of base isolators in iconic structures like Tokyo Skytree.

• Global initiatives: Organizations like the United Nations Development Programme (UNDP) promote earthquake preparedness globally by providing technical assistance and training for disaster risk reduction.

Important Points

• National Disaster Management Authority (NDMA), India: NDMA provides guidelines for seismic zoning and earthquake-resistant construction. It emphasizes retrofitting vulnerable buildings and training engineers on disaster-resilient construction.

• Earthquake-prone regions: In India, states like Uttarakhand, Himachal Pradesh, and Jammu & Kashmir fall under high seismic zones, necessitating strict adherence to earthquake-resistant designs.

• Seismic zones in India: India is divided into four seismic zones (Zone II, III, IV, and V), with Zone V being the most vulnerable. The Bureau of Indian Standards (BIS) provides guidelines for construction practices in these zones.

• Technological advancements: Innovations like base isolation systems, dampers, and vibration control technologies have revolutionized earthquake-resistant construction globally.

• Disaster preparedness drills: Regular drills conducted by schools, workplaces, and communities ensure better preparedness for earthquakes, reducing panic and casualties.

Q38. Answer: (a) Ashwini Vaishnaw

The correct answer is Ashwini Vaishnaw.

Key Points

• Ashwini Vaishnaw, the current Union Minister for Railways, Communications, and Electronics & Information Technology, introduced the Railways (Amendment) Bill in the Rajya Sabha in March 2025.

• The bill aimed to bring comprehensive changes to the functioning and regulations of the Indian Railways, focusing on modernization, safety, and efficiency.

• This bill was part of the government's broader agenda to enhance infrastructure development and improve the operational framework of the railways in India.

• Ashwini Vaishnaw is known for his expertise in both administration and technology, which has significantly influenced reforms within the Indian Railways sector since his appointment in July 2021.

• His tenure has been marked by significant initiatives, including the introduction of Vande Bharat trains and the promotion of digitization within the railways.

Additional Information

• About Ashwini Vaishnaw:

• He is a former IAS officer of the 1994 Odisha cadre and holds an MBA from the Wharton School, University of Pennsylvania.

• Before entering politics, he worked in key roles in the corporate sector with companies such as GE Transportation and Siemens.

• He was appointed as the Minister of Railways, Communications, and Electronics & IT in July 2021, and since then, he has been instrumental in introducing reforms in these sectors.

• Railways (Amendment) Bill 2025:

• The bill introduced provisions to streamline the functioning of the Indian Railways, focusing on public-private partnerships (PPP) for infrastructure development.

• It emphasized passenger safety, modernization of rail infrastructure, and the reduction of operational inefficiencies.

• It also included proposals for the introduction of green energy initiatives in railway operations.

• Indian Railways Modernization:

• Indian Railways is the fourth-largest railway network in the world, operating over a vast network of 67,956 route kilometers.

• Recent modernization efforts include the introduction of semi-high-speed trains like the Vande Bharat Express and electrification of railway tracks.

• Digitization initiatives, such as the Rail Drishti Portal, have been launched to improve transparency and passenger experience.

• Other Ministers Mentioned:

• Kiren Rijiju: Currently serves as the Minister of Earth Sciences and has held various positions in the Indian government but is not directly involved with the railways.

• Sarbananda Sonowal: Minister of Ports, Shipping, and Waterways, and Minister of AYUSH, focusing primarily on water-based transport and wellness initiatives.

• Hardeep Singh Puri: Union Minister for Housing and Urban Affairs and Petroleum & Natural Gas, contributing to urban development and energy sectors.

Important Points

• Indian Railways' Reforms:

• Indian Railways is focusing on achieving net-zero carbon emissions by 2030 through electrification and renewable energy projects.

• Initiatives under the National Rail Plan 2030 aim to increase the railways' share in freight transport to 45%.

• Role of Public-Private Partnerships:

• The government is encouraging PPP models for the development of high-speed rail corridors, station modernization, and freight corridors.

• Examples include the Ahmedabad-Mumbai Bullet Train Project, India's first high-speed rail project.

Q39. Answer: (b) F2

The correct answer is F2.

Key Points

• F2 is the shortcut key used to rename a selected file or folder in the Windows operating system. Upon pressing F2, the name of the file or folder becomes editable, allowing users to enter a new name.

• This functionality is integrated into Windows Explorer, enabling users to quickly manage files and folders without needing to navigate through menus or use a mouse. It saves time in file management tasks.

• The F2 key is a commonly used shortcut across various Windows versions, including Windows 7, Windows 8, Windows 10, and Windows 11. It is part of the standard keyboard shortcuts provided by Microsoft Windows.

• Other function keys like F5 (refresh) or Esc (cancel) serve different purposes and are not used for renaming files or folders. Hence, F2 is the correct option.

• Important Tip: If the F2 shortcut does not work, users should ensure their keyboard is functioning properly or check if function lock (Fn key) is active on their device.

Additional Information

• F5 Key:

• The F5 key is commonly used to refresh the active window or webpage in most web browsers, such as Google Chrome, Mozilla Firefox, and Microsoft Edge.

• In Windows Explorer, pressing F5 refreshes the file view or folder contents.

• This key is not used for renaming files or folders.

• Ctrl Key:

• The Ctrl key is primarily used in combination with other keys to execute various commands like Ctrl+C (copy), Ctrl+V (paste), and Ctrl+Z (undo).

• It does not serve as a direct shortcut for renaming files or folders.

• Esc Key:

• The Esc key is used to cancel or exit an ongoing operation, such as closing a pop-up window or exiting full-screen mode.

• This key does not facilitate file or folder renaming tasks.

• Windows Keyboard Shortcuts:

• Windows OS provides a range of keyboard shortcuts to enhance user efficiency, such as Alt+Tab (switch between windows) and Ctrl+Alt+Del (open security options).

• These shortcuts are designed for specific operations, like navigation, task management, and system control, but F2 remains the dedicated shortcut for renaming files and folders.

Important Points

• Renaming Files in Windows:

• Users can also rename files by right-clicking on the file or folder and selecting the "Rename" option from the context menu.

• Another method includes selecting the file, waiting for a moment, and then clicking on the file name to enable editing.

• Function Keys:

• Function keys on keyboards, from F1 to F12, serve specific purposes based on the application or environment where they are used.

• For example, F1 is generally used to open help menus, and F3 is used for search functions.

• Keyboard Maintenance:

• To ensure proper functioning of shortcut keys like F2, users should clean their keyboards regularly and check for any hardware issues.

• In case of malfunction, troubleshooting steps include updating the keyboard driver or checking the system settings.

Q40. Answer: (a) 3

The correct answer is Option 1.

Key Points

• The Union Territories Laws (Amendment) Bill was introduced in the Lok Sabha on 17 December 2024.

• This Bill amends three Acts, which pertain to the administration and governance of Union Territories in India.

• The primary aim of this amendment is to ensure better legal frameworks for the Union Territories, enhancing administrative efficiency and governance structures.

• Union Territories are governed directly by the Central Government, and the amendment ensures alignment with evolving governance needs and legislative requirements.

• Option 1 is correct as the Bill specifically targets amendments in three specific Acts associated with Union Territories.

Additional Information

• Union Territories in India:

• Union Territories are administrative units governed by the Central Government, unlike states which have their own elected governments.

• India currently has 8 Union Territories, including Delhi, Chandigarh, Jammu & Kashmir, and Puducherry.

• Union Territories often have special legislative needs due to their unique administrative arrangements.

• Acts Governing Union Territories:

• Union Territories are administered under specific laws passed by the Parliament of India.

• These laws define governance structures, powers of administrators, and the role of the Central Government in day-to-day administration.

• Some Union Territories, like Delhi and Puducherry, have legislatures but limited powers compared to states.

• Legislative Amendments:

• Amendments to Acts are carried out to address legal gaps, improve administrative efficiency, and cater to evolving governance challenges.

• The Union Territories Laws (Amendment) Bill is an example of such legislative action aimed at improving governance frameworks.

• Importance of Governance in Union Territories:

• Efficient governance ensures that Union Territories are able to cater to the needs of their residents effectively.

• Union Territories often serve as hubs for economic activities due to their strategic locations (e.g., Delhi and Chandigarh).

• Legal amendments help streamline administrative processes and remove ambiguities in laws.

Important Points

• Role of Parliament:

• The Parliament of India has exclusive powers to legislate for Union Territories under Article 246 of the Constitution.

• Parliament can create, abolish, or merge Union Territories based on legislative needs and administrative requirements.

• Governance Challenges:

• Union Territories often face challenges such as limited autonomy and dependence on Central Government for resources.

• Legislative amendments aim to address these challenges by providing better frameworks for administration.

• Delhi and Puducherry:

• These Union Territories have elected legislative assemblies, but their powers are curtailed under specific laws.

• For instance, the Government of National Capital Territory of Delhi Act governs Delhi's legislative assembly and its powers.

Q41. Answer: (c) 4000

Shortcut Trick

Let the original number be 100%.

After a 7% decrease, the number becomes 100% − 7% = 93%.

Given that 93% of the number = 3720.

1% of the number = 3720 ÷ 93 = 40.

Original Number (100%) = 40 × 100 = 4000.

Therefore The correct answer is 4000.

Alternate Method

Given:

A number when decreased by 7% gives 3720.

Formula Used:

Decreased Value = Original Value × (1 − Rate ÷ 100)

Original Number (100%) = ?

Decreased Value (93%)

−7%

3720

1% = 3720 ÷ 93 = 40 → 100% = 4000

Calculations:

=> Let the original number be x.

=> x − (7% of x) = 3720

=> x × (1 − 0.07) = 3720

=> 0.93x = 3720

=> x = 3720 ÷ 0.93

=> x = 372000 ÷ 93

=> x = 4000

Therefore The correct answer is 4000.

Additional Information

Percentage Change

Percentage change indicates the degree of change over time, calculated as: % Change = [(Final Value − Initial Value) ÷ Initial Value] × 100.

Successive Percentage Change

When a value is subjected to successive percentage changes a% and b%, the net percentage change is given by the formula: (a + b + ab ÷ 100)%.

Base Change Method

If A is x% more than B, then B is [x ÷ (100 + x)] × 100% less than A. Similarly, if A is x% less than B, then B is [x ÷ (100 − x)] × 100% more than A.

Q42. Answer: (b) −129x + 155

Shortcut Trick

Expand the brackets mentally and focus on combining the like terms directly.

x^2 coefficient: 3 × (7/3) − 7 = 7 − 7 = 0

x coefficient: 3 × (−22) − 7 × 9 = −66 − 63 = −129

Constant term: 3 × 19 − 7 × (−14) = 57 + 98 = 155

Resulting expression: −129x + 155

Therefore The correct answer is −129x + 155.

Alternate Method

Given:

Expression: $3((7/3)x^2 - 22x + 19) - 7(x^2 + 9x - 14)$

Calculation:

=> Multiply the constants outside the brackets with each term inside.

=> $[3 \times (7/3)x^2 - 3 \times 22x + 3 \times 19] - [7 \times x^2 + 7 \times 9x - 7 \times 14]$

=> $(7x^2 - 66x + 57) - (7x^2 + 63x - 98)$

=> Remove the brackets and change the signs for the terms in the second bracket.

=> $7x^2 - 66x + 57 - 7x^2 - 63x + 98$

=> Group the like terms together.

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=> $(7x^2 - 7x^2) + (-66x - 63x) + (57 + 98)$

=> $0 - 129x + 155$

=> $-129x + 155$

Therefore The correct answer is $-129x + 155$.

Additional Information

BODMAS Rule

Always follow the sequence: Brackets, Order, Division, Multiplication, Addition, and Subtraction while simplifying algebraic expressions to avoid sign errors.

Distributive Property

For any numbers a, b, and c, the property states that a(b + c) = ab + ac. This is fundamental in expanding terms outside the brackets.

Combining Like Terms

Terms with the exact same variables raised to the identical power can be simplified by adding or subtracting their coefficients.

Q43. Answer: (a) 196.5

Shortcut Trick

Sum of remaining two numbers = Total sum − (Sum of first two + Third number)

Sum of remaining two = 655 − (2 × 80 + 102) = 655 − 262 = 393

Average of remaining two = 393 ÷ 2 = 196.5

Therefore The correct answer is 196.5.

Alternate Method

Given:

Sum of five numbers = 655

Average of the first two numbers = 80

Third number = 102

Formula Used:

Average = Sum of observations ÷ Number of observations

First Two

Sum = 160

Third

102

Remaining Two

Sum = 393

Total Sum = 655

Average of Remaining Two = 393 / 2 = 196.5

Calculations:

=> Sum of the first two numbers = 80 × 2 = 160

=> Sum of the first three numbers = 160 + 102 = 262

=> Sum of the remaining two numbers = 655 − 262 = 393

=> Average of the remaining two numbers = 393 ÷ 2 = 196.5

Therefore The correct answer is 196.5.

Additional Information

Weighted Average

When combining multiple groups with different averages, the overall average is found using the weighted average formula: Combined Average = (n1A1 + n2A2) ÷ (n1 + n2).

Combined Sum Property

The sum of an entire dataset is simply the sum of its non-overlapping subsets. Total Sum = Sum(Subset 1) + Sum(Subset 2) + ... + Sum(Subset n).

Net Deviation Method

Instead of calculating raw sums, averages can be computed by assuming a base average and finding the net deviations of the given numbers. The true average is Assumed Average + (Net Deviation ÷ Total Count).

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Q44. Answer: (c) Rs. 15,300

Shortcut Trick

The multiplying factors for successive discounts of 15% and 10% are 0.85 and 0.90 respectively.

Final Selling Price = Marked Price × 0.85 × 0.90

Final Selling Price = 20000 × 0.85 × 0.90 = 15300

Therefore The correct answer is Rs. 15,300.

Alternate Method

Given:

Marked Price (MP) = Rs. 20,000

First discount (d1) = 15%

Second discount (d2) = 10%

Formula Used:

Final Selling Price = MP × (1 − d1/100) × (1 − d2/100)

MP: Rs. 20k

SP1: Rs. 17k

Final SP

−15%

−10%

Successive Discount Steps

Calculations:

=> Price after 1st discount = 20,000 × (1 − 15/100)

=> Price after 1st discount = 20,000 × 85/100 = Rs. 17,000

=> Final Price after 2nd discount = 17,000 × (1 − 10/100)

=> Final Selling Price = 17,000 × 90/100 = Rs. 15,300

Therefore The correct answer is Rs. 15,300.

Additional Information

Effective Successive Discount

When two successive discounts d1% and d2% are given, the single equivalent discount is: D = (d1 + d2 − d1×d2/100)%.

Marked Price & Cost Price Relation

The relationship between Cost Price, Marked Price, Profit% and Discount% is fixed as: MP/CP = (100 + Profit%) ÷ (100 − Discount%).

Dishonest Dealer

When a dealer uses false weights, the profit is derived from the difference in quantity given to the customer: Profit% = (Error ÷ True Value) × 100.

Q45. Answer: (a) 7467614

Shortcut Trick

For a number to be divisible by 22, it must be divisible by both 2 and 11.

Divisibility by 2: The number must be even (eliminates 6136901).

Divisibility by 11: The difference of the sum of alternate digits must be 0 or a multiple of 11.

Testing 7467614: (4 + 6 + 6 + 7) − (1 + 7 + 4) = 23 − 12 = 11.

Since 11 is divisible by 11, the number 7467614 is divisible by 22.

Therefore The correct answer is 7467614.

Alternate Method

Given:

Options: 7467614, 6136901, 6580350, 8132950

Formula Used:

Divisibility by 22: A number is divisible by 22 if it is exactly divisible by 2 and 11.

Divisibility by 2: The unit digit must be an even number (0, 2, 4, 6, or 8).

Divisibility by 11: The difference between the sum of digits at odd places and the sum of digits at even places must be 0 or a multiple of 11.

Calculations:

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=> Check divisibility by 2: 7467614, 6580350, and 8132950 end with an even digit, so they are divisible by 2.

=> The number 6136901 ends in 1, so it is odd and can be eliminated.

=> Check divisibility by 11 for the remaining numbers:

=> Option 1 (7467614): Sum of odd places = 4 + 6 + 6 + 7 = 23. Sum of even places = 1 + 7 + 4 = 12. Difference = 23 − 12 = 11. (Divisible by 11)

=> Option 3 (6580350): Sum of odd places = 0 + 3 + 8 + 6 = 17. Sum of even places = 5 + 0 + 5 = 10. Difference = 17 − 10 = 7. (Not divisible by 11)

=> Option 4 (8132950): Sum of odd places = 0 + 9 + 3 + 8 = 20. Sum of even places = 5 + 2 + 1 = 8. Difference = 20 − 8 = 12. (Not divisible by 11)

=> Therefore, only the number 7467614 satisfies both conditions.

Therefore The correct answer is 7467614.

Additional Information

Divisibility Rule for Composite Numbers

To check divisibility by any composite number, break it down into co-prime factors and check the divisibility for each factor individually (e.g., for 72, check 8 and 9).

Divisibility Rule for 3 and 9

A number is divisible by 3 or 9 if the sum of all its individual digits is a multiple of 3 or 9, respectively.

Divisibility Rule for 4 and 8

A number is divisible by 4 if the last two digits form a number divisible by 4. It is divisible by 8 if the last three digits form a number divisible by 8.

Q46. Answer: (b) 582/19 %loss

Shortcut Trick

Total CP = Purchase Price + Decoration Cost = 940 + 10 = Rs. 950

Loss = Total CP − SP = 950 − 659 = Rs. 291

Loss % = (Loss ÷ Total CP) × 100

Loss % = (291 ÷ 950) × 100 = 582/19 % loss

Therefore The correct answer is 582/19 % loss.

Alternate Method

Given:

Purchase price of the toy = Rs. 940

Cost of decoration = Rs. 10

Selling price (SP) of the toy = Rs. 659

Formula Used:

Total Cost Price (CP) = Purchase Price + Overhead Expenses

Loss = Total CP − SP

Loss % = (Loss ÷ Total CP) × 100

Profit & Loss Breakdown

SP = Rs. 659

Loss = Rs. 291

Total CP = Rs. 950

Loss % = (291 ÷ 950) × 100 = 582/19 %

Calculation:

=> Total Cost Price (CP) = 940 + 10 = Rs. 950

=> Since Total CP > SP, there is a loss on the transaction.

=> Loss = 950 − 659 = Rs. 291

=> Loss % = (291 ÷ 950) × 100

=> Loss % = 2910 ÷ 95

=> Loss % = 582/19 %

Therefore The correct answer is 582/19 % loss.

Additional Information

Overhead Expenses

Any additional costs incurred before the sale of an item, such as transportation, repair, or decoration, are always added to the

base purchase price to form the Total Cost Price.

Profit and Loss Formulation

Profit occurs when SP > CP and Loss occurs when CP > SP. Both Profit % and Loss % are always calculated based on the Total Cost Price unless specifically stated otherwise.

Marked Price & Discount

Discount is always applied on the Marked Price (MP). It is deduced before calculating profit or loss. Formula: SP = MP − Discount.

Q47. Answer: (c) 13

Shortcut Trick

Let Ram's age be R and Ramya's age be Y.

From the first condition: 2R = 6Y + 14 => R = 3Y + 7

From the second condition: 4Y = R − 4 => R = 4Y + 4

Equating both: 3Y + 7 = 4Y + 4 => Y = 3

Substitute Y = 3 into any equation => R = 4(3) + 4 = 16

Difference in their ages = 16 − 3 = 13 years.

Therefore The correct answer is 13 years.

Alternate Method

Given:

2 × Ram's age = 6 × Ramya's age + 14

4 × Ramya's age = Ram's age − 4

Age Comparison

Ram

16 yrs

Ramya

3 yrs

Difference = 13 yrs

Calculations:

Let the age of Ram be x years and the age of Ramya be y years.

According to the first condition:

=> 2x = 6y + 14

Dividing the equation by 2:

=> x = 3y + 7

According to the second condition:

=> 4y = x − 4

=> x = 4y + 4

Equating both expressions for x:

=> 3y + 7 = 4y + 4

=> 4y − 3y = 7 − 4

=> y = 3

Substitute the value of y to find x:

=> x = 3(3) + 7

=> x = 9 + 7 = 16

Now, finding the difference between their ages:

=> x − y = 16 − 3 = 13 years.

Therefore The correct answer is 13 years.

Additional Information

Ages & Linear Equations

Problems based on ages usually require forming linear equations. Identify the unknowns, express the given conditions as equations, and solve them simultaneously using substitution or elimination.

Ratio of Ages

When the ratio of ages is given (e.g., A:B = p:q), we can assume their ages as px and qx. This converts the given ratio into exact numerical values that can be seamlessly used in algebraic expressions.

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Constant Difference Rule

A core principle of age problems is that the absolute difference between the ages of any two individuals always remains constant over time, regardless of how many years pass into the future or the past.

Q48. Answer: (b) 121

Shortcut Trick

The third proportional of two numbers 'a' and 'b' is calculated directly using the formula: $b^2 \div a$.

Here, the first term a = 4, and the second term b = 22.

Third proportional (x) = (22 × 22) ÷ 4

x = 484 ÷ 4 = 121

Therefore The correct answer is 121.

Alternate Method

1st Term

4

2nd Term

22

3rd Term

x

× 5.5

× 5.5

Continuous Proportion: 4 : 22 :: 22 : x

x = 22 × 5.5 = 121

Given:

First number (a) = 4

Second number (b) = 22

Let the third proportional be x.

Formula Used:

If x is the third proportional to a and b, then a, b, and x are in a continuous proportion. This means the ratio of the first term to the second term is equal to the ratio of the second term to the third term.

a : b :: b : x

a ÷ b = b ÷ x

Calculations:

=> 4 ÷ 22 = 22 ÷ x

By cross-multiplying, we get:

=> 4 × x = 22 × 22

=> 4x = 484

=> x = 484 ÷ 4

=> x = 121

Therefore The correct answer is 121.

Additional Information

Mean Proportional

For any two numbers a and b, the mean proportional is the square root of their product. It is given by √(ab).

Fourth Proportional

For three given numbers a, b, and c, the fourth proportional x satisfies the ratio equality a : b :: c : x. It is calculated as x = (b × c) ÷ a.

Continuous Proportion

When three quantities a, b, and c are related such that a ÷ b = b ÷ c, they are said to be in continuous proportion. In this relation, b is the mean proportional and c is the third proportional.

Q49. Answer: (b) 8.31

Shortcut Trick

The square root of a decimal halves the number of decimal places.

=> √121 = 11

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=> √0.0121 = 0.11

=> √7.84 = 2.8

=> 11 + 0.11 − 2.8 = 8.31

Therefore The correct answer is 8.31.

Alternate Method

Given:

Expression: √121 + √0.0121 − √7.84

Calculations:

=> Convert the decimals into fractions to calculate the square roots easily.

=> √121 + √(121 ÷ 10000) − √(784 ÷ 100)

=> Since 11 × 11 = 121 and 28 × 28 = 784, we simplify the roots:

=> 11 + (11 ÷ 100) − (28 ÷ 10)

=> 11 + 0.11 − 2.8

=> 11.11 − 2.80

=> 8.31

Therefore The correct answer is 8.31.

Additional Information

Square Root of Decimals

When finding the square root of a decimal number, count the number of decimal places. The square root will have exactly half the number of decimal places (e.g., 4 decimal places in 0.0121 become 2 decimal places in 0.11).

Perfect Squares

Memorizing perfect squares up to 30 helps to directly solve simplification problems without the need for prime factorization. For example, knowing that $28^2 = 784$ speeds up the calculation directly.

BODMAS Rule

Simplifications must strictly follow the BODMAS sequence: Brackets, Orders (powers and square roots), Division, Multiplication, Addition, and Subtraction.

Q50. Answer: (a) M - N = 1

Shortcut Trick

For divisibility by 11, the difference between the sum of digits at alternating places must be 0 or a multiple of 11.

Sum of odd-placed digits from the left = N + 1 + 2 = N + 3

Sum of even-placed digits from the left = 0 + M + 2 = M + 2

Difference = (M + 2) − (N + 3) = M − N − 1

Equating the difference to 0 for the lowest multiple of 11: M − N − 1 = 0 => M − N = 1

Therefore The correct answer is M − N = 1.

Alternate Method

Given:

A 6-digit number N01M22 is perfectly divisible by 11.

Formula Used:

A number is divisible by 11 if the difference between the sum of its digits at odd places and the sum of its digits at even places is either 0 or a multiple of 11.

Calculations:

=> Let us calculate the sum of the digits at odd positions (1st, 3rd, and 5th from the left).

=> S_(odd) = N + 1 + 2 = N + 3

=> Let us calculate the sum of the digits at even positions (2nd, 4th, and 6th from the left).

=> S_(even) = 0 + M + 2 = M + 2

=> Now, find the difference between the even-placed sum and the odd-placed sum.

=> Difference = S_(even) − S_(odd) = (M + 2) − (N + 3) = M − N − 1

=> For the number to be divisible by 11, this difference must be exactly 0, 11, or −11.

=> Case 1: M − N − 1 = 0 => M − N = 1 (This is a valid relation for single digits)

=> Case 2: M − N − 1 = 11 => M − N = 12 (Not possible since M and N are single digits and their maximum possible difference is 9)

=> Case 3: M − N − 1 = −11 => M − N = −10 (Not possible as the minimum difference can be −9)

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=> Thus, the only feasible and correct relation is M − N = 1.

Therefore The correct answer is M − N = 1.

Additional Information

Divisibility Rule of 3 & 9

A number is divisible by 3 or 9 if the sum of all its digits is divisible by 3 or 9, respectively.

Divisibility Rule of 4 & 8

A number is divisible by 4 if its last two digits form a number that is divisible by 4. It is divisible by 8 if its last three digits are divisible by 8.

Combined Divisibility Rule of 7, 11, and 13

Group the digits in blocks of 3 starting from right to left. If the difference between the sums of the alternating blocks is exactly divisible by 7, 11, or 13, then the number is divisible by 7, 11, or 13 respectively.

Q51. Answer: (c) 18

Shortcut Trick

For any regular polygon, Interior Angle + Exterior Angle = 180°.

We are given that Interior Angle − Exterior Angle = 140°.

Subtracting the given difference from 180° gives twice the Exterior Angle: 2 × Exterior Angle = 40° => Exterior Angle = 20°.

Number of sides = Total sum of exterior angles ÷ Each Exterior Angle = 360° ÷ 20° = 18.

Therefore The correct answer is 18 sides.

Alternate Method

Given:

Difference between interior and exterior angle = 140°

Formula Used:

Interior Angle (I) + Exterior Angle (E) = 180°

Number of sides (n) = 360° ÷ E

I = 160°

E = 20°

Polygon Interior

Polygon Exterior

Calculations:

=> Let Interior angle = I and Exterior angle = E

=> I + E = 180°

=> I − E = 140° (Given)

=> Subtracting the second equation from the first:

=> (I + E) − (I − E) = 180° − 140°

=> 2E = 40°

=> E = 20°

=> The sum of exterior angles of any regular polygon is 360°.

=> n = 360° ÷ E

=> n = 360° ÷ 20°

=> n = 18

Therefore The correct answer is 18 sides.

Additional Information

Interior Angles of a Polygon

The sum of all interior angles of an n-sided polygon is given by the formula: (n − 2) × 180°. For a regular polygon, each interior angle equals [(n − 2) × 180°] ÷ n.

Exterior Angles of a Polygon

The sum of exterior angles of any convex polygon is always 360°, regardless of the number of sides. For a regular polygon, each exterior angle is exactly 360° ÷ n.

Number of Diagonals

The total number of diagonals in an n-sided polygon can be calculated using the direct formula: n(n − 3) ÷ 2.

Q52. Answer: (d) Rs. 48

Shortcut Trick

Since the rate is given per month and the duration is exactly 1 month, the interest is simply the given percentage of the principal.

=> SI = 4% of 1200

=> SI = (4 × 1200) ÷ 100 = 48

Therefore The correct answer is Rs. 48.

Alternate Method

Given:

Principal (P) = Rs. 1200

Rate (R) = 4% per month

Time (T) = 1 month

Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Principal

Rs. 1200

R = 4% per month

T = 1 month

Interest

Rs. 48

Calculations:

=> SI = (1200 × 4 × 1) ÷ 100

=> SI = 4800 ÷ 100

=> SI = 48

Therefore The correct answer is Rs. 48.

Additional Information

Unit Matching Rule

When calculating interest, the time period unit must always match the rate unit. If the rate is given per month, time should be in months. If the rate is per annum, time should be in years.

Simple Interest (SI) Formula

SI = (P × R × T) ÷ 100, where P is Principal, R is Rate of interest, and T is Time period.

Amount Formula

The total accumulated amount at the end of the time period is calculated as: Amount (A) = Principal (P) + Simple Interest (SI).

Q53. Answer: (c) 531 cm2

Shortcut Trick

Surface area of a sphere = $4 \times \pi \times r^2$

Using fractional values for faster calculation: r = 6.5 cm = 13/2 cm

Surface Area = 4 × (22/7) × (13/2) × (13/2)

Surface Area = (22 × 169) ÷ 7 = 3718 ÷ 7

Surface Area = 531.14 $cm^2 \approx 531\ cm^2$

Therefore The correct answer is 531 cm^2.

Alternate Method

Given:

Radius of the sphere (r) = 6.5 cm

π = 22/7

Formula Used:

Surface Area of a sphere = $4\pi r^2$

r = 6.5 cm

Surface Area = $4\pi r^2$

Calculations:

=> Surface Area = 4 × (22/7) × $(6.5)^2$

=> Surface Area = 4 × (22/7) × 42.25

=> Surface Area = (88 × 42.25) ÷ 7

=> Surface Area = 3718 ÷ 7

=> Surface Area = 531.1428... cm^2

=> Rounding off to the nearest integer, we get 531 cm^2.

Therefore The correct answer is 531 cm^2.

Additional Information

Volume of a Sphere

The volume of a sphere can be calculated using the formula $V = (4/3)\pi r^3$, where r is the radius.

Hemisphere Properties

A hemisphere has a curved surface area (CSA) of $2\pi r^2$ and a total surface area (TSA) of $3\pi r^2$.

Diameter Relation

The diameter (d) is twice the radius (d = 2r). The surface area can also be expressed as πd^2.

Q54. Answer: (b) 3.35 km

Shortcut Trick

Convert the given time directly into hours to find the distance in kilometres.

Time = 3 minutes = 3/60 hours = 1/20 hours

Distance = Speed × Time

Distance = 67 × (1/20) = 3.35 km

Therefore The correct answer is 3.35 km.

Alternate Method

Given:

Speed of the car = 67 km/hr

Time taken to cross the bridge = 3 minutes

Formula Used:

Distance = Speed × Time

Length of Bridge = Distance

Car

Speed = 67 km/hr

Bridge

Time = 3 minutes

Calculations:

=> Time taken in hours = 3 ÷ 60

=> Time = 1/20 hours

=> Length of the bridge = Distance = 67 × (1/20)

=> Length of the bridge = 67 ÷ 20

=> Length of the bridge = 3.35 km

Therefore The correct answer is 3.35 km.

Additional Information

Unit Conversions

To convert speed from km/hr to m/s, multiply by 5/18. To convert speed from m/s to km/hr, multiply by 18/5.

Relative Speed

When two objects move in opposite directions, their relative speed is the sum of their individual speeds (v1 + v2). When moving in the same direction, it is the difference (v1 − v2).

Average Speed

If an object covers equal distances at speeds a and b, the average speed is (2ab) ÷ (a + b). For unequal distances, use Average Speed = Total Distance ÷ Total Time.

Q55. Answer: (a) 99

Shortcut Trick

The product of two numbers is equal to the product of their HCF and LCM.

Other Number = (HCF × LCM) ÷ First Number

Other Number = (11 × 792) ÷ 88

Other Number = 792 ÷ 8 = 99

Therefore The correct answer is 99.

Alternate Method

Given:

HCF = 11

LCM = 792

First number (N1) = 88

Formula Used:

N1 × N2 = HCF × LCM

Calculations:

=> 88 × N2 = 11 × 792

=> N2 = (11 × 792) ÷ 88

=> N2 = 792 ÷ 8

=> N2 = 99

Therefore The correct answer is 99.

Additional Information

Property of HCF and LCM for Two Numbers

The product of the Highest Common Factor (HCF) and the Least Common Multiple (LCM) of two numbers is exactly equal to the product of the numbers themselves. Note that this formula holds true only for a pair of two numbers.

Co-prime Numbers

Two numbers are said to be co-prime if their HCF is exactly 1. In such cases, their LCM is directly calculated as the product of the two numbers.

HCF and LCM of Fractions

HCF of fractions = (HCF of numerators) ÷ (LCM of denominators)

LCM of fractions = (LCM of numerators) ÷ (HCF of denominators)

Q56. Answer: (d) Second scheme

Shortcut Trick

When the sum of two successive discounts is constant (35% in all cases), the equivalent discount is minimum when their product is maximum.

Product of discounts: First = 25 × 10 = 250, Second = 20 × 15 = 300, Third = 30 × 5 = 150.

The Second scheme has the maximum product (300), hence it gives the minimum equivalent discount.

A minimum discount to the customer means maximum profit and highest selling price for the company.

Therefore The correct answer is Second scheme.

Alternate Method

Given:

First scheme: 25% and 10%

Second scheme: 20% and 15%

Third scheme: 30% and 5%

Formula Used:

Equivalent Discount = a + b − (a × b ÷ 100)

Equivalent Discount & Selling Price (MP = 100)

Scheme 1

Discount = 32.5%

SP = 67.5

Scheme 2

Discount = 32.0%

SP = 68.0

Scheme 3

Discount = 33.5%

SP = 66.5

Lowest Discount → Highest SP → Best for Company

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Calculations:

=> First Scheme Equivalent Discount = 25 + 10 − (25 × 10 ÷ 100)

=> First Scheme Equivalent Discount = 35 − 2.5 = 32.5%

=> Second Scheme Equivalent Discount = 20 + 15 − (20 × 15 ÷ 100)

=> Second Scheme Equivalent Discount = 35 − 3.0 = 32.0%

=> Third Scheme Equivalent Discount = 30 + 5 − (30 × 5 ÷ 100)

=> Third Scheme Equivalent Discount = 35 − 1.5 = 33.5%

=> Among all the options, the Second scheme gives the minimum equivalent discount to the buyer (32.0%).

=> A lower discount yields a higher Selling Price, maximizing profit. Thus, it is the best scheme for the company.

Therefore The correct answer is Second scheme.

Additional Information

Successive Discount

When two discounts a% and b% are applied one after another on the marked price, the single equivalent discount formula is a + b − (a × b ÷ 100)%.

Best Scheme for Seller vs Buyer

For a seller (company), the scheme with the minimum equivalent discount is best as it yields the maximum Selling Price. Conversely, for a buyer (customer), the scheme with the maximum equivalent discount is most profitable.

Constant Sum Discount Trick

When the sum of two successive discounts is identical across different choices, the maximum discount is obtained when the difference between the two percentage values is the largest. The minimum discount is obtained when the two values are closest to each other.

Q57. Answer: (a) 2700

Shortcut Trick

Side of one cube, a = $\sqrt[3]{3375}$ = 15 cm.

Area of one face of the cube = $a^2 = 15^2 = 225$ cm².

When 5 cubes are joined end-to-end, the lateral surface comprises exactly 12 square faces (5 front, 5 back, 1 left, 1 right).

Total Lateral Surface Area = 12 × 225 = 2700 cm².

Therefore The correct answer is 2700 cm².

Alternate Method

Given:

Volume of one solid cube = 3375 cm³

Number of cubes joined end-to-end = 5

Formula Used:

Volume of Cube = a^3

Lateral Surface Area of Cuboid = 2h(l + b)

l = 75 cm

h = 15 cm

b = 15 cm

Calculations:

=> $a^3 = 3375$

=> a = 15 cm

=> When 5 cubes are joined in a row, the dimensions of the newly formed cuboid are:

=> Length of cuboid (l) = 5 × 15 = 75 cm

=> Breadth of cuboid (b) = 15 cm

=> Height of cuboid (h) = 15 cm

=> Lateral Surface Area = 2 × h × (l + b)

=> LSA = 2 × 15 × (75 + 15)

=> LSA = 30 × 90 = 2700 cm²

Therefore The correct answer is 2700 cm².

Additional Information

Total vs Lateral Surface Area

Total Surface Area (TSA) of a cuboid includes all 6 faces: TSA = 2(lb + bh + hl). Lateral Surface Area (LSA) excludes the top and bottom faces: LSA = 2h(l + b).

Joining Cubes in a Row

When n solid cubes of side length a are joined end-to-end, they form a cuboid with dimensions: length = n × a, breadth = a, and height = a.

Diagonal of a Cuboid

The length of the longest diagonal (or rod) that can logically fit inside a cuboid is given by $\sqrt{(l^2 + b^2 + h^2)}$.

Q58. Answer: (d) 56/5

Shortcut Trick

Total work = LCM(21, 12, 8) = 168 units.

Efficiencies: Anjali = 8, Anjali + Ayushi = 14, All three = 21.

Efficiency of Ankita = (All three) − (Anjali + Ayushi) = 21 − 14 = 7.

Required time for Anjali and Ankita = 168 ÷ (8 + 7) = 168 ÷ 15 = 56/5 days.

Therefore The correct answer is 56/5 days.

Alternate Method

Given:

Time taken by Anjali = 21 days

Time taken by Anjali and Ayushi together = 12 days

Time taken by Anjali, Ayushi and Ankita together = 8 days

Person	Days	Total Work	Efficiency
Anjali	21	168	8
Anjali + Ayushi	12	14	
Anjali + Ayushi + Ankita	8	21	

Calculations:

=> Efficiency of Ankita = (Efficiency of all three) − (Efficiency of Anjali + Ayushi)

=> Efficiency of Ankita = 21 − 14 = 7

=> Combined efficiency of Anjali and Ankita = 8 + 7 = 15

=> Time taken by Anjali and Ankita = Total Work ÷ Combined Efficiency

=> Time taken = 168 ÷ 15 = 56/5 days

Therefore The correct answer is 56/5 days.

Additional Information

Total Work Concept

In Time and Work problems, Total Work is generally assumed as the LCM of all the given days to make calculations integer-based and easier.

Efficiency

Efficiency is the amount of work done in one unit of time. Efficiency = Total Work ÷ Total Days Taken. Time taken and efficiency are inversely proportional.

Combined Work Rule

If person A takes x days and person B takes y days to complete a task, the time taken by both working together is (x × y) ÷ (x + y) days.

Q59. Answer: (b) 0

Shortcut Trick

Put A = 60° (as A is an acute angle).

M = $\sqrt{[(1 + \cos60°) \div (1 - \cos60°)]} - \operatorname{cosec}60° - \cot60°$

M = $\sqrt{[(1 + 1/2) \div (1 - 1/2)]} - 2/\sqrt{3} - 1/\sqrt{3}$

M = $\sqrt{[(3/2) \div (1/2)]} - 3/\sqrt{3}$

M = $\sqrt{3} - \sqrt{3} = 0$

Therefore The correct answer is 0.

Alternate Method

Given:

M = √[(1 + cosA) ÷ (1 − cosA)] − cosecA − cotA

Formula Used:

sin²A + cos²A = 1

cosecA = 1 / sinA

cotA = cosA / sinA

Calculations:

=> Rationalize the term inside the square root by multiplying the numerator and denominator by (1 + cosA):

=> M = √[((1 + cosA) × (1 + cosA)) ÷ ((1 − cosA) × (1 + cosA))] − cosecA − cotA

=> M = √[(1 + cosA)² ÷ (1 − cos²A)] − cosecA − cotA

=> Using sin²A = 1 − cos²A, we get:

=> M = √[(1 + cosA)² ÷ sin²A] − cosecA − cotA

=> Since A is an acute angle, sinA and (1 + cosA) are always positive. Removing the square root:

=> M = (1 + cosA) / sinA − cosecA − cotA

=> M = (1 / sinA) + (cosA / sinA) − cosecA − cotA

=> M = cosecA + cotA − cosecA − cotA

=> M = 0

Therefore The correct answer is 0.

Additional Information

Fundamental Trigonometric Identities

sin²θ + cos²θ = 1 | sec²θ − tan²θ = 1 | cosec²θ − cot²θ = 1

Reciprocal Trigonometric Ratios

cosecθ = 1 / sinθ | secθ = 1 / cosθ | cotθ = 1 / tanθ = cosθ / sinθ

Value Putting Strategy

When simplifying trigonometric expressions, substituting standard acute angles like 30°, 45°, or 60° can quickly yield the answer. Always ensure the chosen angle does not make the denominator zero or the expression undefined.

Q60. Answer: (a) 19, 33

Shortcut Trick

Check the given options to find numbers with a sum of 52 and an LCM of 627.

Option 1: 19 + 33 = 52. Since they are co-prime, LCM = 19 × 33 = 627. (Matches both conditions)

Option 2: 12 + 40 = 52, but their LCM is 120. (Rejected)

Option 3: 17 + 35 = 52, but their LCM is 595. (Rejected)

Option 4: 24 + 28 = 52, but their LCM is 168. (Rejected)

Therefore The correct answer is 19, 33.

Alternate Method

Given:

Sum of two numbers = 52

LCM of the two numbers = 627

Formula Used:

Product of numbers = HCF × LCM

Quadratic roots formula: x² − (Sum of roots)x + (Product of roots) = 0

Verification of Correct Option

Num 1 = 19

Num 2 = 33

Sum = 52

LCM = 627

Calculations:

Let the two numbers be x and y, and their highest common factor be h.

=> x + y = 52

=> h must strictly divide both their sum (52) and their LCM (627).

=> Factors of 52 = 1, 2, 4, 13, 26, 52

=> Factors of 627 = 1, 3, 11, 19, 33, 57, 209, 627

=> The only common factor is 1, so h = 1. This means the numbers are co-prime.

=> For co-prime numbers, x × y = LCM = 627.

=> Using the sum and product, we form a quadratic equation:

=> $a^2 - (x + y)a + (x \times y) = 0$

=> $a^2 - 52a + 627 = 0$

=> $a^2 - 33a - 19a + 627 = 0$

=> $a(a - 33) - 19(a - 33) = 0$

=> $(a - 19)(a - 33) = 0$

=> The roots are a = 19 or a = 33.

Therefore The correct answer is 19, 33.

Additional Information

Relation between HCF and LCM

For any two positive integers a and b, the product of their HCF and LCM always equals the product of the numbers: HCF(a, b) × LCM(a, b) = a × b.

Co-prime Numbers

Two numbers are considered co-prime if their highest common factor (HCF) is 1. The LCM of two co-prime numbers is always equal strictly to their product.

Divisibility Property of HCF

The HCF of two numbers acts as a universal divisor for their sum, their difference, and their LCM.

Q61. Answer: (c) 6 km/hr

Shortcut Trick

When distance is constant, speed and time are inversely proportional.

If Abhay doubles his speed, his time is halved (from T to T/2).

Total difference in Abhay's time = 5 hours (more) + 8 hours (less) = 13 hours.

So, T − T/2 = 13 => T/2 = 13 => T = 26 hours.

Abhay's speed = Distance ÷ Time = 156 ÷ 26 = 6 km/hr.

Therefore The correct answer is 6 km/hr.

Alternate Method

Given:

Total distance = 156 km

Abhay initially takes 5 hours more than Sameer.

When Abhay doubles his speed, he takes 8 hours less than Sameer.

Formula Used:

Speed = Distance ÷ Time

Distance = 156 km

Abhay's New

Time (T/2)

Sameer's

Time

Abhay's Old

Time (T)

8 hours less

5 hours more

Total Difference = T − T/2 = 13 hours

Calculations:

Let Sameer's time be t hours.

=> Abhay's original time (T) = t + 5 (Equation 1)

When Abhay doubles his speed, his new time becomes half, i.e., T/2.

=> Abhay's new time (T/2) = t − 8 (Equation 2)

Subtracting Equation 2 from Equation 1:

=> T − T/2 = (t + 5) − (t − 8)

=> T/2 = 13

=> T = 26 hours

Now, substitute the time into the speed formula:

=> Abhay's Speed = Total Distance ÷ Original Time

=> Abhay's Speed = 156 ÷ 26

=> Abhay's Speed = 6 km/hr

Therefore The correct answer is 6 km/hr.

Additional Information

Inverse Relation of Speed and Time

For a constant distance, Speed is inversely proportional to Time (S prop. to 1/T). If speed is multiplied by a factor x, the time taken is divided by x.

Average Speed

When a distance is covered in parts, Average Speed = Total Distance ÷ Total Time. If equal distances are covered at speeds a and b, Average Speed = 2ab ÷ (a + b).

Relative Speed

When two bodies move in the same direction, Relative Speed = |S1 − S2|. When moving in opposite directions, Relative Speed = S1 + S2.

Q62. Answer: (a) -27

Shortcut Trick

Apply the BODMAS rule directly to the given expression.

Division: (−60) ÷ (−10) = 6

Multiplication: (−2) × 6 = −12

Substitute and calculate: −9 − 6 + (−12) = −27

Therefore The correct answer is −27.

Alternate Method

Given:

Expression = (−9) − (−60) ÷ (−10) + (−2) × 6

Concept Used:

BODMAS Rule: Brackets, Order, Division, Multiplication, Addition, Subtraction.

Calculations:

=> First, perform the division:

=> (−60) ÷ (−10) = 6

=> The expression becomes: (−9) − 6 + (−2) × 6

=> Next, perform the multiplication:

=> (−2) × 6 = −12

=> The expression becomes: (−9) − 6 + (−12)

=> Finally, perform addition and subtraction from left to right:

=> −9 − 6 = −15

=> −15 + (−12) = −27

Therefore The correct answer is −27.

Additional Information

BODMAS Rule

It dictates the order of operations: Brackets, Orders (powers/roots), Division, Multiplication, Addition, Subtraction. Operations of the same level (like addition/subtraction) are evaluated from left to right.

Sign Rules in Multiplication and Division

Dividing or multiplying two negative numbers gives a positive result. A negative number multiplied or divided by a positive number gives a negative result.

Sign Rules in Addition and Subtraction

Adding two negative numbers results in a larger negative number. Subtracting a positive number from a negative number decreases its overall value further.

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Q63. Answer: (d) 270

Shortcut Trick

Ratio of the first number to the second number = 5 : 1

Product of the ratio parts = 5 × 1 = 5 units²

5 units² = 10125 => 1 unit² = 2025

1 unit = √2025 = 45

Sum of the numbers = (5 + 1) = 6 units = 6 × 45 = 270

Therefore The correct answer is 270.

Alternate Method

Given:

Product of two positive numbers = 10125

First number = 5 × Second number

Formula Used:

Let the second number be x, then the first number is 5x.

Sum = x + 5x = 6x

Ratio Representation (5 : 1)

1st Number :

x

x

x

x

x

2nd Number :

x

Product = 5x × x = 5x² = 10125

Calculations:

=> 5x × x = 10125

=> 5x² = 10125

=> x² = 2025

=> x = √2025 = 45 (since the numbers are positive)

=> Second number = x = 45

=> First number = 5x = 5 × 45 = 225

=> Sum of the numbers = 225 + 45 = 270

Therefore The correct answer is 270.

Additional Information

Ratio Product Rule

When two numbers are given in a ratio a : b, their product is mathematically expressed as a × b × x² (where x is the common multiplier unit), not simply a × b × x.

Square Roots of Numbers Ending in 25

If a perfect square ends in 25, its square root will end in 5. The remaining part of the number is the product of two consecutive integers n × (n + 1). Here, 2025 ends in 25, and 20 = 4 × 5, resulting in the square root being 45.

Sum and Difference Algebraic Identity

For any two numbers x and y, the relation (x + y)² = (x − y)² + 4xy is incredibly useful to find the sum when only the difference and product of the two numbers are given.

Q64. Answer: (d) Rs. 47,400

Shortcut Trick

Let the principal be 100 units.

Interest for the 1^(st) year = 10% of 100 = 10 units.

Interest for the 2^(nd) year = 10 units + (10% of 10 units) = 11 units.

Given, 11 units = Rs. 5,214

=> 100 units = (5214 ÷ 11) × 100 = Rs. 47,400

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Therefore The correct answer is Rs. 47,400.

Alternate Method

Given:

Rate (R) = 10% per annum compounded annually

Compound Interest for the 2^(nd) year = Rs. 5,214

Formula Used:

Amount after n years (A) = $P(1 + R/100)^n$

CI for the n^(th) year = Amount after n years − Amount after (n−1) years

Principal (P)

Amount 1

Amount 2

1st Yr CI = 10%

2nd Yr CI = 11%

Rs. 5,214

Calculations:

=> Amount after 1 year = $P(1 + 10/100)^1 = 1.1P$

=> Amount after 2 years = $P(1 + 10/100)^2 = 1.21P$

=> Compound Interest for the 2^(nd) year = 1.21P − 1.1P

=> 0.11P = 5214

=> P = 5214 ÷ 0.11

=> P = 47,400

Therefore The correct answer is Rs. 47,400.

Additional Information

Effective Rate of Compound Interest

For 2 years at R%, the effective compound interest rate can be directly found using the successive percentage formula: R + R + (R × R)/100.

Compound Interest for a Specific Year

The compound interest for exactly the n^(th) year can be directly calculated by evaluating: CI_n = P(1 + R/100)^(n−1) × (R/100).

Simple vs Compound Interest Difference

For the 1^(st) year, both SI and CI are equal. From the 2^(nd) year onwards, CI becomes progressively greater because interest is recursively charged on the accumulated interest.

Q65. Answer: (c) 21%

Shortcut Trick

Let the marked weight be 100 units.

Selling Price (SP) = 100 + 3% profit = 103 units.

Cost Price (CP) of weight used = 100 − 15% less = 85 units.

Profit = SP − CP = 103 − 85 = 18 units.

Profit % = (18 ÷ 85) × 100 ≈ 21.17% ≈ 21%.

Therefore The correct answer is 21%.

Alternate Method

Given:

Claimed profit = 3%

Dishonest weight used = 15% less than the actual weight.

Actual Weight

850g → CP Rs. 850

Claimed Weight

1000g → Rs. 1000

Selling Price

1030g → SP Rs. 1030

+3%

−15%

Profit = Rs. 1030 − Rs. 850 = Rs. 180

Profit % = (180 ÷ 850) × 100 ≈ 21%

Calculations:

=> Let the cost price (CP) of 1000 gm of pulses be Rs. 1000.

=> As the trader claims a profit of 3%, Selling Price (SP) for 1000 gm = 1000 + 3% of 1000 = Rs. 1030.

=> However, he uses a false weight that is 15% less.

=> Actual weight given = 1000 − 15% of 1000 = 850 gm.

=> Actual Cost Price (CP) for the trader for 850 gm = Rs. 850.

=> Total Profit = SP − CP = 1030 − 850 = Rs. 180.

=> Profit % = (Total Profit ÷ Actual CP) × 100

=> Profit % = (180 ÷ 850) × 100

=> Profit % = 360 ÷ 17 ≈ 21.17%

=> Rounding off to the nearest whole number, we get 21%.

Therefore The correct answer is 21%.

Additional Information

Dishonest Dealer Principle

When a shopkeeper sells goods claiming a specific profit or loss but alters the weight, the actual cost price is based on the weight given, while the selling price depends on the claimed weight.

Profit/Loss Percentage Formula

Profit % = (Total Profit ÷ Actual Cost Price) × 100. Always calculate the profit percentage over the actual cost incurred, not the marked cost.

Effective Multiplier Concept

A dishonest trade can also be solved using multipliers: Overall ratio = (Claimed SP ratio) × (True Weight ÷ False Weight). Here, (103 ÷ 100) × (100 ÷ 85) = 103 ÷ 85. Profit % = (18 ÷ 85) × 100.

Q66. Answer: (c) Rs. 47,475

Shortcut Trick

Kushal's Profit = Total Profit − Brijesh's Profit = Rs. 17,600 − Rs. 2,200 = Rs. 15,400

Profit Ratio (Kushal : Brijesh) = 15,400 : 2,200 = 7 : 1

Since the investment time period is the same, Investment Ratio = Profit Ratio = 7 : 1

Difference in investment = (7 − 1) ÷ (7 + 1) × Total Investment

Difference = 6/8 × 63,300 = Rs. 47,475

Therefore The correct answer is Rs. 47,475.

Alternate Method

Given:

Total investment = Rs. 63,300

Total profit = Rs. 17,600

Brijesh's share in profit = Rs. 2,200

Formula Used:

Profit = Capital × Time

When time is constant, Capital Ratio = Profit Ratio.

Total Profit = Rs. 17,600

Kushal: Rs. 15,400

Brijesh: Rs. 2,200

Profit Ratio = 7 : 1

Investment Ratio (Same Time) = 7 : 1

Total Investment = Rs. 63,300 (8 parts)

Difference (6 parts) = Rs. 47,475

Calculations:

=> Kushal's Profit = Total Profit − Brijesh's Profit

=> Kushal's Profit = 17,600 − 2,200 = 15,400

=> Profit Ratio (Kushal : Brijesh) = 15,400 : 2,200 = 154 : 22 = 7 : 1

=> Since both invested for a year (time is constant), investment ratio is equal to the profit ratio.

=> Investment Ratio (Kushal : Brijesh) = 7 : 1

=> Total Investment = 7 parts + 1 part = 8 parts

=> 8 parts = 63,300

=> 1 part = 63,300 ÷ 8 = 7,912.5

=> Difference in their investments = 7 parts − 1 part = 6 parts

=> Difference = 6 × 7,912.5 = 47,475

Therefore The correct answer is Rs. 47,475.

Additional Information

Simple Partnership

When the capital of all the partners is invested for the same duration of time, the profit is distributed exactly in the ratio of their invested capital.

Compound Partnership

When the capital of the partners is invested for different time periods, the profit is distributed in the ratio of the product of their capital and respective time periods (Profit Ratio = Capital 1 × Time 1 : Capital 2 × Time 2).

Sleeping Partner

A partner who only invests capital but does not actively participate in the business operations. They receive a share of the profit purely based on their investment without any operational salary.

Q67. Answer: (c) 4582/797hours

Shortcut Trick

Total Capacity = LCM(13, 29, 10) = 3770 units

Combined Efficiency = (3770 ÷ 13) + (3770 ÷ 29) + (3770 ÷ 10) = 290 + 130 + 377 = 797 units/hour

Time required together = Total Capacity ÷ Combined Efficiency = 3770 ÷ 797

On converting to a mixed fraction, Time = 4 ^(582)/797 hours

Therefore The correct answer is 4 ^(582)/797 hours.

Alternate Method

Given:

Time taken by pipe A = 13 hours

Time taken by pipe B = 29 hours

Time taken by pipe C = 10 hours

Formula Used:

Total Work = LCM of times taken by individual pipes

Efficiency = Total Work ÷ Time

Time = Total Work ÷ Total Efficiency

Pipe	Hours	Total Work	Efficiency
A	13	3770	290
B	29	130	
C	10	377	

Calculations:

=> Total efficiency of A, B and C = 290 + 130 + 377 = 797 units/hour

=> Time taken when all pipes operate together = Total Work ÷ Total Efficiency

=> Time = 3770 ÷ 797

=> Time = 4 ^(582)/797 hours

Therefore The correct answer is 4 ^(582)/797 hours.

Additional Information

Inlet vs Outlet Pipes

An inlet pipe fills a tank, hence its efficiency is taken as positive. An outlet pipe or a leak empties the tank, so its efficiency is taken as negative.

Work Equivalence Rule

If M1 workers do W1 work in D1 days working H1 hours/day, and M2 workers do W2 work in D2 days working H2 hours/day, then

(M1 × D1 × H1) ÷ W1 = (M2 × D2 × H2) ÷ W2.

Alternate Hours Concept

If pipes operate on alternate hours, calculate the combined work done in one complete cycle (e.g., 3 hours if 3 pipes alternate) and then find the maximum number of full cycles possible before calculating the remaining fractional part.

Q68. Answer: (a) 33.52

Shortcut Trick

Let the assumed combined average be 14 (the smaller average of the two groups).

Excess deviation for 23 matches = 23 × (42 − 14) = 23 × 28 = +644

Average excess distributed over all 33 matches = 644 ÷ 33 ≈ 19.52

Actual combined average = Assumed Average + Net Deviation = 14 + 19.52 = 33.52

Therefore The correct answer is 33.52 runs.

Alternate Method

23 Matches

Average: 42

Total: 966

10 Matches

Average: 14

Combined 33 Matches → Avg ≈ 33.52

Given:

Number of initial matches (n1) = 23

Average of initial matches (A1) = 42

Number of next matches (n2) = 10

Average of next matches (A2) = 14

Formula Used:

Combined Average = (n1 × A1 + n2 × A2) ÷ (n1 + n2)

Calculations:

=> Total runs scored in 23 matches = 23 × 42 = 966

=> Total runs scored in 10 matches = 10 × 14 = 140

=> Total runs scored in all 33 matches = 966 + 140 = 1106

=> Combined Average = Total runs ÷ Total matches

=> Combined Average = 1106 ÷ 33

=> Combined Average ≈ 33.5151...

=> Rounding off to two decimal places, we get 33.52

Therefore The correct answer is 33.52 runs.

Additional Information

Weighted Average

Used when calculating the average of two or more groups with different sample sizes. Formula: A = (n1A1 + n2A2) ÷ (n1 + n2).

Deviation Method

A simpler calculation approach where an assumed average is taken, and the net positive or negative deviations are equally shared among the entire total quantity.

Arithmetic Mean

The foundational concept of average representing the sum of all numerical values in a collection divided by the total count of those values.

Q69. Answer: (c) decrease by Rs. 12,100

Shortcut Trick

Let initial income be 100 units, making Savings = 26 units and Expenditure = 74 units.

New Income = 100 + 17% = 117 units.

New Expenditure = 74 + (50% of 74) = 111 units.

New Savings = 117 − 111 = 6 units.

Decrease in Savings = 26 − 6 = 20 units (20% of the original income) => 20% of Rs. 60,500 = Rs. 12,100.

Therefore The correct answer is decrease by Rs. 12,100.

Alternate Method

Given:

=> Initial Income = Rs. 60,500

=> Initial Savings = 26% of Income

=> Initial Expenditure = (100 − 26)% = 74% of Income

Initial (Base 100x)

Income = 100x

Expenditure = 74x

Sav = 26x

Final (After changes)

New Income = 117x (+17%)

New Expenditure = 111x (+50%)

New Sav = 6x

Calculations:

Let the Initial Income be represented as 100x.

=> Initial Savings = 26x

=> Initial Expenditure = 74x

After applying the given percentage changes:

=> New Income = 100x + 17% of 100x = 117x

=> New Expenditure = 74x + 50% of 74x = 74x + 37x = 111x

=> New Savings = New Income − New Expenditure = 117x − 111x = 6x

Calculating the overall decrease in Savings:

=> Decrease = Initial Savings − New Savings = 26x − 6x = 20x

=> Since 100x = Rs. 60,500, we find x = 605

=> Total Decrease in Savings = 20 × 605 = Rs. 12,100

Therefore The correct answer is decrease by Rs. 12,100.

Additional Information

Income & Expenditure Relation

The foundational equation is Income = Expenditure + Savings. Any absolute change in income perfectly matches the total sum of absolute changes in expenditure and savings.

Percentage Change Distribution

When applying successive or isolated percentage adjustments, always compute them strictly on their own initial values. For example, the 50% increase in expenditure acts purely on the initial expenditure ratio.

Weighted Average (Deviation) Method

You can also verify percentage balance directly by substituting values into the weighted distribution formula: Income × (Income % Change) = Expenditure × (Exp % Change) + Savings × (Sav % Change).

Q70. Answer: (c) Rs. 16,000

Shortcut Trick

Profit ratio = (Capital × Time) ratio

Sharma : Gupta : Sinha = (4 × 6) : (8 × 8) : (6 × 8)

Profit Ratio = 24 : 64 : 48 = 3 : 8 : 6

Total profit = 17 parts = Rs. 34,000 => 1 part = Rs. 2,000

Gupta's share = 8 parts × Rs. 2,000 = Rs. 16,000

Therefore The correct answer is Rs. 16,000.

Alternate Method

Given:

Investment of Mr. Sharma = Rs. 4,000, Time = 6 months

Investment of Mr. Gupta = Rs. 8,000, Time = 8 months

Investment of Ms. Sinha = Rs. 6,000, Time = 8 months

Total Profit = Rs. 34,000

Formula Used:

Profit Ratio = Ratio of (Investment × Time)

Mr. Sharma

Rs. 4k × 6m

Ratio: 3

Mr. Gupta

Rs. 8k × 8m

Ratio: 8

Ms. Sinha

Rs. 6k × 8m

Ratio: 6

Total Ratio = 17 parts → Total Profit = Rs. 34,000

Calculations:

=> Profit Ratio (Sharma : Gupta : Sinha) = (4000 × 6) : (8000 × 8) : (6000 × 8)

=> Profit Ratio = 24000 : 64000 : 48000

=> Profit Ratio = 24 : 64 : 48 = 3 : 8 : 6

=> Total Ratio = 3 + 8 + 6 = 17 units

=> 17 units = Rs. 34,000

=> 1 unit = Rs. 2,000

=> Mr. Gupta's share = 8 units × 2000

=> Mr. Gupta's share = Rs. 16,000

Therefore The correct answer is Rs. 16,000.

Additional Information

Compound Partnership

When investments are made for unequal time periods, the profit is distributed based on the product of Capital and Time (Profit = C × T).

Active Partner

A partner who handles or manages the business. They often receive a fixed salary or a percentage of the total profit before the remaining profit is distributed among all partners.

Sleeping Partner

A partner who only invests money but does not take part in managing the business operations. Their profit share depends entirely on their investment amount and duration.

Q71. Answer: (d) DF-IC

The logic followed here is:

Hence, the correct answer is "Option 4"

Q72. Answer: (d) 186

Given 117 + 16 − 10 × 2 ÷ 2 − 68 + 10 × 5 − 9 = ?

if '÷' and '×' are interchanged and '−' and '+' are interchanged

117 - 16 + 10 ÷ 2 x 2 + 68 - 10 ÷ 5 + 9 = ?

117 - 16 + 5 x 2 + 68 - 2 + 9 = ?

117 - 16 + 10 + 68 - 2+ 9 = ?

117 + 9 + 10 + 68 - 16 - 2= ?

186.

Hence, the correct answer is "Option 4"

Q73. Answer: (b) QBA

The logic followed here is:

Hence, the correct answer is "Option 2"

Q74. Answer: (d) 2

Given : Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order.

• Only F is kept above A.

• Only two boxes are kept between A and D.

• Only B is kept below C.

• G is not kept immediately above D

The Final Arrangement is,

F
A
G
E
D
C
B

Two boxes are kept between B and E

Hence, the correct answer is "Option 2"

Q75. Answer: (b) FIA

The logic followed here is:

Hence, the correct answer is "Option 2"

Q76. Answer: (b) Only conclusion (II) follows

The least possible Venn diagram for the given statements is as shown below :

Conclusion (II): Some Kites are ants. - False (As their is no direct relation between Kites and ants may be it is posssible but not definite. Hence, it is false.

Conclusion (II): Some hats are kites. - True (Some kites are hats means some hats are kites is true)

Only conclusion (II) follows

Hence, the correct answer is "Option 2"

Q77. Answer: (c) 8

Given number 7231456

Ascending order from left to right.

The sum of the digits which are second from the left and second from the right in the new number thus formed is 6+2 =8.

Hence, the correct answer is "Option 3"

Q78. Answer: (b) P

Given: Seven boxes F, G, H, M, N, O and P are kept one over the other but not necessarily in the same order

• Only three boxes are kept below H.

• Only two boxes are kept between H and O.

• Only N is kept above G.

• F is kept at some place below M and at some place above P.

N
G
M
H
F
P
O

Hence, the correct answer is "Option 2"

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Q79. Answer: (d) 27000

The logic follows here,

Hence, the correct answer is "Option 4"

Q80. Answer: (b) 3

Given Series: (Left) & 1 # 6 * ^ @ 3 & $ 7 Ω $ 2 # 6 @ 2 % 9 (Right)

If all the symbols are dropped from the series

New Series : (Left) 1 6 3 7 2 6 2 9 (Right)

Third from the left : (Left) 1 6 3 7 2 6 2 9 (Right)

Hence, the correct answer is "Option 2"

Q81. Answer: (b) CAME - CEMA - EMAC

The logic followed here is:

Similarly,

Hence, the correct answer is "Option 2"

Q82. Answer: (c) Neither conclusion (I) nor (II) follows.

The least possible Venn diagram for the given statements is as shown below :

Conclusions:

(I) All dancers are actors. - False (All Actors are Dancer. All dancers are actors may be it is possible but not definite. Hence, it is false)

(II) No singer is a dancer. - False (Some dancers are singers means some singer is also dancer. Hence, it is false).

Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 3"

Q83. Answer: (c) 3

Given Series: (Left) 4 7 + $ 1 * £ 3 & % 5 @ Ω 6 2 9 # 8 (Right)

Required Conditions: Symbol - Number - Another Symbol

(Left) 4 7 + $ 1 * £ 3 & % 5 @ Ω 6 2 9 # 8 (Right)

Hence, the correct answer is "Option 3"

Q84. Answer: (a) North-west

- Atul starts from his home and drives 5 km towards north.
- He then takes a left turn, drives 6 km, turns left, and drives 4 km.
- He then takes a right turn and drives 5 km and reaches his office.

The final diagram,

Hence, the correct answer is "Option 1"

Q85. Answer: (b) (183, 209, 392)

Logic: First number + Second Number = Third Number

Similarly,

Hence, the correct answer is "Option 2"

Q86. Answer: (d) OUT : PVU

The logic followed here is:

Similarly,

Hence, the correct answer is "Option 4"

Q87. Answer: (d) FRW

The logic followed here is:

Hence, the correct answer is "Option 4"

Q88. Answer: (c) KSOL

The logic followed here is:

Hence, the correct answer is "Option 3"

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Q89. Answer: (d) 150

The logic followed here is:

Hence, the correct answer is "Option 4"

Q90. Answer: (a) 4

Seven people, A, B, C, D, E, F, and G, are sitting in a row, facing north.

• Only two people sit between D and C.

• Only G sits to the right of E.

• Only one person sits between C and E.

• A sits at some place to the right of F but at some place to the left of B

The final arrangement is

Hence, the correct answer is "Option 1"

Q91. Answer: (d) 507

Given: 9 − 3 × 756 + 84 ÷ 3 = ?

'+' means 'subtraction', − means 'division', ÷ means 'multiplication', × means 'addition',

9 ÷ 3 + 756 - 84 × 3 = ?

3 + 756 - 84 × 3 = ?

3 + 756 - 252 = ?

759 - 252 = ?

507.

Hence, the correct answer is "Option 4"

Q92. Answer: (c) 3 km to the north

• Prabash starts from Point A and drives 6 km towards east.

• He then takes a left turn, drives 4 km, turns left and drives 9 km.

• He then takes a left turn and drives 7 km.

• He takes a final left turn, drives 3 km and stops at Point P.

The final Diagram,

Hence, the correct answer is "Option 3"

Q93. Answer: (b) 7

• 'GLUE' is coded as '4627'

• 'LOAD' is coded as '1375'

The code for 'L' is 7.

Hence, the correct answer is "Option 2"

Q94. Answer: (a) TP-AX

The logic followed here is:

Hence, the correct answer is "Option 1"

Q95. Answer: (b) 7

'DEAR' is coded as '4627'

'TURN' is coded as '1375'

The code for 'R' is 7.

Hence, the correct answer is "Option 2"

Q96. Answer: (b) 4

Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order.

• Only three boxes are kept below G.

• Only two boxes are kept between G and B.

• Only A is kept above F. E is kept at some place below D and at some place above C

The Final Arrangement is,

A

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F
D
G
E
C
B

Hence, the correct answer is "Option 2"

Q97. Answer: (d) Two

Seven people, A, B, C, D, P, Q and R, are sitting in a row, facing north.

• Only two people sit between Q and R.

• Only D sits to the right of A.

• Only one person sits between R and A.

• B sits at some place to the right of P but at some place to the left of C

The Final Arrangement is,

.

Hence, the correct answer is "Option 4"

Q98. Answer: (b) Mother's father

Using the symbols in the below table, we can draw a family tree.

The possible family tree is as follows:

X is father of D and D is mother of E.

Hence, the correct answer is "Option 2"

Q99. Answer: (b) 8

Given number 2736158

If 2 is added to each odd digit and 1 is subtracted from each even digit in the number

Sum of the digits that are third from the left and third from the right in the new number

5 + 3 = 8.

Hence, the correct answer is "Option 2"

Q100. Answer: (a) 126

The logic follows here,

Hence, the correct answer is "Option 1"

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