RRB NTPC (UG) CBT-I Official Paper (Held On 19 Jun, 2026 Shift 2) (Previous Year Paper)

RRB NTPC • 2026 • 100 questions • 90 minutes • Answer key and solutions

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MATHEMATICS

Q1. What is the average of prime numbers lying between 5 and 30?

(a) 19
(b) 17
(c) 23
(d) 21

Q2. Pipes A, B and C can together fill a tank in 6 hours. After working together for 2 hours, C is closed and A and B together fill the remaining part in 7 hours. The time taken (in hours) by C alone to fill the tank is:

(a) 12
(b) 14
(c) 9
(d) 21

Q3. Which of the following are true to construct a quadrilateral uniquely?

(i) Rhombus and square can be constructed when 2 diagonals are given.
(ii) The lengths of 2 adjacent sides and 2 angles are given.
(iii) The lengths of 3 sides and 1 angle are given.
(iv) The lengths of 4 sides and 1 diagonal are given.

(a) (ii) and (iv)
(b) (i) and (iii)
(c) (i) and (iv)
(d) (ii) and (iii)

Q4. A wholesaler allows a scheme discount of 25% on an article whose marked price is Rs. 2,400. The retailer is required to pay the remaining amount in full. What is the net price paid by the retailer?

(a) Rs. 1,800
(b) Rs. 1,900
(c) Rs. 1,750
(d) Rs. 1,700

Q5. A fruit seller uses a faulty balance that reads 900 grams as 1 kg. He sells apples at Rs. 150 per kg (as per faulty balance). If his purchase price is Rs. 120 per kg (actual weight), what is his actual profit percentage?

(a) 384/9%
(b) 374/9%
(c) 388/9%
(d) 378/9%

Q6. Two trains of lengths 100 m and 150 m are moving in opposite directions at 40 km/h and 60 km/h, respectively. Find the time taken by the trains (in seconds) to cross each other other.

(a) 9 seconds
(b) 9.5 seconds
(c) 8.9 seconds
(d) 8 seconds

Q7. An investor's portfolio value decreases by 30% in the first quarter but then increases by 50% in the next quarter. What is the overall percentage change in the portfolio value?

(a) 5% increase
(b) 10% increase
(c) 20% increase
(d) 15% decrease

Q8. The radius of the base of a cylinder is 3.5 cm and its curved surface area is 616 cm^2. Find the volume of the cylinder. Take $\pi = 22/7$

(a) 1024 cm^3
(b) 1424 cm^3
(c) 1370 cm^3
(d) 1078 cm^3

Q9. If the cost of 6 chocolates, 12 chocolates, and x chocolates are in proportion such that x is the third proportional, how many chocolates correspond to x?

(a) 28
(b) 32
(c) 24
(d) 26

Q10. A shirt costs Rs. 655. During a sale, its price is reduced by 20%. What is the new price (in Rs.) of the shirt?

(a) 526
(b) 525
(c) 524
(d) 527

Q11. The sum of two positive numbers is 14 and their product is 45. The positive difference between them is:

(a) 7
(b) 8
(c) 4
(d) 11

Q12. A cyclist travels from town A to town B, a distance of 182 km. For the first 84 km, he rides at a certain speed. For the remaining distance (98 km), he increases his speed by 7 km/h and therefore reaches 42 minutes earlier than the time he would have taken if he had travelled the entire distance at the original speed. Find the original speed.

(a) 22.5 km/hr
(b) 28 km/hr
(c) 24 km/hr
(d) 21 km/hr

Q13. Which of the following options is the nearest number to 95061 that is divisible by 9?

(a) 95059
(b) 95057
(c) 95060
(d) 95058

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Q14. Simplify: $((3^2 \times 9)^3)/(27^2 \times 3^4)$

(a) 9
(b) 1/9
(c) 3
(d) 1/3

Q15. The average of 8 numbers is 43. If each number is decreased by 7, what will the new average be?

(a) 43
(b) 36
(c) 8
(d) 29

Q16. A sum is invested at 8% per annum, compounded half-yearly. If the amount after one year is Rs. 10,816, then what was the principal (in Rs.)?

(a) 10,500
(b) 10,400
(c) 10,000
(d) 10,200

Q17. The present ages of A and B are in the ratio 5 : 7. After 6 years, the sum of their ages will be 60 years. What is A's present age?

(a) 40 years
(b) 20 years
(c) 25 years
(d) 30 years

Q18. Juhi and Mamta have certain amount of money. If Juhi gives Rs. 30 to Mamta, Juhi will then have twice as much money as Mamta. However, if Mamta gives Rs. 10 to Juhi, Juhi will then have four times as much money as Mamta. What is the total amount of money (in Rs.) that Juhi and Mamta initially had together?

(a) 310
(b) 320
(c) 300
(d) 290

Q19. If the ratio of the height of a tower and the length of its shadow on the ground is $\sqrt{3} : 1$, then the angle of elevation of the sun is:

(a) 65°
(b) 45°
(c) 30°
(d) 60°

Q20. P sells an item to Q and earns 12% profit. Q sells it to R and earns a profit of Rs. 26. If the item was sold to R directly by P at the same price, the percentage of profit would have been 25%. The cost price of the item is Rs. _____.

(a) 200
(b) 220
(c) 250
(d) 180

Q21. Rs. 1,472 is divided among Rohit, Maya, and Vikas in such a way that if Rs. 25, Rs. 52, and Rs. 18 be deducted from their respective shares, they have money in the ratio 15:19:17. Find Vikas's amount after deduction.

(a) Rs. 459
(b) Rs. 359
(c) Rs. 509
(d) Rs. 559

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Q22. The mode of the numbers 7, 8, 7, 9, 10 is:

(a) 8
(b) 10
(c) 9
(d) 7

Q23. The sum of the surface areas of two spheres is 12584 π sq. cm. The radius of the larger sphere is five times the radius of the smaller sphere. Find the diameter of the larger sphere.

(a) 125 cm
(b) 110 cm
(c) 115 cm
(d) 120 cm

Q24. If the sum of two distinct consecutive prime numbers is 36, what is the product of the two primes?

(a) 361
(b) 221
(c) 323
(d) 289

Q25. A sum, when invested at 20% simple interest per annum, amounts to Rs. 5,040 after 3 years. What is the simple interest (in Rs.) on the same sum at the same rate in 2 years?

(a) 630
(b) 2,520
(c) 5,040
(d) 1,260

Q26. The marked price of a cooker is the same at four shops I, II, III and IV. Shop I allows two successive discounts of 89% and 68%, shop II allows successive discounts of 50% and 51%, shop III allows successive discounts of 25% and 11% and shop IV allows successive discounts of 94%, 49%, and 21% on the marked price of the cooker. Which shop is selling the cooker at the lowest price?

(a) IV
(b) I
(c) II
(d) III

Q27. The ages of father and son are in the ratio of 12:7. Four years from now, their ages will be in the ratio of 5:3. Find the sum of their present ages.

(a) 139 years
(b) 119 years
(c) 128 years
(d) 152 years

Q28. The LCM of the numbers 15, 10 and 0.4 is:

(a) 30
(b) 34
(c) 32
(d) 36

Q29. A and B can do a piece of work in 12 days and 6 days, respectively. Both work for 2 days and then A leaves. B completed the remaining work alone. The whole work was completed in _____ days.

(a) 5
(b) 6
(c) 4
(d) 3

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Q30. Simplify {(20/36)÷ (20/5)}÷ (5/11× 22/15+3/12)+5/5÷ 33/21 of 21/5

(a) 10/33
(b) 13/27
(c) 11/24
(d) 1/40

GENERAL AWARENESS

Q31. Consider the following statements:

1. Project Elephant was launched in 1992 to protect elephants in India.
2. Project Tiger was launched in 1973 to conserve tigers in India
3. Sundarbans Biosphere Reserve is located in West Bengal, India.
4. Keoladeo National Park is located in Madhya Pradesh.

Which of the above statements are correct?

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

Q32. What is the President's primary constitutional duty as per the oath under Article 60?

(a) Formulate policies for the governance of India
(b) Preserve, protect and defend the Constitution
(c) Manage finances for the governance of India
(d) Control Council of Ministers headed by Prime Minister

Q33. Which policy, approved in August 2024, aims to accelerate innovation-driven research and entrepreneurship in high-performance biomanufacturing in India?

(a) GenTech Initiative
(b) BioGrowth Scheme
(c) BioE3
(d) Bio-India 2025

Q34. What was Raja Ram Mohan Roy's greatest social achievement?

(a) Promoting English education
(b) Founding the Indian National Congress
(c) Abolition of child marriage
(d) Abolition of Sati in 1829

Q35. What was the theme for International Mother Language Day 2025?

(a) Using technology for multilingual learning: Challenges and opportunities
(b) Silver Jubilee Celebration of International Mother Language Day
(c) Multilingual Education: A necessity to transform education
(d) Multilingual education – a pillar of learning and intergenerational learning

Q36. According to the Union Budget 2025-26, what is the total estimated expenditure for the year?

(a) Rs. 40 lakh crore
(b) Rs. 55 lakh crore
(c) Rs. 45 lakh crore
(d) Rs. 50.65 lakh crore

Q37. In which year was the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) launched?

(a) 2012-13
(b) 2015-16
(c) 2013-14

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(d) 2014-15

Q38. During PM Modi's visit to the USA in February 2025, what was the target set under 'Mission 500'?

(a) 500 Indian startups launched in the USA
(b) $500 billion in bilateral trade by 2030
(c) 500 defence agreements signed
(d) 500 joint military exercises

Q39. When Barium Chloride (BaCl2) solution is mixed with Sodium Sulfate (Na2SO4) solution, a white product Barium Sulfate (BaSO4) is formed. This product is known as a _____.

(a) Emulsion
(b) Isomer
(c) Precipitate
(d) Isotope

Q40. Which of the following Constitutional Amendments introduced Part IX related to Panchayats in India?

(a) 86th Amendment
(b) 73rd Amendment
(c) 42nd Amendment
(d) 44th Amendment

Q41. In Windows 11 File Explorer, which feature is used to quickly locate a file by typing its name?

(a) Search box
(b) Properties
(c) Sort
(d) View

Q42. Which Padma Shri awardee was given the title of Nritya Samragini by Rabindranath Tagore?

(a) Kanak Rele
(b) Sobha Naidu
(c) Sitara Devi
(d) Balasaraswati

Q43. Which tree species is most commonly associated with India’s tropical deciduous forests?

(a) Fir
(b) Oak
(c) Teak
(d) Pine

Q44. Which Indian city hosted the 23rd Asian Oceanian Congress of Radiology (AOCR) 2025?

(a) Hyderabad
(b) Jaipur
(c) Chennai
(d) Chandigarh

Q45. Consider the following statements regarding the provincial administration in the Mughal period and select the correct option.

Statement I: The subedar was head of the province and responsible for the maintenance of general law and order.

Statement II: The head of the revenue department in the suba was Diwan.

(a) Statement I is incorrect, while statement II is correct.
(b) Both statements I and II are incorrect.
(c) Both statements I and II are correct.
(d) Statement I is correct, while statement II is incorrect.

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Q46. If a ball is thrown vertically upward, which of the following describes its velocity at the highest point?

(a) Equal to acceleration due to gravity
(b) Zero
(c) Negative
(d) Positive

Q47. What was the campaign theme of World Mental Health Day 2025 observed on 10 October?

(a) Mental Health in Humanitarian Emergencies
(b) Mental Health at Work
(c) Make Mental Health & Well-being for All a Global Priority
(d) Mental Health is a Universal Human Right

Q48. Which Constitutional Article established the office of Special Officer for Linguistic Minorities?

(a) Article 350-B
(b) Article 315-B
(c) Article 338-A
(d) Article 348-A

Q49. A Local Area Network (LAN) enables resource sharing by connecting devices to the network medium through a specialized adapter called the _____.

(a) Graphics Processing Unit
(b) Read-Only Memory
(c) Network Interface Card
(d) Central Processing Unit

Q50. In which year was the PM Gati Shakti National Master Plan (NMP) launched in India to ensure integrated planning and coordinated execution of infrastructure projects?

(a) 2022
(b) 2021
(c) 2023
(d) 2024

Q51. What was the primary objective of Pandita Ramabai's work?

(a) Establishing a national army
(b) Promoting traditional religious practices
(c) Political independence for India
(d) Women's education and empowerment

Q52. Tribunals under Article 323A (Administrative tribunals) of the Constitution of India can be established by:

(a) High Courts only
(b) Parliament only
(c) State legislatures only
(d) Supreme Courts only

Q53. Which of the following is a landlocked inland river port in India?

(a) Kandla port
(b) Pandu port
(c) Mumbai port
(d) Chennai port

Q54. The French East India Company's main settlement in India was located at which place?

(a) Mahe
(b) Chandernagore
(c) Karaikal
(d) Pondicherry

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Q55. In 1309 CE, Malik Kafur invaded which of the following kingdoms in South India?

(a) Yadava Kingdom
(b) Hoysala Kingdom
(c) Kakatiya Kingdom
(d) Pandya Kingdom

Q56. Uday Shankar, the pioneer of modern dance form, was conferred with which of the following National Awards in 1971?

(a) Jnanpith Award
(b) Padma Bhushan
(c) Padma Shri
(d) Padma Vibhushan

Q57. As per the RBI's announcement on December 5, 2025, what is the revised GDP growth projection for India for FY 2025–26?

(a) 7.1%
(b) 7%
(c) 7.2%
(d) 7.3%

Q58. Which of the following is an inland riverine port?

(a) Visakhapatnam
(b) Kandla
(c) Kolkata
(d) Kochi

Q59. India followed which strategy to reduce dependence on foreign goods after independence?

(a) Export-led growth
(b) Dollarisation
(c) Free trade
(d) Import substitution

Q60. Which of the following statements is/are true or false regarding Sleep and Hibernate modes in Windows 11?

(i) Hibernate saves the session to the hard disk before shutting down, allowing full recovery upon restart.
(ii) Sleep consumes more power than Hibernate because it keeps the RAM powered.

(a) (i) False, (ii) False
(b) (i) False, (ii) True
(c) (i) True, (ii) True
(d) (i) True, (ii) False

Q61. Which of the following statements about the Emergency provisions is true?

(a) Formalise a constitutional amendment
(b) Allow federalism to continue
(c) Make India a monarchy
(d) Convert the federal system into a unitary one

Q62. Which statement is True or False about System Software?

(i) The Operating System runs in privileged mode, giving it unrestricted access to hardware.
(ii) Core System Software like device drivers is essential for the computer to start and function.

(a) (i) False, (ii) True
(b) (i) True, (ii) False
(c) (i) True, (ii) True
(d) (i) False, (ii) False

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Q63. Which of the following is a method specifically used to control particulate air pollution?

(a) Use of fabric filters to trap dust and fly ash
(b) Increasing chimney height without any treatment
(c) Catalytic combustion in open furnaces
(d) Absorption of gases using liquid scrubbers

Q64. Which of the following elements is malleable and a good conductor of heat and electricity?

(a) Sulfur (S)
(b) Barium (Ba)
(c) Iodine (I)
(d) Neon (Ne)

Q65. At the 2025 World Aquatics Championships, which male swimmer set a new world record in the 200 m individual medley (IM) during semifinals?

(a) Shaine Casas
(b) Leon Marchand
(c) Michael Phelps
(d) Luca Urlando

Q66. Which Article of the Indian Constitution places the most emphasis on reducing income and status disparities?

(a) Article 36
(b) Article 39
(c) Article 38(1)
(d) Article 38(2)

Q67. Which of the following best explains the emergence of “megaregions” with extremely high population densities (e.g., Bos Wash, Tokyo-Osaka, Pearl River Delta)?

(a) They exist because of high natural population growth in these regions
(b) They develop due to integrated economic corridors and high connectivity
(c) Governments intentionally relocate populations to form megaregions
(d) Megaregions form primarily because of uniform physical geography

Q68. In the context of periodicity, elements in the same group tend to display similar chemical properties. Which primary factor is responsible for this similarity among group members?

(a) Constant atomic radius
(b) Similar valence electronic configuration
(c) Identical atomic numbers
(d) Similar atomic masses

Q69. Which highly revered Śvetāmbara Jain text describes the lives of the 24 Tīrthankaras, the lineage of pontiffs, and the monastic rules observed during the Paryusana festival?

(a) Kalpa-yoga
(b) Kalpa-sutradham
(c) Kalpa-samant
(d) Kalpa-sutra

Q70. Which of the following is the primary association of the Ektara, a folk musical instrument?

(a) Temple rituals in Odisha
(b) Martial arts performances in Chhau dance
(c) Court dances of Tamil Nadu
(d) Folk and devotional string music

GENERAL INTELLIGENCE AND REASONING

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Q71. In a certain code language, ‘CONE’ is coded as ‘1536’ and ‘NOTE’ is coded as ‘3146’. What is the code for ‘T’ in the given code language?

(a) 3
(b) 1
(c) 6
(d) 4

Q72. Each vowel in the word 'SCRAMBLE' is changed to the second letter immediately following it in the English alphabetical order and each consonant is changed to the letter immediately following it in the English alphabetical order. Which letter will appear exactly twice in the group of the letters thus formed?

(a) N
(b) C
(c) S
(d) M

Q73. If ‘+’ means ‘−’, ‘−’ means ‘×’, ‘×’ means ‘÷’, and ‘÷’ means ‘+’, then what will come in place of the question mark (?) in the following equation?

54 − 2 ÷ 120 × 2 + 85 = ?

(a) 85
(b) 88
(c) 86
(d) 83

Q74. In a certain code language, ‘queen dirt world’ is coded as ‘ya yo mq’ and ‘world bat law’ is coded as ‘yo uj zs’. How is ‘world’ coded in that language? (All codes are two-letter codes.)

(a) yo
(b) uj
(c) ya
(d) mq

Q75. Shreya starts from Point A and drives 22 km towards the north. He then takes a right turn, drives 24 km, turns right and drives 28 km. He then takes a right turn and drives 30 km. He takes a final right turn, drives 6 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 7 km to the west
(b) 3 km to the east
(c) 5 km to the east
(d) 6 km to the east

Q76. The position(s) of how many letters will remain unchanged if each letter in the word DEPARTS is arranged in the English alphabetical order?

(a) 0
(b) 1
(c) 3
(d) 2

Q77. Seven boxes F,G,H,I,J,K and S are kept one over the other but not necessarily in the same order. Only three boxes are kept above G. Only one box is kept between J and G. Only three boxes are kept between J and K. K is kept at some place above G. S is kept immediately below K. F is kept at one of the places above I. H is not kept immediately above or below J. How many boxes are kept between H and J?

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

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Q78. What should come in place of the '?' in the given series?

4 12 36 108 ? 972

(a) 321
(b) 323
(c) 322
(d) 324

Q79. All 193 people are standing in a row facing north. Ccd is 14th from the right end while Vks is 124th from the left end. How many people are there between Ccd and Vks?

(a) 53
(b) 55
(c) 52
(d) 54

Q80. 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/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(27, 12, 322)

(24, 13, 310)

(a) (29, 10, 292)
(b) (32, 7, 224)
(c) (34, 9, 308)
(d) (31, 8, 246)

Q81. P is the sister of Q. Q is the brother of S. T is the father of X. X is the son of S. How is X related to P?

(a) Sister's son
(b) Son
(c) Daughter's son
(d) Brother's son

Q82. Seven boxes L, M, N, O, P, Q and R are kept one over the other but not necessarily in the same order. Box Q is kept immediately above N. Exactly two boxes are kept between L and N. L is kept on one of the positions above N. O is placed at the topmost position. Exactly two boxes are kept between M and P. Only one box is kept below P. R is kept on one of the positions below N. How many boxes are kept between Q and R?

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

Q83. Select the triad that follows the same pattern as the one followed by the two triads given below. Both triads follow the same pattern.

FA - HC - JL

ID - KF - MO

(a) NH - OJ - QR
(b) MH - OJ - QR
(c) NH - OI - QR
(d) MH - OJ - QS

Q84. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

HM - JR - LW

UL - WQ - YV

(a) GP - EK - SV

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(b) CF - EK - GP
(c) CF- GK - HP
(d) GP - JK - CE

Q85. Based on the English alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that does not belong to that group?

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

(a) BCDF
(b) UVWX
(c) HIJL
(d) OPQS

Q86. Based on the English alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that does not belong to that group?

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

(a) NQM
(b) YBX
(c) JMI
(d) UYT

Q87. Seven people A, B, D, J, O, T and Z are sitting in a row, facing north. Only two people sit to the right of T. Only two people sit between T and B. Only two people sit between A and Z. Z sits to the immediate left of T. O sits to the immediate right of D. Who sits immediately to the right of J?

(a) D
(b) Z
(c) B
(d) J

Q88. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

FJI JNM NRQ RVU ?

(a) VYX
(b) VZY
(c) VAX
(d) VWY

Q89. 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 is the one that does not belong to that group?

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

(a) RF – NC
(b) KP – GL
(c) ME – IA
(d) ZW – VS

Q90. Refer to the following series and answer the question. (Counting to be done from left to right only.) (All numbers are single-digit numbers only.)

(Left) 5 3 5 1 5 4 1 2 9 1 1 7 4 8 7 6 6 8 1 5 6 4 1 1 6 6 4 (Right)

How many such even numbers are there, each of which is immediately preceded by an odd number and also immediately followed by an even number?

(a) 6
(b) 4
(c) 5
(d) 3

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Q91. Each of the digits in the number 6534217 is arranged in ascending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

(a) TWO
(b) THREE
(c) NONE
(d) ONE

Q92. Seven people, S, T, I, C, K, E and R, are sitting in a row, facing north. Only two people sit to the right of E. Only two people sit between E and C. Only two people sit between T and S. S sits to the immediate left of E. K sits to the immediate right of R. Who sits at the third position from the left end of the line?

(a) S
(b) E
(c) I
(d) K

Q93. WSPO is related to SPNN in a certain way based on the English alphabetical order. In the same way, TQNL is related to PNLK. To which of the following is MKHI related, following the same logic?

(a) IHFH
(b) IGDE
(c) IGEF
(d) TYWD

Q94. Read the given statement(s) 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 statement(s).

Statements:

All cherries are bats.

No bat is an orange.

Conclusions:

(I) No cherry is an orange.

(II) Some oranges are bats.

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

Q95. In a certain code language,

A ÷ B means ‘A is the son of B’,

A # B means ‘A is the wife of B’,

A + B means ‘A is the brother of B’ and

A & B means ‘A is the father of B’.

How is S related to H if ‘S ÷ D & R + Y # H’?

(a) Wife's brother
(b) Brother
(c) Father
(d) Wife's father

Q96. What should come in place of ? in the given series based on the English alphabetical order?

QMO NJL KGI HDF ?

(a) EZB
(b) EFH
(c) EAC
(d) EBB

Q97. If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+' and 'D' stands for '−', then what will come in place of the question mark (?) in the following equation?

43 D 28 C 35 A 7 B 11 = ?

(a) 71
(b) 73
(c) 70
(d) 74

Q98. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

JCT 6 NGQ -7 RKN -20 VOK -33 ?

(a) ZDX -45
(b) ZSH -46
(c) ZCD -54
(d) ZXD -44

Q99. What should come in place of '?' in the given series?

871 791 721 661 611 ?

(a) 501
(b) 539
(c) 523
(d) 571

Q100. 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 engineers are designers. All designers are creators.

Conclusions:

(I) All creators are engineers.

(II) Some engineers are creators.

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

ANSWER KEY

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

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SOLUTIONS

Q1. Answer: (b) 17

Shortcut Trick

List the prime numbers between 5 and 30: 7, 11, 13, 17, 19, 23, and 29.

Total count of these prime numbers = 7.

Sum = 7 + 11 + 13 + 17 + 19 + 23 + 29 = 119.

Average = Sum ÷ Count = 119 ÷ 7 = 17.

Therefore The correct answer is 17.

Alternate Method

Given: Prime numbers lying between 5 and 30.

Formula Used: Average = (Sum of all observations) ÷ (Total number of observations)

Step-by-step Calculation:

=> Prime numbers between 5 and 30 are 7, 11, 13, 17, 19, 23, and 29.

=> Sum = 7 + 11 + 13 + 17 + 19 + 23 + 29

=> Sum = 119

=> Total count of numbers (n) = 7

=> Average = 119 ÷ 7

=> Average = 17

Therefore The correct answer is 17.

Additional Information

Prime Numbers

A prime number is a natural number greater than 1 that has exactly two distinct factors: 1 and itself. The smallest prime number is 2, which is also the only even prime.

Average of Numbers

The average (arithmetic mean) is calculated by dividing the sum of all values by the total number of values. For prime numbers, there is no shortcut formula due to their irregular distribution.

Prime Numbers up to 100

There are 25 prime numbers between 1 and 100: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, and 97.

Q2. Answer: (b) 14

Shortcut Trick

Remaining work of (A+B+C) for 4 hr (6 − 2) is completed by (A+B) in 7 hr.

Efficiency ratio (A+B+C) : (A+B) = 7 : 4 (Inverse of time ratio 4 : 7).

Efficiency of Pipe C = Efficiency of (A+B+C) − Efficiency of (A+B) = 7 − 4 = 3 units.

Total Work = Efficiency of (A+B+C) × Total time = 7 × 6 = 42 units.

Time taken by C alone = Total Work ÷ Efficiency of C = 42 ÷ 3 = 14 hr.

Therefore The correct answer is 14 hr.

Alternate Method

Given:

Time taken by Pipes A, B and C together = 6 hr

Part of tank filled by A, B and C in 2 hr = 2 ÷ 6 = 1/3 part

Remaining part = 1 − 1/3 = 2/3 part

Time taken by (A+B) to fill 2/3 part = 7 hr

Time taken by (A+B) to fill full tank = 7 × (3 ÷ 2) = 10.5 hr

Person	Days	Total Work	Efficiency
A+B+C	6 hr	42	7
A+B	10.5 hr	4	

=> Efficiency of Pipe C = Efficiency of (A+B+C) − Efficiency of (A+B)

=> Efficiency of C = 7 − 4 = 3 units/hr

=> Time taken by C alone to fill the tank = Total Work ÷ Efficiency of C

=> Time = 42 ÷ 3 = 14 hr

Therefore The correct answer is 14 hr.

Additional Information

Pipes & Cisterns Efficiency

The time taken to fill a tank is inversely proportional to the efficiency of the pipe (Time = Work ÷ Efficiency).

Combined Work Formula

If pipe A fills in x hours and pipe B fills in y hours, their combined 1-hour work is (1/x + 1/y).

Part of Work Completed

Part of tank filled in 't' hours = (t ÷ Total time taken to fill the full tank).

Q3. Answer: (c) (i) and (iv)

Shortcut Trick

To construct a unique quadrilateral, we generally need 5 independent measurements.

Statement (iv) provides 4 sides + 1 diagonal = 5 elements, which is the standard requirement.

Statement (i) involves special quadrilaterals; a Rhombus and Square have fixed properties (diagonals bisect at 90°), allowing construction with only 2 diagonals.

Statements (ii) and (iii) provide only 4 elements each, which is insufficient for a general quadrilateral.

Therefore The correct answer is (i) and (iv).

Alternate Method

Given: Various combinations of sides, angles, and diagonals for constructing a quadrilateral.

Property Used: A unique quadrilateral can be constructed if 5 independent parts are known. Special shapes like the square and rhombus require fewer measurements due to inherent symmetry and properties.

=> Condition (i): For a Rhombus, diagonals are perpendicular bisectors. Knowing d1 and d2 allows us to plot the vertices uniquely. For a Square, d1 = d2, and they are also perpendicular bisectors.

=> Condition (ii): 2 sides and 2 angles provide only 4 independent elements. This results in a family of quadrilaterals rather than a unique one.

=> Condition (iii): 3 sides and 1 angle provide only 4 independent elements, which is insufficient.

=> Condition (iv): 4 sides and 1 diagonal provide 5 independent elements. This allows the construction of two triangles (ABC and ADC) sharing a common base (AC), forming a unique quadrilateral.

Therefore The correct answer is (i) and (iv).

Additional Information

Minimum elements for unique construction

A general quadrilateral requires 5 independent parts: 4 sides + 1 diagonal, 3 sides + 2 diagonals, or 3 sides + 2 included angles.

Properties of a Rhombus

All sides are equal and diagonals bisect each other at 90°. This internal symmetry reduces the number of external measurements needed for construction.

Properties of a Square

A square can be constructed uniquely if only one diagonal is given, because both diagonals are equal and intersect at right angles at their midpoints.

Triangulation Method

Every quadrilateral can be divided into two triangles by a diagonal. Constructing these two triangles using SSS or SAS congruency leads to the unique construction of the quadrilateral.

Q4. Answer: (a) Rs. 1,800

Shortcut Trick

Convert Discount % to fraction: 25% = 1/4.

If Marked Price is 4 units, Discount is 1 unit, so Net Price is 3 units.

4 units = Rs. 2,400 => 1 unit = Rs. 600.

3 units = 3 × 600 = Rs. 1,800.

Therefore The correct answer is Rs. 1,800.

Alternate Method

Given:

Marked Price (MP) = Rs. 2,400

Discount Percentage = 25%

Formula Used:

Net Price = Marked Price × (100 − Discount%)/100

Calculations:

=> Discount Amount = 25% of 2,400

=> Discount Amount = (25/100) × 2,400 = Rs. 600

=> Net Price = MP − Discount Amount

=> Net Price = 2,400 − 600

=> Net Price = Rs. 1,800

Therefore The correct answer is Rs. 1,800.

Additional Information

Marked Price (MP)

The price at which a product is listed or labeled by the manufacturer or wholesaler before any discount.

Selling Price (SP) / Net Price

The actual price the buyer pays after deducting the discount from the marked price: SP = MP − Discount.

Successive Discounts

When two discounts d1% and d2% are given, the effective discount is [d1 + d2 − (d1 × d2)/100]%.

Q5. Answer: (c) 388/9%

Shortcut Trick

Use the ratio method: Effective SP/CP Ratio = (Faulty Weight Reading ÷ Actual Weight) × (Stated SP ÷ Actual CP)

Ratio = (1000 ÷ 900) × (150 ÷ 120)

Ratio = (10 ÷ 9) × (5 ÷ 4) = 50 ÷ 36 = 25/18

Actual Profit % = (25 − 18) ÷ 18 × 100 = 7/18 × 100 = 38(8/9)%

Therefore The correct answer is 38(8)/(9)%.

Alternate Method

Given:

Actual Cost Price (CP) of 1000 g = Rs. 120

Faulty Selling Price (SP) of 1000 g = Rs. 150

Actual weight delivered = 900 g for every 1000 g reading.

Calculations:

=> Actual CP of the 900 g fruit sold = (120 ÷ 1000) × 900 = Rs. 108

=> Actual SP received (for the 1 kg reading) = Rs. 150

=> Profit Amount = SP − CP = 150 − 108 = Rs. 42

=> Actual Profit Percentage = (Profit ÷ Actual CP) × 100

=> Profit % = (42 ÷ 108) × 100

=> Profit % = (7 ÷ 18) × 100 = 700/18 = 350/9 = 38(8/9)%

Therefore The correct answer is 38(8)/(9)%.

Additional Information

Profit Percentage Formula

Profit % = [(SP − CP) ÷ CP] × 100. Always ensure both CP and SP are calculated for the same quantity of goods.

Faulty Weight Gain

When a seller uses a weight of 'w' grams instead of 'W' grams, the weight gain factor is (W ÷ w). This acts as a successive multiplier to the price-based profit.

Successive Percentage Change

The net profit when there is both a markup (m%) and a weight error (e%) can be calculated using the combined ratio of SP/CP = (1 + m/100) × (True Weight ÷ Faulty Weight).

Q6. Answer: (a) 9 seconds

Shortcut Trick

Relative Speed in opposite direction = 40 + 60 = 100 km/h

Convert to m/s: 100 × 5/18 = 250/9 m/s

Total Distance = Sum of lengths = 100 + 150 = 250 m

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Time = 250 ÷ (250/9) = 9 sec

Therefore The correct answer is 9 sec.

Alternate Method

Given:

Length of first train (L1) = 100 m

Length of second train (L2) = 150 m

Speed of first train (S1) = 40 km/h

Speed of second train (S2) = 60 km/h

Formula Used:

Time = (Total Distance) ÷ (Relative Speed)

Calculations:

=> Total Distance = L1 + L2 = 100 + 150 = 250 m

=> Relative Speed = S1 + S2 = 40 + 60 = 100 km/h

=> Relative Speed in m/s = 100 × (5/18) m/s

=> Relative Speed = 500/18 = 250/9 m/s

=> Time Taken = Total Distance ÷ Relative Speed

=> Time Taken = 250 ÷ (250/9)

=> Time Taken = 250 × (9/250)

=> Time Taken = 9 sec

Therefore The correct answer is 9 sec.

Additional Information

Relative Speed in Same Direction

When two objects move in the same direction, their relative speed is the difference of their individual speeds: |S1 − S2|.

Unit Conversion Shortcut

To convert km/h to m/s, multiply the speed by 5/18. To convert m/s to km/h, multiply by 18/5.

Crossing a Stationary Object

When a train crosses a pole or a man, the distance covered is equal to the length of the train. When it crosses a platform or bridge, the distance is the sum of their lengths.

Q7. Answer: (a) 5% increase

Shortcut Trick

Use the successive percentage change formula: Net Change = [x + y + (xy ÷ 100)]%.

Here, x = −30 (decrease) and y = +50 (increase).

Net Change = −30 + 50 + [(−30 × 50) ÷ 100].

Net Change = 20 − 15 = 5%.

A positive result indicates an overall increase.

Therefore The correct answer is 5% increase.

Alternate Method

Given:

Initial decrease = 30%

Subsequent increase = 50%

Assume the initial portfolio value is 100 units.

Step 1: Calculate value after the first quarter (30% decrease).

=> New Value = 100 − (30% of 100)

=> New Value = 100 − 30 = 70 units.

Step 2: Calculate value after the next quarter (50% increase).

=> Final Value = 70 + (50% of 70)

=> Final Value = 70 + 35 = 105 units.

Step 3: Calculate overall percentage change.

=> Net % Change = [(Final Value − Initial Value) ÷ Initial Value] × 100

=> Net % Change = [(105 − 100) ÷ 100] × 100 = 5%.

Therefore The correct answer is 5% increase.

Additional Information

Successive Percentage Change Rule

The net effect of two successive changes of x% and y% is always [x + y + (xy ÷ 100)]%. This is widely used in compound interest and profit/loss calculations.

Multiplier Method

For a series of changes, the final value = Initial × Multiplier1 × Multiplier2. A 30% decrease has a multiplier of 0.70 and a 50% increase has a multiplier of 1.50.

Order Independence

The net percentage change is independent of the order. A 30% decrease followed by a 50% increase results in the same final value as a 50% increase followed by a 30% decrease.

Q8. Answer: (d) 1078 cm^3

Shortcut Trick

The relationship between the Volume (V) and Curved Surface Area (CSA) of a cylinder is: V = (CSA × r) ÷ 2

Given CSA = 616 cm^2 and radius (r) = 3.5 cm

V = (616 × 3.5) ÷ 2

V = 308 × 3.5 = 1078 cm^3

Therefore The correct answer is 1078 cm^3.

Alternate Method

Given:

Radius (r) = 3.5 cm = 7/2 cm

Curved Surface Area (CSA) = 616 cm^2

Formula Used:

Curved Surface Area of Cylinder = 2 × π × r × h

Volume of Cylinder = π × r^2 × h

Calculations:

=> CSA = 2 × (22/7) × 3.5 × h

=> 616 = 2 × (22/7) × (7/2) × h

=> 616 = 22 × h

=> h = 616 ÷ 22 = 28 cm

=> Volume = (22/7) × $(3.5)^2$ × 28

=> Volume = (22/7) × 3.5 × 3.5 × 28

=> Volume = 22 × 0.5 × 3.5 × 28

=> Volume = 11 × 3.5 × 28

=> Volume = 38.5 × 28 = 1078 cm^3

Therefore The correct answer is 1078 cm^3.

Additional Information

Total Surface Area of Cylinder

The total surface area includes the curved surface and the areas of the two circular bases: TSA = 2 × π × r(r + h).

Volume Relation with Cone

If a cone and a cylinder have the same radius and height, the volume of the cylinder is three times the volume of the cone (V_(cyl) = 3 × V_(cone)).

Base Area of Cylinder

The area of the circular base is given by A = π × r^2. Thus, Volume = Base Area × Height.

Q9. Answer: (c) 24

Shortcut Trick

To find the Third Proportional (x) of two numbers a and b, use the formula: x = b^2 ÷ a.

Here, a = 6 and b = 12.

=> x = (12 × 12) ÷ 6

=> x = 144 ÷ 6 = 24.

Therefore The correct answer is 24 chocolates.

Alternate Method

Given that 6, 12, and x are in continued proportion, the ratio between the first and second term is equal to the ratio between the second and third term.

Relationship used: Product of Extremes = Product of Means

=> 6 : 12 :: 12 : x

=> 6 ÷ 12 = 12 ÷ x

=> 6 × x = 12 × 12

=> 6x = 144

=> x = 144 ÷ 6

=> x = 24

Therefore The correct answer is 24 chocolates.

Additional Information

Mean Proportional

The mean proportional (b) between two numbers a and c is given by the square root of their product: $b = \sqrt{(a \times c)}$.

Fourth Proportional

If four numbers a, b, c, and d are in proportion (a : b = c : d), then d is the fourth proportional: $d = (b \times c) \div a$.

Continued Proportion

Three quantities a, b, c are in continued proportion if a : b = b : c. This implies that the square of the middle term equals the product of the first and last terms ($b^2 = ac$).

Q10. Answer: (c) 524

Shortcut Trick

A reduction of 20% means the New Price is 80% of the Original Price.

New Price = 80% of 655

=> 0.8 × 655 = 524

Therefore The correct answer is Rs. 524.

Alternate Method

Given:

Cost of the shirt (Original Price) = Rs. 655

Discount percentage during sale = 20%

Formula Used:

Discount Amount = (Discount % ÷ 100) × Original Price

New Price = Original Price − Discount Amount

Calculations:

=> Discount Amount = (20 ÷ 100) × 655

=> Discount Amount = 0.2 × 655 = Rs. 131

=> New Price = 655 − 131

=> New Price = 524

Therefore The correct answer is Rs. 524.

Additional Information

Percentage Decrease

To find the final value after a percentage decrease, multiply the original value by (1 − r/100), where r is the rate of decrease.

Successive Discounts

If two discounts a% and b% are given, the effective discount is (a + b − ab/100)%.

Multiplying Factor

A 20% reduction corresponds to a multiplying factor of 0.80, whereas a 20% increase corresponds to 1.20.

Q11. Answer: (c) 4

Shortcut Trick

Find the factors of the product 45 that add up to the sum 14:

Factors of 45: 9 × 5 = 45

Sum of these factors: 9 + 5 = 14

Therefore, the two positive numbers are 9 and 5.

Their positive difference is: 9 − 5 = 4

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Therefore The correct answer is 4.

Alternate Method

Given:

Sum of two numbers (a + b) = 14

Product of two numbers (ab) = 45

A = 9

Q12. Answer: (b) 28 km/hr

Shortcut Trick

The time difference of 42 minutes occurs only during the 98 km segment of the journey.

Let the original speed be s km/hr. Equation: (98 ÷ s) − (98 ÷ (s + 7)) = 42/60 = 0.7 hours.

Testing the provided answer 28 km/hr from the options:

(98 ÷ 28) − (98 ÷ 35) = 3.5 − 2.8 = 0.7 hours.

The condition is satisfied, thus the original speed is 28 km/hr.

Therefore The correct answer is 28 km/hr.

Alternate Method

Given:

Total distance from Town A to Town B = 182 km

First segment distance = 84 km

Second segment distance = 98 km

Time saved = 42 minutes = 42 ÷ 60 hours = 0.7 hours

Formula Used:

Time = Distance ÷ Speed

Calculations:

=> Let the original speed of the cyclist be s km/hr.

=> Hypothetical time to cover the entire distance at original speed = 182 ÷ s

=> Actual time taken = (84 ÷ s) + (98 ÷ (s + 7))

=> According to the question: (182 ÷ s) − [(84 ÷ s) + (98 ÷ (s + 7))] = 0.7

=> (182 − 84) ÷ s − 98 ÷ (s + 7) = 0.7

=> 98 ÷ s − 98 ÷ (s + 7) = 0.7

=> 98 [(s + 7 − s) ÷ (s(s + 7))] = 0.7

=> (98 × 7) ÷ (s^2 + 7s) = 0.7

=> 686 ÷ 0.7 = s^2 + 7s

=> s^2 + 7s − 980 = 0

=> s^2 + 35s − 28s − 980 = 0

=> s(s + 35) − 28(s + 35) = 0

=> (s − 28)(s + 35) = 0

=> Since speed cannot be negative, s = 28.

Therefore The correct answer is 28 km/hr.

Additional Information

Speed-Distance-Time Relation

The fundamental relation is Speed = Distance ÷ Time. For a constant distance, speed is inversely proportional to time.

Average Speed

For any journey, Average Speed is calculated as the Total Distance divided by the Total Time taken for all segments.

Quadratic Equations in Motion

Problems involving speed changes and time savings frequently result in quadratic equations of the form s^2 + as − k = 0, where s is the speed.

Q13. Answer: (d) 95058

Shortcut Trick

Apply the divisibility rule of 9: the sum of the digits must be a multiple of 9.

Sum of digits of 95061 = 9 + 5 + 0 + 6 + 1 = 21.

The nearest multiples of 9 to 21 are 18 (21 − 3) and 27 (21 + 6).

Subtracting 3 from the number: 95061 − 3 = 95058.

Adding 6 to the number: 95061 + 6 = 95067. Since 3 < 6, 95058 is the nearest.

Therefore The correct answer is 95058.

Alternate Method

Given: Target number = 95061, Divisor = 9.

=> Divide 95061 by 9 to find the remainder.

=> 95061 ÷ 9 = 10562 with a remainder of 3.

=> Lower multiple = 95061 − 3 = 95058.

=> Higher multiple = 95061 + (9 − 3) = 95061 + 6 = 95067.

=> Distance to 95058 = |95061 − 95058| = 3.

=> Distance to 95067 = |95067 − 95061| = 6.

=> Comparing distances: 3 < 6.

Therefore The correct answer is 95058.

Additional Information

Divisibility Rule of 9

A number is divisible by 9 if and only if the sum of its digits is divisible by 9. For example, in 95058, 9+5+0+5+8 = 27, which is divisible by 9.

Nearest Number Logic

To find the nearest number divisible by n, calculate the remainder r when the number N is divided by n. Compare r and (n − r). The smaller value determines whether to subtract or add.

Divisibility Rule of 3

Similar to the rule for 9, a number is divisible by 3 if the sum of its digits is divisible by 3.

Q14. Answer: (a) 9

Given:

$((3^2 \times 9)^3)/(27^2 \times 3\text{^}4) = ?$

Formula used:

1. $(a\text{^}m)^n = a\text{^}(m \times n)$

2. $a\text{^}m \times a^n = a\text{^}(m + n)$

3. $a\text{^}m / a^n = a\text{^}(m - n)$

Calculations:

To Simplify the expression, convert all terms to Base 3:

$9 = 3^2$

$27 = 3^3$

Substituting these values in the Numerator and Denominator:

$=> ((3^2 \times 3^2)^3)/((3^3)^2 \times 3\text{^}4)$

Using the Laws of Exponents:

$=> ((3\text{^}(2+2))^3)/(3\text{^}(3 \times 2) \times 3\text{^}4)$

$=> ((3\text{^}4)^3)/(3\text{^}6 \times 3\text{^}4)$

$=> (3\text{^}(4 \times 3))/(3\text{^}(6+4))$

$=> (3^{12})/(3\text{^}(10))$

$=> 3\text{^}(12 - 10)$

$=> 3^2$

=> 9

Therefore The correct answer is option (1).

Q15. Answer: (b) 36

Shortcut Trick

If every number in a data set is decreased by a constant value k, then the average of the set also decreases by the same value k.

Given Old Average = 43 and Decrease (k) = 7.

New Average = Old Average − k

=> 43 − 7 = 36

Therefore The correct answer is 36.

Alternate Method

Given:

Total numbers = 8

Original average = 43

Decrease in each number = 7

Formula Used:

Average = Sum ÷ Total Numbers

New Average = (Original Sum − Total Decrease) ÷ Total Numbers

Calculations:

=> Original Sum = 8 × 43 = 344

=> Total Decrease = 8 × 7 = 56

=> New Sum = 344 − 56 = 288

=> New Average = 288 ÷ 8 = 36

Therefore The correct answer is 36.

Additional Information

Multiplication and Division Rule

If each observation is multiplied or divided by a non-zero constant a, the new average becomes the old average multiplied or divided by a.

Addition Rule

If a constant value k is added to every number in a series, the average of that series also increases exactly by k.

Average of Consecutive Numbers

For any arithmetic progression, the average is simply the middle term or (First term + Last term) ÷ 2.

Q16. Answer: (c) 10,000

Shortcut Trick

Effective rate for compounded half-yearly is 8% ÷ 2 = 4% per half-year.

Ratio of Principal to Amount for 4% (1/25) for 2 half-years = $25^2 : 26^2 = 625 : 676$.

Given 676 units = Rs. 10,816 => 1 unit = 10816 ÷ 676 = Rs. 16.

Principal = 625 units = 625 × 16 = Rs. 10,000.

Therefore The correct answer is Rs. 10,000.

Alternate Method

Given:

Total Amount (A) = Rs. 10,816

Annual Rate of Interest (R) = 8% per annum

Time (T) = 1 year

Compounding: Half-yearly

Formula Used: $A = P(1 + r/100)^n$

Where r = Annual Rate ÷ 2 and n = Time in years × 2.

Calculations:

=> Half-yearly rate (r) = 8 ÷ 2 = 4%

=> Number of half-years (n) = 1 × 2 = 2

=> $10816 = P(1 + 4/100)^2$

=> $10816 = P(1 + 1/25)^2$

=> $10816 = P(26/25)^2$

=> 10816 = P × (676 ÷ 625)

=> P = (10816 × 625) ÷ 676

=> P = 16 × 625

=> P = Rs. 10,000

Therefore The correct answer is Rs. 10,000.

Additional Information

Effective Rate of Interest

For two successive growth periods of r%, the effective rate R_(eff) = r + r + (r × r)/100. In this case, 4 + 4 + (4 × 4)/100 = 8.16%.

Quarterly Compounding

If interest is compounded quarterly, the rate becomes R/4 and the number of periods becomes T × 4.

Compound Interest vs Simple Interest

For 2 periods, the difference between CI and SI is P(r/100)², where r is the rate per period.

Q17. Answer: (b) 20 years

Shortcut Trick

Present sum of ages = Sum after 6 years − (Number of people × Years passed)

Present sum = 60 − (2 × 6) = 48 years

Ratio of A : B is 5 : 7, so total parts = 12

12 parts = 48 => 1 part = 4

A's present age = 5 parts = 5 × 4 = 20 years

Therefore The correct answer is 20 years.

Alternate Method

Given: Present ratio of ages of A and B = 5 : 7. Sum of ages after 6 years = 60 years.

Let the present ages of A and B be 5x and 7x respectively.

=> Age of A after 6 years = 5x + 6

=> Age of B after 6 years = 7x + 6

=> (5x + 6) + (7x + 6) = 60

=> 12x + 12 = 60

=> 12x = 60 − 12

=> 12x = 48

=> x = 4

=> A's present age = 5x = 5 × 4 = 20

Therefore The correct answer is 20 years.

Additional Information

Sum of Ages in the Future/Past

If the sum of ages of 'n' persons is S now, then after 't' years, the sum will be S + (n × t). Similarly, 't' years ago, it was S − (n × t).

Ratio of Ages

If the ages are in ratio a : b, their actual values can be taken as ax and bx. The difference between their ages (b−a)x remains constant regardless of time.

Proportional Division

To find A's share from total sum S with ratio A:B = a:b, use the formula: A = [a ÷ (a + b)] × S.

Q18. Answer: (c) 300

Shortcut Trick

Let the total amount be T. The sum of money remains constant regardless of transfers.

Condition 1: Juhi has 2 parts out of 3 (total 2+1=3) => Juhi's amount = (2/3)T + 30 (since she gave 30).

Condition 2: Juhi has 4 parts out of 5 (total 4+1=5) => Juhi's amount = (4/5)T − 10 (since she received 10).

Equating Juhi's original amount: (4/5)T − 10 = (2/3)T + 30 => (4/5 − 2/3)T = 40.

(2/15)T = 40 => T = 20 × 15 = 300.

Therefore The correct answer is Rs. 300.

Alternate Method

Given: Juhi (J) and Mamta (M) exchange money in two scenarios. Scenario 1: J gives Rs. 30 to M. New Ratio J:M = 2:1. Scenario 2: M gives Rs. 10 to J. New Ratio J:M = 4:1.

Step-by-step Calculation:

=> From scenario 1: (J − 30) = 2(M + 30)

=> J − 30 = 2M + 60 => J − 2M = 90 —— (Equation 1)

=> From scenario 2: (J + 10) = 4(M − 10)

=> J + 10 = 4M − 40 => J − 4M = −50 —— (Equation 2)

=> Subtracting (Equation 2) from (Equation 1): (J − 2M) − (J − 4M) = 90 − (−50)

=> 2M = 140 => M = 70

=> Substituting M = 70 in Equation 1: J − 2(70) = 90 => J − 140 = 90 => J = 230

=> Total initial amount = J + M = 230 + 70 = 300

Therefore The correct answer is Rs. 300.

Additional Information

Simultaneous Linear Equations

Used to find the values of two variables when two distinct conditions are provided. The method of elimination or substitution is typically employed.

Constant Sum Property

When money is transferred internally between two individuals, the sum of their assets (total money) remains unchanged. This allows for quick ratio comparisons.

Ratio Balancing

If the total units in two ratios differ (e.g., 3 units and 5 units), they can be equated by multiplying each ratio by the total of the other to find a common denominator.

Q19. Answer: (d) 60°

Shortcut Trick

The ratio of height to shadow is given as √3 : 1.

In trigonometry, the tangent of the angle of elevation (θ) is the ratio of height (perpendicular) to shadow (base).

=> tan θ = √3 / 1 = √3.

Since we know that tan 60° = √3, the value of θ must be 60°.

Therefore The correct answer is 60°.

Alternate Method

Given: Ratio of the height of the tower to the length of its shadow = √3 : 1.

Formula Used: tan θ = Perpendicular (Height) ÷ Base (Shadow).

=> Let the height of the tower (AB) be √3x.

=> Let the length of the shadow (BC) be 1x.

=> Let the angle of elevation of the sun be θ.

=> In right-angled triangle ABC, tan θ = AB ÷ BC

=> tan θ = √3x ÷ 1x

=> tan θ = √3

=> tan θ = tan 60°

=> θ = 60°

Therefore The correct answer is 60°.

Additional Information

Angle of Elevation

It is the angle formed by the line of sight with the horizontal when the object being viewed is above the horizontal level.

Standard Trigonometric Ratios

For height-shadow problems, remember: tan 30° = 1/√3, tan 45° = 1, and tan 60° = √3.

Sun Altitude Relation

As the angle of elevation of the sun increases (from 0° to 90°), the length of the shadow of a fixed object decreases.

Q20. Answer: (a) 200

Shortcut Trick

The difference between the direct profit percentage and the first profit percentage equals Q's profit relative to P's Cost Price.

Difference in profit = 25% − 12% = 13%

This 13% of CP is equal to Q's profit of Rs. 26.

13% of Cost Price = Rs. 26 => 1% = Rs. 2

100% (Cost Price) = 2 × 100 = Rs. 200

Therefore The correct answer is Rs. 200.

Alternate Method

Given:

Profit by P selling to Q = 12%

Profit by Q selling to R = Rs. 26

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Direct profit if P sells to R at same price = 25%

Calculations:

=> Let the Cost Price (CP) of the item for P be Rs. x.

=> Selling Price for P (which is CP for Q) = x + 12% of x = 1.12x

=> Selling Price for Q (which is the price R pays) = 1.12x + 26

=> According to the condition, if P sells to R at 1.12x + 26, profit = 25%.

=> 1.25x = 1.12x + 26

=> 1.25x − 1.12x = 26

=> 0.13x = 26

=> x = 26 ÷ 0.13 = 2600 ÷ 13

=> x = 200

Therefore The correct answer is Rs. 200.

Additional Information

Successive Profit/Loss

When an item is sold through multiple hands, the effective profit is calculated by multiplying the factors: Final Price = CP × (1 + r1/100) × (1 + r2/100)...

Profit Percentage Formula

Profit % = [(Selling Price − Cost Price) ÷ Cost Price] × 100.

Difference between Two Profits

If SP1 and SP2 are selling prices at profit % p1 and p2 respectively, then SP2 − SP1 = (p2 − p1)% of Cost Price.

Q21. Answer: (a) Rs. 459

Shortcut Trick

Total deduction = Rs. 25 + Rs. 52 + Rs. 18 = Rs. 95

Remaining amount = Rs. 1,472 − Rs. 95 = Rs. 1,377

Vikas's share ratio part = 17 ÷ (15 + 19 + 17) = 17/51 = 1/3

Vikas's amount after deduction = 1/3 × Rs. 1,377 = Rs. 459

Therefore The correct answer is Rs. 459.

Alternate Method

Given: Total amount = Rs. 1,472, Deductions = Rs. 25, Rs. 52, Rs. 18, Ratio after deduction = 15 : 19 : 17

=> Total Deductions = 25 + 52 + 18 = Rs. 95

=> Amount left to be divided = 1472 − 95 = Rs. 1,377

=> Let the shares of Rohit, Maya, and Vikas after deduction be 15x, 19x, and 17x respectively.

=> 15x + 19x + 17x = 1377

=> 51x = 1377

=> x = 1377 ÷ 51 = 27

=> Vikas's amount after deduction = 17 × 27 = Rs. 459

Therefore The correct answer is Rs. 459.

Additional Information

Ratio and Proportion

To divide a quantity S into parts a:b:c, the parts are calculated as [a/(a+b+c)] × S, [b/(a+b+c)] × S, and [c/(a+b+c)] × S.

Original Amount Calculation

If the original share is required, add the deducted amount back to the calculated share: Original Share = Share after deduction + Deducted amount.

Sum of Ratio Parts

The sum of all individual ratio shares must always equal the total amount being distributed.

Q22. Answer: (d) 7

Shortcut Trick

The mode is the value that appears most frequently in the given data set.

Checking frequencies: 7 occurs 2 times, 8 occurs 1 time, 9 occurs 1 time, and 10 occurs 1 time.

The number with the highest frequency is 7.

Therefore The correct answer is 7.

Alternate Method

Given: Data set = {7, 8, 7, 9, 10}

Formula Used: Mode = Value with the maximum frequency in the observation set.

=> Count of number 7 = 2

=> Count of number 8 = 1

=> Count of number 9 = 1

=> Count of number 10 = 1

=> Maximum frequency = 2 (for number 7)

=> Mode = 7

Therefore The correct answer is 7.

Additional Information

Empirical Relationship

For a moderately skewed distribution, the relationship between mean, median, and mode is: Mode = 3 × Median − 2 × Mean.

Types of Mode

A data set with one mode is called unimodal, two modes is bimodal, and more than two is multimodal.

No Mode Case

If all observations in a data set occur with the same frequency, the data set is said to have no mode.

Q23. Answer: (b) 110 cm

Shortcut Trick

Ratio of radii of smaller to larger sphere (r : R) = 1 : 5.

Ratio of surface areas = $(1)^2 : (5)^2 = 1 : 25$.

Total surface area ratio units = 1 + 25 = 26 units.

Given, $4\pi \times$ (Sum of r^2) = 12584π => $26r^2 = 12584 \div 4 = 3146$.

$r^2 = 3146 \div 26 = 121$ => r = 11 cm.

Diameter of larger sphere = 2 × (5 × 11) = 110 cm.

Therefore The correct answer is 110 cm.

Alternate Method

Given:

Sum of surface areas of two spheres = 12584π cm^2.

Radius of larger sphere (R) = 5 × Radius of smaller sphere (r).

Formula Used:

Surface area of a sphere = $4\pi r^2$

Calculations:

=> $4\pi R^2 + 4\pi r^2 = 12584\pi$

=> $4\pi(R^2 + r^2) = 12584\pi$

=> $R^2 + r^2 = 3146$

Substitute R = 5r:

=> $(5r)^2 + r^2 = 3146$

=> $25r^2 + r^2 = 3146$

=> $26r^2 = 3146$

=> $r^2 = 121$

=> $r = \sqrt{121} = 11$ cm

=> Radius of larger sphere (R) = 5 × 11 = 55 cm

=> Diameter of larger sphere = 2 × R = 2 × 55 = 110 cm

Therefore The correct answer is 110 cm.

Additional Information

Volume of a Sphere

The volume of a sphere is given by the formula $V = (4/3)\pi r^3$, where r is the radius.

Hemisphere Properties

For a hemisphere, the Curved Surface Area (CSA) is $2\pi r^2$ and the Total Surface Area (TSA) is $3\pi r^2$.

Ratio of Attributes

If the ratio of radii of two spheres is a:b, then the ratio of their surface areas is $a^2:b^2$ and the ratio of their volumes is $a^3:b^3$.

Q24. Answer: (c) 323

Shortcut Trick

Find the average (mid-point) of the two numbers: 36 ÷ 2 = 18.

The consecutive prime numbers immediately smaller and larger than 18 are 17 and 19.

Verify the sum: 17 + 19 = 36.

Calculate the product: 17 × 19 = (18 − 1) × (18 + 1) = $18^2 - 1^2$ = 324 − 1 = 323.

Therefore The correct answer is 323.

Alternate Method

Given: The sum of two distinct consecutive prime numbers is 36.

Method: Test pairs of prime numbers that add up to 36.

=> Let the primes be p1 and p2.

=> Prime numbers list: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31...

=> Testing pairs: 5 + 31 = 36 (Not consecutive), 7 + 29 = 36 (Not consecutive), 13 + 23 = 36 (Not consecutive).

=> Testing 17 and 19: They are consecutive primes.

=> Sum = 17 + 19 = 36 (Satisfied).

=> Product = 17 × 19 = 323.

Therefore The correct answer is 323.

Additional Information

Prime Numbers

A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.

Twin Primes

A twin prime is a prime number that is either 2 less or 2 more than another prime number (e.g., 17 and 19 are twin primes).

Consecutive Primes

Consecutive primes are prime numbers that follow one another in the sequence of prime numbers without any other primes in between.

Product of Primes

The product of two odd primes is always an odd number. If p1 + p2 is even, both must be odd (except when one is 2).

Q25. Answer: (d) 1,260

Shortcut Trick

Rate = 20%, Time = 3 years => Total Interest = 60%

Total Amount = 100% (Principal) + 60% (Interest) = 160%

Given, 160% = Rs. 5,040

Required SI for 2 years = 20% × 2 = 40%

Required SI = (5,040 ÷ 160) × 40 = 5,040 ÷ 4 = Rs. 1,260

Therefore The correct answer is Rs. 1,260.

Alternate Method

Given: Amount after 3 years (A) = Rs. 5,040, Rate (R) = 20% per annum, Time (T1) = 3 years.

Formula Used: Amount = P + (P × R × T) ÷ 100; SI = (P × R × T) ÷ 100

=> Amount = P[1 + (R × T1) ÷ 100]

=> 5,040 = P[1 + (20 × 3) ÷ 100]

=> 5,040 = P[1 + 0.6] => 5,040 = 1.6P

=> Principal (P) = 5,040 ÷ 1.6 = Rs. 3,150

=> Simple Interest for 2 years (SI2) = (P × R × T2) ÷ 100

=> SI2 = (3,150 × 20 × 2) ÷ 100

=> SI2 = 3,150 × 0.4 = Rs. 1,260

Therefore The correct answer is Rs. 1,260.

Additional Information

Simple Interest Formula

The basic formula is SI = (P × R × T) ÷ 100, where P is Principal, R is Rate per annum, and T is Time in years.

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Relationship between Amount and Principal

Amount (A) = Principal (P) + Simple Interest (SI). In percentage terms, if P is 100%, A is (100 + R × T)%.

Constant Interest Property

In Simple Interest, the interest earned every year remains the same because it is always calculated on the original Principal.

Q26. Answer: (a) IV

Shortcut Trick

To find the lowest selling price, compare the product of the remaining percentages (100% − discount%).

Shop I factor: 0.11 × 0.32 = 0.0352

Shop II factor: 0.50 × 0.49 = 0.2450

Shop III factor: 0.75 × 0.89 = 0.6675

Shop IV factor: 0.06 × 0.51 × 0.79 = 0.024174

Since 0.024174 is the smallest multiplier, Shop IV offers the lowest price.

Therefore The correct answer is IV.

Alternate Method

Assume the Marked Price (MP) of the cooker is Rs. 100 at all shops.

Formula: Selling Price (SP) = MP × (1 − d1/100) × (1 − d2/100) × ...

Shop I SP:

=> 100 × (1 − 0.89) × (1 − 0.68)

=> 100 × 0.11 × 0.32 = Rs. 3.52

Shop II SP:

=> 100 × (1 − 0.50) × (1 − 0.51)

=> 100 × 0.50 × 0.49 = Rs. 24.50

Shop III SP:

=> 100 × (1 − 0.25) × (1 − 0.11)

=> 100 × 0.75 × 0.89 = Rs. 66.75

Shop IV SP:

=> 100 × (1 − 0.94) × (1 − 0.49) × (1 − 0.21)

=> 100 × 0.06 × 0.51 × 0.79 = Rs. 2.4174

Comparing all values: Rs. 2.4174 < Rs. 3.52 < Rs. 24.50 < Rs. 66.75.

Therefore The correct answer is IV.

Additional Information

Successive Discount Formula

For two discounts x% and y%, the effective discount is (x + y − xy/100)%. For more than two, apply the formula repeatedly or use the multiplier method.

Multiplying Factor Method

Final SP = MP × Product of (1 − d_i/100). The shop with the smallest product provides the highest discount and the lowest price.

Marked Price and Selling Price

Selling Price = Marked Price − Discount. Discount is always calculated on the Marked Price unless stated otherwise.

Q27. Answer: (d) 152 years

Shortcut Trick

Present ratio of Father and Son = 12 : 7 (Difference = 5 units)

Future ratio (after 4 years) = 5 : 3 (Difference = 2 units)

Equalize differences: Multiply present by 2 and future by 5 → Present = 24 : 14 | Future = 25 : 15

Ratio increase = 25 − 24 = 1 unit => 1 unit = 4 years

Sum of present ages = (24 + 14) units = 38 units = 38 × 4 = 152 years

Therefore The correct answer is 152 years.

Alternate Method

Given: Present ratio = 12:7 and Ratio after 4 years = 5:3.

Let the present ages of Father and Son be 12x and 7x respectively.

=> According to the question, (12x + 4) ÷ (7x + 4) = 5 ÷ 3

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=> 3 × (12x + 4) = 5 × (7x + 4)

=> 36x + 12 = 35x + 20

=> 36x − 35x = 20 − 12

=> x = 8

=> Father's present age = 12 × 8 = 96 years

=> Son's present age = 7 × 8 = 56 years

=> Sum of their present ages = 96 + 56 = 152 years

Therefore The correct answer is 152 years.

Additional Information

Concept of Age Difference

The difference between the ages of two persons always remains constant, regardless of how many years pass.

Ratio Balancing Method

To solve age problems quickly, multiply the ratios so that the difference between the terms of each ratio is the same. This makes the unit change per year consistent.

Cross-Multiplication Rule

For any ratio a:b becoming c:d after k years: x = [k × (d − c)] ÷ (ad − bc), where x is the common multiplier for the initial ratio.

Q28. Answer: (a) 30

Shortcut Trick

Equalize decimal places: 15.0, 10.0, 0.4.

Remove decimals: 150, 100, 4.

Find LCM of 150, 100, and 4: $150 = 2 \times 3 \times 5^2$, $100 = 2^2 \times 5^2$, $4 = 2^2$.

LCM = $2^2 \times 3 \times 5^2 = 4 \times 3 \times 25 = 300$.

Re-adjust decimal: 300 ÷ 10 = 30.

Therefore The correct answer is 30.

Alternate Method

Given: The numbers are 15, 10, and 0.4.

Formula Used: LCM of fractions = LCM of Numerators ÷ HCF of Denominators.

Convert the decimal and integers into simple fractions:

=> 15 = 15/1

=> 10 = 10/1

=> 0.4 = 4/10 = 2/5

=> Numerators = 15, 10, 2

=> Denominators = 1, 1, 5

=> LCM(15, 10, 2) = 30

=> HCF(1, 1, 5) = 1

=> Required LCM = 30 ÷ 1 = 30

Therefore The correct answer is 30.

Additional Information

LCM of Fractions

LCM of (a/b, c/d, e/f) = LCM(a, c, e) ÷ HCF(b, d, f). Ensure all fractions are simplified before calculating.

HCF of Fractions

HCF of (a/b, c/d, e/f) = HCF(a, c, e) ÷ LCM(b, d, f).

Property of Two Numbers

The product of two numbers is equal to the product of their LCM and HCF (n1 × n2 = LCM × HCF).

Q29. Answer: (a) 5

Shortcut Trick

Total Work = LCM(12, 6) = 12 units.

Efficiency of A = 1 unit/day and efficiency of B = 2 units/day.

Work done by A and B in 2 days = (1 + 2) × 2 = 6 units.

Remaining work = 12 − 6 = 6 units.

Time taken by B alone to complete the rest = 6 ÷ 2 = 3 days.

Total time taken = 2 days (together) + 3 days (alone) = 5 days.

Therefore The correct answer is 5 days.

Alternate Method

Given: Time taken by A = 12 days and time taken by B = 6 days.

Formula Used: Total Work = Efficiency × Time; Total Time = Initial days + Remaining days.

Person	Days	Total Work	Efficiency
A	12	12	1
B	6	2	

=> Let Total Work be the LCM of 12 and 6 = 12 units.

=> Combined efficiency of A and B = 1 + 2 = 3 units/day.

=> Work completed by both in 2 days = 3 × 2 = 6 units.

=> Remaining Work to be done by B = 12 − 6 = 6 units.

=> Time taken by B to finish remaining work = 6 ÷ 2 = 3 days.

=> Whole work completed in = 2 + 3 = 5 days.

Therefore The correct answer is 5 days.

Additional Information

Efficiency and Time Relation

Efficiency is inversely proportional to the Time taken to complete a work. If the ratio of time taken is x:y, the ratio of their efficiency will be y:x.

Work and Wages

Wages are generally distributed in the ratio of the Work Done by each person or the ratio of their Efficiencies if they work for the same duration.

Pipes and Cisterns

Similar logic applies to pipes where the Inlet pipe has positive efficiency and the Outlet pipe has negative efficiency.

Q30. Answer: (a) 10/33

Given:

{(20/36) ÷ (20/5)} ÷ (5/11 × 22/15 + 3/12) + 5/5 ÷ 33/21 of 21/5

Formula used:

The order of operations follows VBODMAS: Brackets, Of, Division, Multiplication, Addition, and Subtraction.

Calculation:

=> {(20/36) ÷ (20/5)} ÷ (5/11 × 22/15 + 3/12) + 5/5 ÷ (33/21 × 21/5)

=> (20/36 × 5/20) ÷ (2/3 + 1/4) + 1 ÷ 33/5

=> (5/36) ÷ (11/12) + (1 × 5/33)

=> (5/36 × 12/11) + 5/33

=> 5/33 + 5/33

=> 10/33

Therefore The correct answer is option (1).

Q31. Answer: (a) 1, 2, 3

The correct answer is 1, 2, 3.

Key Points

• Project Elephant was launched by the Government of India in February 1992 as a Centrally Sponsored Scheme to provide financial and technical support to states for the protection of elephants, their habitats, and corridors. Hence, statement 1 is correct.

• Project Tiger was launched on April 1, 1973, at Jim Corbett National Park to ensure a viable population of the Bengal Tiger in India and to preserve areas of biological importance as a natural heritage. Hence, statement 2 is correct.

• The Sundarbans Biosphere Reserve, located in the Ganges-Brahmaputra Delta in West Bengal, is the largest mangrove forest in the world and was designated as a UNESCO World Heritage Site in 1987. Hence, statement 3 is correct.

• Keoladeo National Park, formerly known as the Bharatpur Bird Sanctuary, is located in Bharatpur, Rajasthan, not Madhya Pradesh. Hence, statement 4 is incorrect.

Additional Information

• Project Tiger is administered by the National Tiger Conservation Authority (NTCA), a statutory body under the Ministry of Environment, Forest and Climate Change.

• The Sundarbans is a unique ecosystem known for the Royal Bengal Tiger and was designated as a Ramsar Site of international importance in January 2019.

• Keoladeo National Park is a man-made wetland and a UNESCO World Heritage Site, famous for hosting thousands of birds, including the critically endangered Siberian Crane during winters.

• Project Elephant also focuses on addressing issues of Human-Elephant Conflict and the welfare of domesticated elephants through the MIKE (Monitoring the Illegal Killing of Elephants) program.

Q32. Answer: (b) Preserve, protect and defend the Constitution

The correct answer is Preserve, protect and defend the Constitution.

Key Points

• According to Article 60 of the Indian Constitution, every person assuming the office of the President must make and subscribe to an oath or affirmation in the presence of the Chief Justice of India or the senior-most Judge of the Supreme Court.

• The core text of the oath explicitly mandates that the President shall, to the best of their ability, preserve, protect and defend the Constitution and the law.

• This specific phrasing highlights the President's role as the custodian and guardian of the supreme law of the land, distinguishing the office from other political or administrative roles.

• While the Prime Minister and Council of Ministers are responsible for the day-to-day governance and policy formulation, the President ensures that such actions do not violate Constitutional mandates.

• The oath also includes a commitment to devote themselves to the service and well-being of the people of India, emphasizing the President's position as the symbolic head of the Republic.

Additional Information

• Article 52: Establishes that there shall be a President of India.

• Article 53: Declares the President as the head of the Union Executive, noting that all executive powers are exercised by the President either directly or through subordinate officers.

• Comparison with other functions:

• Formulate policies: This is the primary function of the Cabinet and the Executive branch led by the Prime Minister, not a constitutional duty of the President under Article 60.

• Manage finances: Financial governance is primarily handled by the Ministry of Finance and Parliament, which has the power of the purse via the Consolidated Fund of India (Article 266).

• Control Council of Ministers: Under Article 74, the President acts on the aid and advice of the Council of Ministers. While the President appoints the ministers, the Prime Minister exercises real political control.

• Violation of Oath: The President can be removed from office through Impeachment under Article 61 only on the grounds of 'violation of the Constitution', which directly correlates to the failure to uphold the oath prescribed in Article 60.

Q33. Answer: (c) BioE3

The correct answer is BioE3.

Key Points

• The BioE3 (Biotechnology for Economy, Environment and Employment) Policy was formally approved by the Union Cabinet, chaired by Prime Minister Narendra Modi, in August 2024.

• The policy is a strategic initiative by the Department of Biotechnology (DBT) under the Ministry of Science & Technology to accelerate high-performance biomanufacturing in India.

• Its primary objective is to facilitate the transition from traditional chemical-based processes to sustainable bio-based manufacturing, aligning with the national goal of achieving a Net-Zero carbon economy by 2070.

• The policy emphasizes the development of Biomanufacturing & Bio-foundry hubs and Bio-AI hubs to support innovation-driven research and commercialization across various sectors.

• It supports entrepreneurship by creating a robust ecosystem for startups and small-scale industries to scale biological solutions into global products.

Additional Information

• Strategic Thematic Areas:

• The policy focuses on six core sectors: Bio-based chemicals and enzymes, Functional foods and smart proteins, Precision biotherapeutics, Climate-resilient agriculture, Carbon capture and utilization, and Marine and space research.

• It promotes the Lifestyle for Environment (LiFE) initiative by encouraging circular economy practices and sustainable consumption of resources.

• Economic Projections and Employment:

• India aims to expand its bioeconomy from approximately $150 billion in 2024 to $300 billion by 2030.

• Implementation of the BioE3 policy is expected to drive significant employment generation, particularly for high-skilled technical personnel in Tier-II and Tier-III cities through regional manufacturing clusters.

Q34. Answer: (d) Abolition of Sati in 1829

The correct answer is Abolition of Sati in 1829.

Key Points

• Raja Ram Mohan Roy, often regarded as the Father of the Indian Renaissance, was a pioneer of social and religious reform in 19th-century India.

• His most significant social achievement was the relentless campaign against Sati, a cruel practice where widows were immolated on their husbands' funeral pyres. He argued that this custom had no basis in authentic Hindu scriptures like the Upanishads.

• He founded the Brahmo Sabha in 1828 (later Brahmo Samaj), which provided a structured platform to advocate for monotheism and the abolition of social evils.

• Roy's persistent advocacy and petitions influenced Lord William Bentinck, the then Governor-General of India, to pass the Sati Regulation Act XVII on December 4, 1829.

• This landmark legislation initially declared Sati illegal and punishable as culpable homicide in the Bengal Presidency, and it was subsequently extended to Madras and Bombay in 1830.

Additional Information

• Promoting English education:

• Roy was a staunch supporter of modern Western education to modernize Indian society.

• He assisted David Hare in establishing the Hindu College in 1817 and founded the Vedanta College in 1825, which integrated Indian learning with Western physical and social sciences.

• Indian National Congress (INC):

• The INC was founded in 1885 by Allan Octavian Hume, over five decades after Roy's death in 1833.

• Abolition of child marriage:

• While Roy opposed the practice, the formal Child Marriage Restraint Act (also known as the Sarda Act) was not enacted until 1929.

• Other reformers like Ishwar Chandra Vidyasagar (who focused on widow remarriage) and B.M. Malabari were instrumental in later legislative successes against child marriage.

• Journalism:

• He utilized the press to influence public opinion, publishing the Bengali journal Sambad Kaumudi and the Persian newspaper Mirat-ul-Akbar.

Q35. Answer: (b) Silver Jubilee Celebration of International Mother Language Day

The correct answer is Silver Jubilee Celebration of International Mother Language Day.

Key Points

• International Mother Language Day is celebrated every year on 21 February to promote linguistic and cultural diversity and the importance of multilingualism.

• The day was first proclaimed by the UNESCO General Conference in November 1999 and has been observed worldwide since February 2000.

• The year 2025 marks the Silver Jubilee (25th anniversary) of this global initiative, celebrating a quarter-century of efforts to preserve and protect mother tongues.

• The theme specifically acknowledges the historical milestone reached since the first celebration in 2000, highlighting the long-term commitment of UNESCO and its member states to linguistic diversity.

• The observance has its roots in the Language Movement of Bangladesh (formerly East Pakistan), where students and activists sacrificed their lives in 1952 to establish Bangla as an official state language.

• The 25-year milestone in 2025 serves as a platform to evaluate the progress of the International Decade of Indigenous Languages (2022−2032) and the integration of mother languages in digital and educational spaces.

Additional Information

• Other themes associated with the recent history of International Mother Language Day include:

• Using technology for multilingual learning: Challenges and opportunities: This was the official theme for 2022, focusing on the potential of technology to support multilingual education.

• Multilingual Education: A necessity to transform education: This served as the theme for 2023, emphasizing the shift towards inclusive mother-tongue-based learning environments.

• Multilingual education - a pillar of learning and intergenerational learning: This was the official theme for 2024, stressing the role

of native languages in passing knowledge between generations.

Q36. Answer: (d) Rs. 50.65 lakh crore

The correct answer is Rs. 50.65 lakh crore.

Key Points

• During the presentation of the Union Budget 2025-26 on February 1, 2025, the Union Finance Minister Nirmala Sitharaman estimated the total expenditure for the financial year at Rs. 50.65 lakh crore (specifically Rs. 50,65,345 crore).

• This estimated total expenditure represents a growth of approximately 7.4% over the revised estimate of Rs. 47.16 lakh crore for the previous financial year (2024-25).

• The total budget is distributed into revenue expenditure and capital expenditure, with revenue expenditure estimated to grow by 6.7% and capital expenditure set to increase by 10.1% over the revised estimates.

• The capital expenditure (capex) for FY 2025-26 has been pegged at Rs. 11.21 lakh crore, which constitutes about 3.1% of the GDP.

Additional Information

• Budget Estimates 2025-26:

• Total Receipts: The non-debt receipts (excluding borrowings) are estimated at Rs. 34.96 lakh crore, showing an 11.1% increase over the revised estimates of 2024-25.

• Fiscal Deficit: For FY 2025-26, the fiscal deficit is targeted at 4.4% of GDP, keeping on path with the fiscal consolidation roadmap.

• Net Tax Receipts: The net tax collections for the Centre are projected at Rs. 28.37 lakh crore.

• Theme of the Budget: The budget was presented under the theme Sabka Vikas, highlighting development pillars under the vision of Viksit Bharat.

Q37. Answer: (b) 2015-16

The correct answer is 2015-16.

Key Points

• The Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) was launched on 1st July 2015, which falls under the financial year 2015-16, with the motto of 'Har Khet Ko Pani'.

• The primary objective of the scheme is to achieve convergence of investments in irrigation at the field level, expand the cultivable area under assured irrigation, and improve on-farm water use efficiency to reduce wastage of water.

• The scheme was formulated by amalgamating ongoing schemes such as the Accelerated Irrigation Benefit Programme (AIBP), the Integrated Watershed Management Programme (IWMP), and the On Farm Water Management (OFWM) component of the National Mission on Sustainable Agriculture (NMSA).

• It focuses on creating protective irrigation by harnessing rainwater through 'Jal Sanchay' and 'Jal Sinchan' at the micro level to enhance agricultural productivity and generate rural employment.

Additional Information

• Main Components of PMKSY:

• Accelerated Irrigation Benefit Programme (AIBP): Monitored by the Ministry of Jal Shakti, it aims at the faster completion of ongoing Major and Medium Irrigation projects.

• Har Khet Ko Pani (HKKP): Focuses on the creation of new water sources through Minor Irrigation (both surface and ground water) and the restoration of traditional water bodies.

• Per Drop More Crop (PDMC): Managed by the Department of Agriculture and Farmers Welfare, this component promotes Micro-irrigation technologies like Drip and Sprinkler systems to maximize water productivity.

• Watershed Development: Implemented by the Department of Land Resources, it emphasizes effective management of runoff water and improved soil and moisture conservation activities.

Q38. Answer: (b) $500 billion in bilateral trade by 2030

The correct answer is 500 billion in bilateral trade by 2030.

Key Points

• During Prime Minister Narendra Modi's landmark visit to the United States in February 2025, both nations launched Mission 500 to significantly scale up their economic partnership.

• The primary objective of Mission 500 is to achieve a bilateral trade turnover of 500 billion USD between India and the USA by the year 2030.

• This target represents a massive leap from the current trade levels, which stood at approximately 190 billion USD to 200 billion USD in the preceding fiscal years, making the USA India's largest trading partner.

• The mission focuses on high-growth sectors including critical minerals, semiconductors, clean energy, space technology, and

pharmaceuticals to drive this exponential growth.

• The initiative was conceptualized to streamline supply chains and reduce trade barriers, reinforcing the Comprehensive Global Strategic Partnership.

• Therefore, the correct option is 2.

Additional Information

• India-USA Economic Relations:

• The USA is one of the few countries with which India enjoys a trade surplus, particularly in goods and services exports.

• The iCET (initiative on Critical and Emerging Technology) serves as a foundational framework for the technical collaboration required to reach the 500 billion USD milestone.

• Investment flows are a critical component, with the USA being among the top five sources of Foreign Direct Investment (FDI) into India.

• The partnership also emphasizes Defense Industrial Cooperation, although the specific Mission 500 nomenclature is strictly reserved for the trade value target.

• Cooperation in Green Hydrogen and Civil Nuclear Energy is expected to contribute a significant portion of the trade volume in the coming decade.

Q39. Answer: (c) Precipitate

The correct answer is Precipitate.

Key Points

• When a solution of Barium Chloride (BaCl2) is mixed with Sodium Sulfate (Na2SO4), a double displacement reaction occurs where the ions of the two salts exchange partners.

• The chemical equation for this process is: BaCl2 (aq) + Na2SO4 (aq) → BaSO4 (s) + 2NaCl (aq).

• The resulting Barium Sulfate (BaSO4) is a white, insoluble solid that does not dissolve in water and settles at the bottom of the container.

• In chemistry, any solid that forms and separates from a liquid solution during a chemical reaction is scientifically defined as a Precipitate.

• The formation of Barium Sulfate is often used in laboratories as a qualitative test to confirm the presence of Sulfate ions in a given sample.

• Since Barium Sulfate is the solid product emerging from the aqueous mixture, it is correctly identified as a Precipitate.

Additional Information

• Emulsion:

• A mixture of two or more immiscible liquids where one is dispersed in the other, such as oil in water.

• They are stabilized by agents called emulsifiers and are common in food products like milk and butter.

• Isomer:

• Compounds that share the exact same molecular formula but have different structural arrangements or spatial configurations.

• Because of these differences in bonding, isomers typically exhibit distinct physical and chemical properties.

• Isotope:

• Variants of a particular chemical element which possess the same number of protons (same atomic number) but a different number of neutrons.

• This leads to differences in atomic mass, such as the difference between Carbon-12 and Carbon-14.

Q40. Answer: (b) 73rd Amendment

The correct answer is 73rd Amendment.

Key Points

• The 73rd Constitutional Amendment Act, 1992, was passed to provide constitutional status and protection to the Panchayati Raj Institutions (PRIs) in India.

• This amendment introduced a new Part IX to the Constitution, titled 'The Panchayats', which contains provisions from Article 243 to 243-O.

• It added the Eleventh Schedule to the Constitution, which lists 29 functional items or subjects that are placed under the jurisdiction of Panchayats, such as agriculture, land improvement, and primary education.

• The act mandated a three-tier system of Panchayati Raj in every state: the Gram Panchayat at the village level, the Panchayat Samiti at the intermediate (block) level, and the Zilla Parishad at the district level.

• It established the Gram Sabha as the foundation of the Panchayati Raj system, consisting of all persons registered in the electoral rolls of a village.

• The amendment provided for the reservation of seats for Scheduled Castes (SCs) and Scheduled Tribes (STs) in proportion to

their population, and reserved not less than one-third of the total number of seats for women.

• The act came into force on April 24, 1993, and this day is celebrated every year as National Panchayati Raj Day.

Additional Information

• 86th Amendment Act (2002):

• Inserted Article 21A, which made free and compulsory education a Fundamental Right for children between the ages of 6 and 14 years.

• Modified Article 45 (Directive Principles) and added a new Fundamental Duty under Article 51A(k).

• 42nd Amendment Act (1976):

• Widely known as the 'Mini-Constitution', it added the words 'Socialist', 'Secular', and 'Integrity' to the Preamble.

• Introduced Part IV-A (Fundamental Duties) upon the recommendation of the Swaran Singh Committee.

• 44th Amendment Act (1978):

• Removed the Right to Property from the list of Fundamental Rights and made it a legal right under Article 300A.

• Restricted the power of the government to proclaim an Internal Emergency by replacing 'internal disturbance' with 'armed rebellion'.

Q41. Answer: (a) Search box

The correct answer is Search box.

Key Points

• The Search box is a dedicated input field located in the top-right corner of the Windows 11 File Explorer interface, used for performing real-time queries.

• It allows users to quickly find files, folders, and sub-directories by typing their file names, file extensions (such as .docx or .pdf), or specific keywords found within the file content.

• The feature utilizes the Windows Search Indexing service, which pre-scans files to provide near-instant results; users can also use keyboard shortcuts like Ctrl + F or F3 to activate it immediately.

• Advanced users can utilize search filters within this box to refine results by date modified, file type, or size using specific syntax such as 'kind:image' or 'size:large'.

Additional Information

• Properties:

• Provides detailed metadata about a selected file, including file size, creation date, and location path.

• Allows users to manage file attributes like Read-only or Hidden and adjust security permissions.

• Sort:

• Used to organize existing files in the current view based on criteria like Name, Date modified, Type, or Size.

• It changes the order of visible items but does not perform a search for items located in other folders.

• View:

• Adjusts the layout of the File Explorer window, offering options like Extra large icons, List, or Details.

• Enables the visibility of hidden items and file name extensions through the Show sub-menu.

Q42. Answer: (c) Sitara Devi

The correct answer is Sitara Devi.

Key Points

• Sitara Devi (1920–2014) was a legendary exponent of Kathak, a classical dance form of North India, and is widely credited with bringing the dance style to the global stage and mainstream Indian Cinema.

• The title Nritya Samragini, which translates to the Empress of Dance, was bestowed upon her by the Nobel Laureate Rabindranath Tagore after he witnessed her performance in Mumbai.

• The historical encounter took place when Sitara Devi was only sixteen years old; she performed a three-hour long Kathak recital at the Tata Palace in the presence of Tagore and other luminaries like Sarojini Naidu.

• Deeply impressed by her rhythmic precision and expressive power, Tagore invited her to Shantiniketan and presented her with a ceremonial shawl and a gold coin as a mark of respect along with the iconic title.

• She belonged to the Banaras Gharana of Kathak and was trained by her father, Sukhadev Maharaj, who was a renowned scholar and dancer himself.

• Over her illustrious career, she was honored with the Sangeet Natak Akademi Award in 1969 and the Padma Shri in 1973 for her immense contribution to the performing arts.

Additional Information

• Kanak Rele:

• She was a world-renowned Mohiniyattam dancer and the founder-director of the Nalanda Dance Research Centre in Mumbai.

• She was instrumental in the scientific systematization of Mohiniyattam and received the Padma Bhushan in 2013.

• Sobha Naidu:

• A prominent disciple of Vempati Chinna Satyam, she was an eminent Kuchipudi dancer known for her mastery over the Satyabhama and Padmavati roles.

• She served as the principal of the Kuchipudi Art Academy in Hyderabad and was awarded the Padma Shri in 2001.

• T. Balasaraswati:

• A seventh-generation representative of the traditional Devadasi heritage, she is regarded as the Queen of Bharatanatyam.

• She was the first dancer to be awarded the Padma Vibhushan in 1977 and played a key role in gaining international recognition for South Indian classical dance.

Q43. Answer: (c) Teak

The correct answer is Teak.

Key Points

• Tropical Deciduous Forests are the most widespread forest type in India, often referred to as Monsoon Forests. They cover nearly 65 percent of India's total forest area.

• Teak (Tectona grandis) is the most dominant and commercially valuable tree species found in these forests. It is particularly characteristic of the Moist Deciduous subtype, which thrives in regions receiving rainfall between 100 cm and 200 cm.

• These forests are found on the eastern slopes of the Western Ghats, the Chhota Nagpur Plateau, and throughout Central India. Significant populations are located in Madhya Pradesh, Maharashtra, Karnataka, and Tamil Nadu.

• The defining feature of species like Teak in these regions is the seasonal shedding of leaves for approximately six to eight weeks during the dry summer months to prevent water loss through transpiration.

• Teak is prized for its high-quality hardwood, which contains natural oils making it resistant to termites and weather, essential for shipbuilding and premium furniture.

Additional Information

• Comparison with other forest species:

• Fir: A coniferous tree belonging to Montane Forests. It is found at high altitudes in the Himalayan region, typically above 2,500 meters.

• Oak: A broad-leaved species common in Wet Temperate Forests. In India, they are found in the Himalayas at altitudes between 1,000 and 2,000 meters.

• Pine: Specifically the Chir Pine, it is the most common tree in Subtropical Pine Forests, found in the lower altitudes of the Himalayan belt.

• Sal: Along with Teak, Sal is a major deciduous species, but it is more prevalent in the northeastern parts of the peninsula and the Himalayan foothills.

Q44. Answer: (c) Chennai

The correct answer is Chennai.

Key Points

• The 23rd Asian Oceanian Congress of Radiology (AOCR) is scheduled to be held in Chennai, Tamil Nadu, from January 23 to 26, 2025.

• The event is being organized as a joint congress along with the 77th Annual Conference of the Indian Radiological and Imaging Association (IRIA), making it one of the largest radiological gatherings in the Asia-Oceania region.

• The designated venue for this mega-event is the Chennai Trade Centre, which will host thousands of delegates, including radiologists, scientists, and medical imaging professionals from across the globe.

• The central theme for AOCR 2025 is 'Radiology: Driving Precision and Personalised Medicine', focusing on the transformative role of imaging in tailoring healthcare to individual patient needs.

• Scientific sessions during the congress are designed to cover advanced topics such as Artificial Intelligence (AI) in Radiology, Functional Imaging, and Teleradiology, aiming to enhance diagnostic accuracy and patient care standards.

Additional Information

• Indian Radiological and Imaging Association (IRIA):

• Founded in 1931, it is the premier professional body for radiologists in India.

• The association works toward the advancement of medical imaging techniques including X-ray, Ultrasound, CT, MRI, and PET-CT.

• It holds an annual conference to facilitate the exchange of knowledge and promote the latest technological innovations in the field.

• Asian Oceanian Society of Radiology (AOSR):

• It serves as the regional federation for radiological societies within the Asia-Oceania geographic zone.

• The AOCR is the society's flagship biennial congress, rotating among member nations to promote regional cooperation and education.

• The society focuses on improving radiological standards and supporting young radiologists through fellowships and training programs.

Q45. Answer: (c) Both statements I and II are correct.

The correct answer is Both statements I and II are correct.

Key Points

• During the Mughal Empire, the administration was highly centralized and divided into provinces known as Subas. The Subedar, also known as the Sipah-salar or Nazim, was the executive head of the province appointed directly by the Emperor. His primary duties included the maintenance of law and order, command of the provincial army, and the execution of imperial decrees within his jurisdiction. Hence, statement I is correct.

• To ensure a system of checks and balances, the Mughal administration established a separate office for financial affairs. The Diwan was the head of the revenue department at the provincial level. He was responsible for the collection of land revenue, management of provincial expenses, and supervision of the Amils and Qanungos. The Diwan reported directly to the Wazir (Central Diwan) rather than the Subedar, creating a dual power structure in the province. Hence, statement II is correct.

Additional Information

• Apart from the Subedar and Diwan, several other key officials facilitated provincial governance:

• Bakshi: He served as the provincial paymaster and was responsible for the military organization, recruitment of soldiers, and checking the branding of horses (Dagh system).

• Sadr and Qazi: These officials were often combined into one person; the Sadr managed religious grants and charities, while the Qazi functioned as the head of the judicial department in the province.

• Kotwal: He was the officer in charge of municipal administration and maintained peace, sanitation, and market regulations in the provincial capital and major cities.

• Waqia-Navis: These were news writers or intelligence officers who reported provincial developments and the conduct of officials directly to the central government.

• Faujdar: At the district level (Sarkar), the Faujdar assisted the Subedar by maintaining internal security and suppressing local rebellions.

Q46. Answer: (b) Zero

The correct answer is Zero.

Key Points

• When an object is thrown vertically upward, it moves against the force of Earth's Gravity, which provides a constant downward Acceleration ($g \approx 9.8$ m/s^2).

• As the object rises, its Initial Velocity decreases at a steady rate due to this downward acceleration, a process known as Deceleration or Retardation.

• The Highest Point represents the peak of the trajectory where the object reaches its maximum vertical displacement from the point of release.

• To transition from an upward motion to a downward motion, the object's velocity must pass through a state of Instantaneous Rest; therefore, the magnitude of its velocity at that exact moment is 0 m/s.

• Using the first equation of motion, $v = u - gt$, at the maximum height ($t = u/g$), the final velocity (v) equates to exactly Zero.

Additional Information

• Acceleration vs Velocity:

• A common misconception is that acceleration is also zero at the peak. However, the Acceleration due to Gravity remains constant and non-zero (9.8 m/s^2 downward) throughout the motion. If it were zero, the ball would stop and float rather than falling back down.

• Directional Sign Convention:

• In physics, velocity is a Vector Quantity. If upward motion is defined as Positive, the velocity is positive during ascent and Negative during descent.

• The value Zero marks the critical point where the direction of the vector flips.

• Energy Distribution:

• At the highest point, the ball's Kinetic Energy ($1/2\ mv^2$) is zero because the velocity is zero.

• Conversely, its Gravitational Potential Energy (mgh) is at its maximum, representing the total mechanical energy of the system in the absence of air resistance.

Q47. Answer: (a) Mental Health in Humanitarian Emergencies

The correct answer is Mental Health in Humanitarian Emergencies.

Key Points

• World Mental Health Day is observed annually on October 10 to raise global awareness of mental health issues and to mobilize efforts in support of mental well-being.

• The official theme for 2025, designated by the World Federation for Mental Health (WFMH) and the World Health Organization (WHO), is Mental Health in Humanitarian Emergencies (also referred to as 'Access to Services – Mental Health in Catastrophes and Emergencies').

• The campaign addresses the severe psychological impact of wars, natural disasters, epidemics, and climate-related crises on individuals and communities.

• Data from the WHO indicates that approximately one in five people (22%) living in areas affected by conflict suffer from conditions such as depression, anxiety, PTSD, or schizophrenia.

• The 2025 initiative emphasizes that Mental Health and Psychosocial Support (MHPSS) must be integrated as a fundamental part of humanitarian responses, ensuring survivors receive psychological first aid alongside medical and physical assistance.

Additional Information

• Historical Themes:

• Mental Health at Work: This was the official campaign theme for World Mental Health Day 2024, focusing on workplace well-being.

• Mental Health is a Universal Human Right: This theme was observed in 2023 to advocate for equitable access to mental health care.

• Make Mental Health & Well-being for All a Global Priority: This was the designated theme for 2022.

• Relevant Indian Initiatives:

• Tele-MANAS: Launched in 2022, the Tele-Mental Health Assistance and Networking Across States provides 24x7 free mental health counseling via the toll-free number 14416.

• Manodarpan: A platform by the Ministry of Education providing psychosocial support to students, teachers, and families for emotional well-being.

Q48. Answer: (a) Article 350-B

The correct answer is Article 350-B.

Key Points

• Article 350-B was not a part of the original Constitution of India; it was inserted through the 7th Constitutional Amendment Act, 1956. This amendment followed the recommendations of the States Reorganisation Commission (1953-55) to safeguard the rights of linguistic groups in different states.

• The article mandates that there shall be a Special Officer for Linguistic Minorities to be appointed by the President of India. The officer is designated as the Commissioner for Linguistic Minorities.

• The primary duty of this officer is to investigate all matters relating to the safeguards provided for linguistic minorities under the Constitution. This includes monitoring the implementation of constitutional provisions and administrative schemes related to language rights.

• The Special Officer submits reports to the President at such intervals as the President may direct. These reports are subsequently laid before each House of Parliament and sent to the governments of the States concerned.

• The office of the Commissioner for Linguistic Minorities was established in 1957, with its headquarters located at Prayagraj (Allahabad), and it operates under the administrative control of the Ministry of Minority Affairs.

Additional Information

• Article 338-A:

• This article provides for the establishment of the National Commission for Scheduled Tribes (NCST).

• It was inserted into the Constitution by the 89th Constitutional Amendment Act, 2003, which bifurcated the erstwhile combined National Commission for Scheduled Castes and Scheduled Tribes.

• The Commission consists of a Chairperson, a Vice-Chairperson, and three other members appointed by the President.

• Article 315:

• Relates to the Public Service Commissions for the Union and for the States.

• Article 315(1) mandates the creation of the Union Public Service Commission (UPSC) and State Public Service Commissions (SPSC) to conduct examinations for appointments to the services of the Union and the States respectively.

• Article 348:

• Specifies the language to be used in the Supreme Court and the High Courts and for Acts, Bills, etc.

• Under Article 348(1), all proceedings in the Supreme Court and every High Court shall be in the English language until

Parliament by law provides otherwise.

Q49. Answer: (c) Network Interface Card

The correct answer is Network Interface Card.

Key Points

• A Network Interface Card (NIC) is a hardware component, typically a circuit board or chip, installed on a computer that allows it to connect to a Local Area Network (LAN) and other networks.

• The NIC operates at both the Physical Layer (Layer 1) and the Data Link Layer (Layer 2) of the Open Systems Interconnection (OSI) model, providing the necessary hardware circuitry for data transmission.

• Each card has a unique, permanent identification number called the Media Access Control (MAC) address, which is used to direct traffic to the specific device on the network.

• The NIC acts as a translator, converting the computer's internal Parallel Data into Serial Data signals that can travel over network cables (like Ethernet) or through the air via radio waves (for Wireless NICs).

• It manages the flow of data packets between the computer and the transmission medium, ensuring that data is transmitted at a speed compatible with the network standard, such as 10/100/1000 Mbps.

Additional Information

• Graphics Processing Unit (GPU):

• A specialized processor designed to accelerate Graphics Rendering and image processing.

• Commonly used in Gaming, video editing, and complex mathematical computations like Machine Learning.

• Read-Only Memory (ROM):

• A Non-Volatile memory type that permanently stores data required to start the computer.

• It contains the BIOS (Basic Input/Output System) or UEFI firmware that performs the initial hardware checks.

• Central Processing Unit (CPU):

• Referred to as the Brain of the Computer, it interprets and executes most of the commands from hardware and software.

• Consists of the Arithmetic Logic Unit (ALU) for calculations and the Control Unit (CU) for managing instruction cycles.

Q50. Answer: (b) 2021

The correct answer is 2021.

Key Points

• The PM Gati Shakti - National Master Plan (NMP) was officially launched by Prime Minister Narendra Modi on October 13, 2021, to transform the infrastructure landscape of India.

• It is a 100 lakh crore national master plan for multi-modal connectivity aimed at developing integrated infrastructure and reducing logistics costs, which currently stand at approximately 13-14% of the GDP.

• The plan provides a digital platform that brings 16 Ministries, including Railways and Roadways, together for integrated planning and coordinated implementation of infrastructure connectivity projects.

• It utilizes the GIS-based spatial planning tools developed by the Bhaskaracharya National Institute for Space Applications and Geoinformatics (BISAG-N) to provide a unified map for all infrastructure initiatives.

• The initiative is designed to address the long-standing issue of departmental silos, ensuring that projects like the Bharatmala, Sagarmala, and UDAN are executed with shared information and synchronized timelines.

Additional Information

• Six Pillars of PM Gati Shakti:

• Comprehensiveness: Integrates all existing and planned initiatives of various ministries into a centralized portal.

• Prioritization: Enables departments to prioritize projects through cross-sectoral interactions based on critical gaps.

• Optimization: Assists in identifying the most efficient route and transport mode to save time and resources.

• Synchronization: Ensures coordination between the Central government and State governments to avoid project delays.

• Analytical: Provides satellite imagery and 200+ GIS layers for better visibility and decision-making.

• Dynamic: Offers real-time progress tracking of projects via the digital platform.

• The plan focuses on seven engines of growth: Railways, Roads, Ports, Waterways, Airports, Mass Transport, and Logistics Infrastructure.

Q51. Answer: (d) Women’s education and empowerment

The correct answer is Women’s education and empowerment.

Key Points

• Pandita Ramabai Sarasvati was a pioneering social reformer and scholar who dedicated her life to the cause of women’s emancipation and education in India during the late 19th century.

• She established the Arya Mahila Samaj in 1882 at Pune with the primary goal of promoting female education and fighting against the social evils of child marriage and the oppression of women.

• In 1889, she founded the Sharada Sadan (Home for Learning) in Mumbai, which later moved to Pune; this institution provided vocational training and education to high-caste Hindu widows who were socially ostracized.

• She authored the influential book The High-Caste Hindu Woman in 1887, which critically examined the life of Hindu women and advocated for their legal rights and social dignity.

• Ramabai testified before the Hunter Commission on Education in 1882, where she recommended that women should be trained as medical doctors and school inspectors to better serve the needs of the female population.

Additional Information

• Major Institutions and Achievements:

• Mukti Mission: Established at Kedgaon, it became a sanctuary for thousands of destitute women and orphans, teaching them skills like carpentry and printing to ensure economic self-reliance.

• Academic Honors: She was the first woman to receive the titles of Pandita and Sarasvati from the University of Calcutta for her profound knowledge of Sanskrit.

• Social Activism: She was a staunch advocate for the Age of Consent Act and challenged orthodox religious norms that restricted women's mobility and intellectual growth.

• Kaisar-i-Hind: The British government awarded her the Kaisar-i-Hind Medal in 1919 for her exceptional humanitarian services to Indian society.

Q52. Answer: (b) Parliament only

The correct answer is Parliament only.

Key Points

• Article 323A of the Constitution of India specifically provides for the establishment of Administrative Tribunals for the adjudication of disputes relating to the recruitment and conditions of service of persons appointed to public services.

• According to Clause (1) of Article 323A, the power to create such tribunals is vested exclusively in the Parliament by law; it does not grant this specific power to State Legislatures or the Judiciary.

• This article was inserted into the Constitution through the 42nd Amendment Act, 1976, which introduced a new Part XIV-A titled Tribunals.

• In pursuance of Article 323A, the Parliament enacted the Administrative Tribunals Act, 1985, which authorized the Central Government to establish the Central Administrative Tribunal (CAT) and State Administrative Tribunals (SATs).

• Even when a State Administrative Tribunal is established for a particular state, it is done by an act of Parliament (upon the request of the respective state government), confirming that the legislative competence remains with the Union Parliament only.

Additional Information

• Article 323B:

• Unlike Article 323A, which is restricted to public service matters, Article 323B allows for the creation of tribunals for various other matters such as taxation, foreign exchange, land reforms, ceiling on urban property, and elections.

• Under Article 323B, both the Parliament and the State Legislatures have the authority to establish tribunals within their respective legislative fields.

• Judicial Review:

• In the landmark L. Chandra Kumar vs. Union of India (1997) case, the Supreme Court ruled that the decisions of these tribunals are subject to the judicial review of High Courts.

• This means that while the Parliament establishes them, the High Courts and the Supreme Court maintain supervisory jurisdiction over them as part of the basic structure of the Constitution.

Q53. Answer: (b) Pandu port

The correct answer is Pandu port.

Key Points

• Pandu port is situated in Guwahati, Assam, on the banks of the Brahmaputra River. It serves as the primary and largest riverine port in the North Eastern Region of India.

• It is categorized as a landlocked inland port because it is located hundreds of kilometers away from the coastline, situated deep within the mainland of the Assam valley.

• The port is a critical component of National Waterway 2 (NW-2), which connects Dhubri and Sadiya. It is meticulously managed by the Inland Waterways Authority of India (IWAI).

• Functioning as a multimodal transport hub, it facilitates the transit of bulk cargo such as coal, cement, and food grains via the Indo-Bangladesh Protocol (IBP) route, linking the landlocked North East to the Bay of Bengal.

• Unlike coastal ports that handle oceanic vessels, Pandu port is designed for inland water transport (IWT) vessels and barges

that navigate river systems.

Additional Information

• Major Seaports in India

• Kandla Port: Renamed as Deendayal Port, it is located in the Kutch district of Gujarat. It is a major tidal port on the western coast and acts as a gateway for petroleum and fertilizer imports.

• Mumbai Port: Located in Maharashtra on the Arabian Sea, it is India's largest natural deep-water seaport by size and shipping traffic volume.

• Chennai Port: Situated on the Coromandel Coast in Tamil Nadu, it is an artificial deep-sea port and the third oldest port in India, serving as a hub for the automobile industry.

Q54. Answer: (d) Pondicherry

The correct answer is Pondicherry.

Key Points

• The French East India Company, formally known as the Compagnie des Indes Orientales, was established in 1664 during the reign of King Louis XIV under the guidance of his finance minister, Jean-Baptiste Colbert.

• In 1673, Francois Martin, who succeeded Bellanger de l'Espinay at the Masulipatnam factory, obtained a grant from Sher Khan Lodi, the Governor of Valikondapuram, for a site to build a settlement.

• Pondicherry was officially founded in 1674 and was developed as a well-planned township, serving as the administrative headquarters and the chief commercial hub for the French in the Indian subcontinent.

• Francois Martin served as the first Governor of Pondicherry, transforming it from a small fishing village into a strategic stronghold protected by the construction of Fort Louis.

• By 1701, Pondicherry was designated as the capital of all French settlements in India, centralizing their trade and political operations.

Additional Information

• Other notable French settlements in India included:

• Chandernagore: Established in 1690 in Bengal on the banks of the Hooghly River after obtaining permission from the Mughal Subahdar, Shaista Khan.

• Mahe: Located on the Malabar Coast in Kerala, this strategic trading post was occupied by the French in 1725.

• Karaikal: Situated on the Coromandel Coast in Tamil Nadu, it was acquired by the French in 1739 following a treaty with the Raja of Tanjore.

• Yanam: Located in Andhra Pradesh at the confluence of the Godavari river, it was established as a French factory in 1723.

• The French territories in India were collectively known as Établissements français de l'Inde and remained under French sovereignty until their integration into the Indian Union in 1954.

Q55. Answer: (c) Kakatiya Kingdom

The correct answer is Kakatiya Kingdom.

Key Points

• In October 1309, Malik Kafur, the prominent military commander and Naib of the Delhi Sultanate ruler Alauddin Khalji, launched a major expedition into South India.

• The primary target of this campaign was the Kakatiya Kingdom, with its capital located at Warangal (in present-day Telangana).

• The Delhi forces marched through Devagiri and entered the Kakatiya territory, reaching the frontier of the kingdom by late 1309 and laying siege to the Warangal Fort in early 1310.

• The Kakatiya ruler, Prataparudra II, defended the fort which consisted of two layers: an outer mud wall and an inner stone wall. However, after a fierce struggle, the Sultanate forces breached the outer defenses.

• Facing defeat, Prataparudra II sued for peace and agreed to surrender an enormous amount of wealth, including 100 elephants, 7,000 horses, and several chests of jewels, while also promising an annual tribute to the Delhi Sultanate.

• This invasion was a pivotal moment in the Khilji dynasty's expansion, marking the transition of the Deccan kingdoms into tributary states rather than direct annexations.

Additional Information

• Yadava Kingdom:

• Located in Devagiri, Maharashtra, and ruled by King Ramachandra.

• Malik Kafur invaded this kingdom in 1308 because the ruler had stopped paying the tribute promised after Alauddin Khalji's initial raid in 1296.

• Hoysala Kingdom:

• Based at Dwarasamudra (modern-day Halebidu, Karnataka) under King Vira Ballala III.

• The invasion of the Hoysalas occurred in 1311, following the successful subjugation of the Kakatiyas.

• Pandya Kingdom:

• Situated in the southernmost part of the peninsula with its capital at Madurai.

• Malik Kafur marched towards the Pandya territory in 1311, exploiting a civil war between the brothers Vira Pandya and Sundara Pandya to loot massive wealth from temples.

Q56. Answer: (d) Padma Vibhushan

The correct answer is Padma Vibhushan.

Key Points

• Uday Shankar (1900−1977) was a world-renowned Indian dancer and choreographer, celebrated as the pioneer of modern dance in India.

• In the year 1971, the Government of India conferred upon him the Padma Vibhushan, which is the second-highest civilian award of the Republic of India, for his exceptional and distinguished service in the field of Arts.

• He is credited with creating a unique style of dance that fused Indian classical and folk elements with Western theatrical techniques and ballet, making Indian dance accessible to a global audience.

• He established the Uday Shankar India Culture Centre at Almora in 1938, where he mentored famous artists like Guru Dutt and Shanti Bardhan.

• His magnum opus was the 1948 film Kalpana, which remains a landmark in Indian cinema for its focus on dance-drama and artistic expression.

Additional Information

• Jnanpith Award

• It is the highest literary honor in India, presented by the Bharatiya Jnanpith to authors for their outstanding contribution to literature in Indian languages.

• Padma Bhushan

• The third-highest civilian award in India, given for distinguished service of a high order in any field, including Arts and Science.

• Padma Shri

• The fourth-highest civilian award in India, recognizing distinguished contribution in various spheres of activity including social service, public affairs, and sports.

• Sangeet Natak Akademi Fellowship

• In addition to the Padma Vibhushan, Uday Shankar was also awarded the Sangeet Natak Akademi Fellowship (Akademi Ratna) in 1962, the highest honor in the performing arts in India.

Q57. Answer: (d) 7.3%

The correct answer is 7.3%.

Key Points

• During the Monetary Policy Committee (MPC) meeting concluded on December 5, 2025, the Reserve Bank of India (RBI) updated its economic outlook for the Indian economy.

• The RBI Governor announced a revision in the Real GDP growth projection for the Financial Year 2025-26 (FY26), raising it to 7.3% from the previous estimate of 7.2%.

• This upward revision was primarily driven by robust domestic demand, a recovery in agricultural output due to favorable climatic conditions, and sustained momentum in the manufacturing and services sectors.

• The MPC highlighted that the investment cycle continues to gain traction, supported by the government's focus on infrastructure spending and improving corporate balance sheets.

• Quarterly projections for FY 2025-26 were adjusted to reflect this optimistic trend, with expectations of steady growth across all four quarters of the fiscal year.

Additional Information

• Monetary Policy Committee (MPC):

• The MPC is a statutory body under the Reserve Bank of India Act, 1934, responsible for fixing the benchmark policy rate (Repo Rate) to contain inflation within the target level.

• It consists of six members: three from the RBI (including the Governor) and three external members appointed by the Government of India.

• Growth Drivers for FY 2025-26:

• Private Consumption: Expected to remain the primary driver, bolstered by rural demand recovery.

• Gross Fixed Capital Formation (GFCF): Reflects the strengthening of the private investment cycle.

• Export Performance: Despite global headwinds, Indian service exports and specific manufacturing segments showed resilience.

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• Inflation Outlook:

• The RBI maintains a medium-term target for Consumer Price Index (CPI) inflation of 4% within a band of ± 2%.

Q58. Answer: (c) Kolkata

The correct answer is Kolkata.

Key Points

• Kolkata Port, officially known as the Syama Prasad Mookerjee Port, is the only major riverine port in India. It is situated on the left bank of the Hooghly River in West Bengal.

• The port is located approximately 126 kilometers inland from the sea, making it an inland port that relies on the river system for maritime access.

• Historically, it was the premier port of the British East India Company and played a pivotal role in the trade of indigo, tea, and jute.

• Due to its location on a river, the port faces significant challenges from siltation. To maintain navigable depth for large ships, constant dredging is required by the Dredging Corporation of India.

• It serves as the primary gateway for the hinterland of Eastern India, including Bihar, Jharkhand, Uttar Pradesh, and landlocked neighboring countries like Nepal and Bhutan.

Additional Information

• Visakhapatnam Port:

• Located in Andhra Pradesh on the East Coast, it is a land-locked, deep-water port protected by the Dolphin-s Nose hill.

• Kandla Port:

• Now known as Deendayal Port, it is located in the Gulf of Kutch, Gujarat. It is a tidal port established to reduce the pressure on Mumbai Port after the loss of Karachi Port during partition.

• Kochi Port:

• Situated on Willingdon Island in Kerala, it is a natural all-weather harbor located at the entrance of the Vembanad Lake on the West Coast.

Q59. Answer: (d) Import substitution

The correct answer is Import substitution.

Key Points

• After independence in 1947, India adopted an inward-looking trade strategy known as Import Substitution Industrialization (ISI) to achieve self-reliance and reduce its vulnerability to the global economy.

• The primary objective of this policy was to protect domestic industries (often called infant industries) from foreign competition by replacing imports with indigenous production.

• This strategy was heavily emphasized during the Second Five-Year Plan (1956-1961), which was based on the Mahalanobis Model focusing on heavy industries and capital goods.

• The government implemented this through two main instruments: Tariffs (imposing high taxes on imported goods to make them less attractive) and Quotas (specifying the maximum quantity of goods that could be imported).

• By restricting foreign goods, the government aimed to save foreign exchange reserves and promote the growth of local manufacturers in sectors like electronics, automobiles, and machinery.

Additional Information

• Export-led growth:

• This is an outward-looking strategy where a country seeks to grow its Gross Domestic Product (GDP) by focusing on producing goods for the international market.

• Unlike India's early approach, this was successfully utilized by East Asian Tigers like South Korea and Taiwan.

• Free trade:

• A policy where the government does not discriminate against imports or interfere with exports by applying tariffs or subsidies.

• India moved toward this model only after the 1991 Economic Reforms, which introduced Liberalization, Privatization, and Globalization (LPG).

• Dollarisation:

• A process where a country officially adopts the United States Dollar as its legal tender alongside or instead of its domestic currency.

Q60. Answer: (c) (i) True, (ii) True

The correct answer is (i) True, (ii) True.

Key Points

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• Hibernate mode in Windows 11 is a power-saving state designed primarily for laptops; it takes all currently open applications and system metadata and writes them to the hard disk or SSD into a hidden file called hiberfil.sys. This process allows the computer to be powered off completely while ensuring that the user session is fully restored exactly as it was when the machine is turned back on. Hence, statement (i) is correct.

• Sleep mode, also known as Standby or S3 State, maintains the current session in the Random Access Memory (RAM). Because RAM is volatile memory, it requires a continuous, albeit small, amount of electrical power to prevent data loss, whereas Hibernate (an S4 State) requires effectively zero power because the session is stored on non-volatile physical storage. Hence, statement (ii) is correct.

Additional Information

• Comparison of Power States:

• Sleep Mode: It offers the fastest resume time (often 1-2 seconds) because the CPU does not need to reload data from the disk. It is ideal for short breaks during work but risks data loss if the battery dies.

• Hibernate Mode: While it has a slower startup time compared to sleep, it is safer for long periods of inactivity as it does not drain the battery and is immune to power outages.

• Hybrid Sleep: A feature mostly used on desktop computers that combines both modes; it puts the session in RAM for speed but also writes it to the hard drive as a backup in case of a power failure.

• Fast Startup: A Windows feature that uses hibernation technology to save the operating system kernel to the disk during shutdown, enabling faster boot times upon the next start.

Q61. Answer: (d) Convert the federal system into a unitary one

The correct answer is Convert the federal system into a unitary one.

Key Points

• The Emergency Provisions are contained in Part XVIII of the Constitution of India, from Article 352 to Article 360, designed to protect the sovereignty, unity, and integrity of the nation.

• During the proclamation of an emergency, the Central Government acquires the power to direct any state regarding the manner in which its executive power is to be exercised, effectively overriding the federal distribution of powers.

• The unique feature of the Indian Constitution is its ability to transform from a federal structure to a unitary structure during emergencies without requiring a formal Constitutional Amendment under Article 368.

• This shift ensures that the Union Government can respond decisively to extraordinary situations like war, internal disturbances, or financial instability by centralizing legislative and executive authority.

• Dr. B.R. Ambedkar noted that while most federal systems are "placed in a tight mould of federalism," the Indian system is unique as it can be both unitary as well as federal according to the requirements of time and circumstances.

Additional Information

• Types of Emergencies in India:

• National Emergency (Article 352): Triggered by war, external aggression, or armed rebellion. It suspends the Fundamental Rights under Article 19 automatically and others via Presidential order.

• President's Rule (Article 356): Imposed when the constitutional machinery in a state fails, allowing the President to assume the functions of the State Government.

• Financial Emergency (Article 360): Proclaimed if the financial stability or credit of India is threatened; it allows the Centre to reduce the salaries and allowances of all classes of persons serving the Union or States.

• Incorrect Concepts:

• Monarchy: India is a Democratic Republic, meaning the Head of State (President) is elected, and emergency provisions do not alter this fundamental status.

• Federalism continuation: While the federal structure exists in normal times, it is temporarily suspended or "unitatized" during an emergency to ensure national security.

Q62. Answer: (c) (i) True, (ii) True

The correct answer is (i) True, (ii) True.

Key Points

• Operating Systems function using a dual-mode operation to protect the system. The Kernel, which is the core part of the Operating System, executes in Privileged Mode (also known as Kernel Mode or Supervisor Mode). In this state, the CPU has unrestricted access to all Hardware, Memory, and System Instructions, allowing it to manage resources and perform low-level tasks that User Applications cannot. Hence, statement (i) is correct.

• System Software serves as the interface between the hardware and the user. Device Drivers are specialized programs that allow the Operating System to communicate with specific hardware components like Hard Drives, Graphics Cards, and Network Adapters. Without these core components, the Operating System would be unable to initialize hardware during the Boot Process or manage data flow, making them essential for the computer to start and function. Hence, statement (ii) is correct.

Additional Information

• System Software Categories:

• Operating System (OS): Software like Windows, Linux, or macOS that manages CPU Scheduling and Memory Allocation.

• BIOS/UEFI: The primary Firmware that performs the Power-On Self-Test (POST) and initializes hardware during startup.

• Utility Software: Tools like Disk Defragmenters and Antivirus that maintain system efficiency.

• CPU Execution Modes:

• User Mode: A restricted mode where Application Software runs to prevent it from accessing critical memory or hardware directly.

• Privileged Mode: Reserved for the OS Kernel; it uses Protection Rings (usually Ring 0) to ensure system stability and security.

Q63. Answer: (a) Use of fabric filters to trap dust and fly ash

The correct answer is Use of fabric filters to trap dust and fly ash.

Key Points

• Fabric filters, commonly referred to as baghouses, are specialized industrial air pollution control devices designed to remove particulate matter (PM) from flue gas or exhaust streams.

• They function by passing contaminated air through a series of long, cylindrical bags made of woven or felted fabric, which physically trap solid pollutants such as dust, soot, and fly ash.

• The filtration process involves several physical mechanisms including inertial impaction, interception, and diffusion; as the operation continues, a dust cake forms on the fabric, which significantly increases the removal efficiency of fine particulates.

• These systems are highly effective for particulate control, often achieving collection efficiencies of over 99 percent for particles as small as 0.5 to 1 micrometer in diameter.

• They are essential in high-pollution industries such as thermal power plants, cement factories, and metal smelting units to prevent the release of harmful fly ash into the atmosphere.

Additional Information

• Absorption of gases (Liquid Scrubbers):

• This method primarily targets gaseous pollutants like Sulfur Dioxide (SO2) and Nitrogen Oxides (NOx) by dissolving them in a liquid solvent (often water or an alkaline solution).

• While wet scrubbers can capture some particulates, the specific process of absorption is a mass-transfer operation meant for chemical gas removal rather than solid particle filtration.

• Catalytic Combustion:

• This technique is used to treat Volatile Organic Compounds (VOCs) and Carbon Monoxide (CO) by oxidizing them at lower temperatures using a catalyst (such as Platinum or Palladium).

• It does not effectively remove non-combustible particulates like mineral dust or ash.

• Increasing Chimney Height:

• A dispersion strategy that utilizes stack height to release pollutants higher into the atmosphere, allowing for dilution by wind before they reach ground level.

• This is not a control method as it does not reduce the total mass of pollutants emitted into the environment.

• Electrostatic Precipitators (ESP):

• Another major device for particulate control that uses electric charges to collect particles on large collector plates, widely used for managing fine fly ash in coal-fired power stations.

Q64. Answer: (b) Barium (Ba)

The correct answer is Barium (Ba).

Key Points

• Barium (Ba) is a chemical element classified as an alkaline earth metal, located in Group 2 and Period 6 of the periodic table with the atomic number 56.

• As a metallic element, Barium possesses the physical property of malleability, meaning it can be hammered, pressed, or rolled into thin sheets without breaking or cracking.

• It is an effective conductor of heat and electricity because its metallic lattice contains delocalized valence electrons that are free to move and transport energy throughout the material.

• While Barium is a soft, silvery-white metal, it is highly reactive, particularly with water and oxygen, which is why it is often stored in mineral oil to prevent oxidation.

• In comparison to the other options, Barium is the only true metal; the others are non-metals or noble gases which lack the metallic bonding necessary for conductivity and malleability.

Additional Information

• Sulfur (S):

• It is a non-metal with the atomic number 16.

• In its common solid form (S8), it is extremely brittle and will crumble into powder when struck, making it the opposite of malleable.

• It acts as an insulator because it lacks free electrons to facilitate electrical or thermal flow.

• Iodine (I):

• A halogen and non-metal with the atomic number 53.

• Although it appears as a dark, lustrous solid at room temperature, it is physically brittle and a poor conductor.

• Neon (Ne):

• A noble gas with the atomic number 10 belonging to Group 18.

• It is a colorless, odorless monatomic gas under standard conditions, meaning properties like malleability are not applicable.

• Industrial Uses of Barium:

• Barium sulfate (BaSO4) is used as a radiocontrast agent for X-ray imaging of the gastrointestinal tract.

• It is also utilized as a getter in vacuum tubes to remove residual trace gases due to its high chemical reactivity.

Q65. Answer: (b) Leon Marchand

The correct answer is Leon Marchand.

Key Points

• Leon Marchand, the French swimming sensation, set a monumental new World Record in the 200 m Individual Medley (IM) during the 2025 World Aquatics Championships held in Singapore.

• He achieved this historic feat during the semifinals of the event on July 30, 2025, clocking a time of 1:52.69, which was an astonishing 1.31 seconds faster than the previous mark.

• The previous world record of 1:54.00 had been held by American legend Ryan Lochte for 14 years, dating back to the 2011 World Championships in Shanghai.

• Marchand's record-breaking splits included 24.10 seconds (Butterfly), 28.40 seconds (Backstroke), 32.13 seconds (Breaststroke), and 28.06 seconds (Freestyle).

• Coached by Bob Bowman, Marchand entered the Singapore championships following a dominant four-gold medal performance at the Paris 2024 Olympic Games.

Additional Information

• Other Noteworthy Swimmers:

• Shaine Casas: An elite American swimmer who specialized in the 200 m IM and earned the silver medal at the 2025 championships behind Marchand.

• Michael Phelps: The most decorated Olympian of all time; he held the 200 m IM world record multiple times between 2003 and 2009 before it was broken by Lochte.

• Luca Urlando: A versatile American athlete recognized for his success in butterfly and medley disciplines, frequently reaching finals in World Aquatics competitions.

• Event Details:

• The 2025 World Aquatics Championships were hosted at the Singapore Sports Hub, marking the first time the event was held in Southeast Asia.

• Marchand's performance was particularly rare as World Records are seldom broken in semifinal rounds, where swimmers often conserve energy for the final.

Q66. Answer: (d) Article 38(2)

The correct answer is Article 38(2).

Key Points

• Article 38(2) of the Indian Constitution specifically mandates that the State shall strive to minimize inequalities in income.

• It further directs the government to endeavor to eliminate inequalities in status, facilities, and opportunities among individuals and groups of people.

• This clause is unique because it targets disparities not only between individuals but also among groups of people residing in different areas or engaged in different vocations.

• The provision is a vital part of the Directive Principles of State Policy (DPSP), which provide a roadmap for establishing a welfare state and ensuring economic justice.

• By focusing on income and status, this article serves as the constitutional basis for progressive taxation, subsidies, and various affirmative action programs.

Additional Information

• 44th Constitutional Amendment Act, 1978:

• Article 38(2) was not originally in the Constitution; it was inserted by the 44th Amendment during the Morarji Desai-led Janata Party government to reinforce socialist goals.

• Article 38(1):

• This clause focuses on the broader concept of social order, directing the State to promote the welfare of the people by securing social, economic, and political justice.

• Article 39:

• This article lists specific principles like the right to an adequate livelihood, equal pay for equal work, and the prevention of the concentration of wealth in a few hands.

• Article 36:

• It defines the term 'State' for the purpose of Part IV (DPSP), carrying the same meaning as defined under Article 12 in Part III.

Q67. Answer: (b) They develop due to integrated economic corridors and high connectivity

The correct answer is They develop due to integrated economic corridors and high connectivity.

Key Points

• Megaregions are vast networks of metropolitan areas that share environmental systems, infrastructure, and integrated economic activities, often spanning hundreds of miles.

• The development of these regions is driven by agglomeration economies, where the clustering of businesses, labor, and services leads to increased productivity and innovation.

• Integrated economic corridors, such as high-speed rail, multi-lane expressways, and advanced telecommunications, allow for the seamless movement of goods, services, and human capital across city boundaries.

• For instance, the Tokaido Corridor in Japan is a quintessential megaregion where the Shinkansen (bullet train) has physically and economically linked Tokyo, Nagoya, and Osaka, enabling them to function as a single urban system.

• The Pearl River Delta in China demonstrates how high connectivity through massive bridges and port infrastructure has turned a cluster of cities into a global manufacturing and technology powerhouse.

• Unlike natural population growth, which occurs locally, megaregions emerge through economic magnetism that attracts migrants and investment from across the globe.

Additional Information

• The Northeast Megalopolis (BosWash):

• First identified by geographer Jean Gottmann in 1961, stretching from Boston to Washington, D.C.

• It contains less than 2% of United States land area but produces approximately 20% of the national Gross Domestic Product (GDP).

• Connectivity is sustained by the I-95 corridor and the Northeast Corridor rail line, facilitating intense financial and political exchange.

• The Pearl River Delta (Greater Bay Area):

• Consists of nine mainland cities plus Hong Kong and Macau, forming the most densely populated urban area in the world.

• It is a polycentric urban region where specific cities specialize in manufacturing (Dongguan), finance (Hong Kong), and technology (Shenzhen).

• Conceptual Differences:

• Natural Growth vs. Integration: While natural birth rates contribute to population, the defining feature of a megaregion is the functional integration of separate cities.

• Physical Geography: While many megaregions are coastal, geography alone does not create them; rather, the man-made infrastructure (ports and airports) leveraging that geography is what drives the density.

Q68. Answer: (b) Similar valence electronic configuration

The correct answer is Similar valence electronic configuration.

Key Points

• In the Modern Periodic Table, elements are arranged in vertical columns called groups and horizontal rows called periods. The chemical behavior of an element is primarily determined by its electronic configuration, specifically in the outermost shell.

• The valence shell is the outermost electron shell of an atom, and the electrons residing there are called valence electrons. Elements in the same group possess the same number of valence electrons, leading to a similar valence electronic configuration.

• Chemical reactions involve the redistribution of electrons (losing, gaining, or sharing) to achieve a stable state, often following the octet rule. Since elements in a group have the same number of electrons available for bonding, they tend to form similar types of chemical bonds and compounds.

• For instance, all elements in Group 1 (Alkali Metals) have a general outer configuration of ns^1, meaning they all have one valence electron. This commonality makes them all highly reactive, as they easily lose that single electron to form +1 cations.

Additional Information

• Atomic Number:

• Each element has a unique atomic number representing the number of protons in its nucleus. While the atomic number increases sequentially across a period and jumps by specific intervals down a group, it is never identical for any two elements.

• Atomic Radius:

• The atomic radius is the distance from the center of the nucleus to the outermost shell. Within a group, the atomic radius increases from top to bottom due to the addition of new principal energy levels (shells). Therefore, it is not a constant factor.

• Atomic Mass:

• This is the weighted average mass of an atom's isotopes. In any group, the atomic mass increases significantly as we move down, meaning it is not a factor that remains similar or dictates group-wise chemical similarity.

Q69. Answer: (d) Kalpa-sutra

The correct answer is Kalpa-sutra.

Key Points

• The Kalpa-sutra is a foundational religious text in Jainism, specifically belonging to the Svetambara tradition, and is traditionally attributed to the monk Bhadrabahu, who lived in the 4th century BCE.

• The text is structurally divided into three sections: the first part, Jinacharita, provides detailed hagiographies of the 24 Tirthankaras, focusing heavily on the lives of Mahavira, Parshvanatha, Neminatha, and Rishabhanatha.

• The second section, known as the Theravali, chronicles the succession of disciples and the lineage of pontiffs (spiritual leaders) who maintained the Jain teachings after the Nirvana of Lord Mahavira.

• The final section, Samachari, prescribes the monastic rules and codes of conduct specifically for the rainy season (Varshavas), which are ritually recited by monks during the Paryushana festival.

• It serves as a primary source for understanding early Jain history, the evolution of monastic discipline, and the transition of the faith from oral traditions to written scriptures.

Additional Information

• Paryushana Festival:

• This is the most important annual holy event for Jains, where the Kalpa-sutra is publicly read and explained to the laity over several days.

• It emphasizes repentance (Pratikramana), fasting, and the study of sacred scriptures to achieve spiritual purification.

• Artistic and Historical Significance:

• The Kalpa-sutra manuscripts are famous for their miniature paintings, representing some of the earliest examples of the Western Indian school of art.

• The author, Bhadrabahu, was the spiritual teacher of the Mauryan Emperor Chandragupta and is credited with preserving Jain knowledge during a great famine in Magadha.

Q70. Answer: (d) Folk and devotional string music

The correct answer is Folk and devotional string music.

Key Points

• The Ektara is a traditional one-stringed instrument widely recognized as one of the simplest string instruments used in the Indian subcontinent. The name is derived from the Hindi words Ek meaning 'one' and Tara meaning 'string'.

• It is primarily utilized as a drone instrument to provide a basic rhythmic and melodic foundation for singers, particularly in folk and devotional contexts.

• The instrument is the soul of the Baul music tradition of West Bengal and Bangladesh, where wandering mystic minstrels use it to accompany their spiritual songs.

• It also holds a significant place in Sufi music and Bhakti movement traditions across Maharashtra, Punjab, and Uttar Pradesh, often used by saints and bards during Kirtans and Bhajans.

• Structurally, it consists of a resonator (usually a dried gourd, wood, or coconut shell) covered with skin, and a split bamboo neck that the player squeezes to vary the tension of the string and change the pitch.

Additional Information

• Folk Traditions and Variations:

• In Maharashtra, the Ektara is frequently used by Warkari pilgrims and Haridasa singers to praise Lord Vitthal.

• In the Punjab region, a similar version is used in folk ballads and traditional storytelling.

• It is often played alongside other folk instruments like the Duggi (a small drum) or Khamak to create a rich rhythmic layer for mystical poetry.

• Other Regional Contexts:

• Chhau Dance: Unlike the Ektara, this martial dance primarily uses loud percussion and wind instruments like the Dhol, Nagada, and Shehnai to match its energetic movements.

• Temple Rituals in Odisha: These typically involve instruments like the Mardala (pakhawaj variant) and Shankha (conch shell), which are distinct from the nomadic nature of the Ektara.

• Court Dances: Classical forms like Bharatanatyam rely on sophisticated string instruments like the Saraswati Veena rather than simple folk drones.

Q71. Answer: (d) 4

Logic followed here is:

Thus, the code for T is 4.

Hence, the correct answer is "option 4"

Q72. Answer: (b) C

The logic followed here is,

Original Letter	S	C	R	A	M	B	L	E
Operation	+1	+1	+1	+2	+1	+1	+1	+2
New Letter	T	D	S	C	N	C	M	G

• The group of letters formed is: T, D, S, C, N, C, M, G

• The letter C appears exactly twice in the group.

Hence, the correct answer is "Option 2"

Q73. Answer: (d) 83

BODMAS Table:

Original Sign	New Sign
•	−
−	×
×	÷
÷	•

Given Expression: 54 − 2 ÷ 120 × 2 + 85 = ?

After replacing the signs with their respective meanings, and following the BODMAS rule,

= 54 × 2 + 120 ÷ 2 − 85

= 54 × 2 + 60 − 85

=108 + 60 − 85

= 168 − 85

= 83

Hence, the correct answer is "option 4"

Q74. Answer: (a) yo

Logic: The code for the word is,

Therefore, the code for world is yo.

Hence, the correct answer is "option 1"

Q75. Answer: (d) 6 km to the east

• Shreya starts from Point A and drives 22 km towards the north. He then takes a right turn, drives 24 km, turns right and drives 28 km.

• He then takes a right turn and drives 30 km.

• He takes a final right turn, drives 6 km and stops at Point P

The Final Diagram,

Thus, he should drive 6 km to the east.

Hence, the correct answer is "option 4"

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Q76. Answer: (b) 1

Given word: DEPARTS

Original Word	D	E	P	A	R	T	S
Alphabetical Order	A	D	E	P	R	S	T

Only R remains at the same position.

Hence, the correct answer is " Option 2".

Q77. Answer: (c) Four

Given: Seven boxes F,G,H,I,J,K and S are kept one over the other but not necessarily in the same order.

1. Only three boxes are kept above G.
2. Only one box is kept between J and G.
3. Only three boxes are kept between J and K.
4. K is kept at some place above G.

Position	Box
7	
6	K
5	
4	G
3	
2	J
1	

1. S is kept immediately below K.
2. H is not kept immediately above or below J.
3. F is kept at one of the places above I.

Final Arrangement:

7	H
6	K
5	S
4	G
3	F
2	J
1	I

Thus, there are four boxes between H and J.

Hence, the correct answer is "Option 3"

Q78. Answer: (d) 324

The logic followed here is.

• 4 × 3 = 12

• 12 × 3 = 36

• 36 × 3 = 108

• 108 × 3 = 324

• 324 × 3 = 972

Hence, the correct answer is "option 4"

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Q79. Answer: (b) 55

The logic followed here is:

• Total number of people standing in the row = 193

• Position of Vks from the left end = 124^(th)

• Position of Ccd from the right end = 14^(th)

Position of Ccd from the left = (Total number of people − Position of Ccd from the right end) + 1

= (193 − 14) + 1

= 179 + 1

= 180

• Position of Vks from the left = 124^(th)

• Position of Ccd from the left = 180^(th)

• Number of people between Ccd and Vks = (Position of Ccd from the left − Position of Vks from the left) − 1

= (180 − 124) − 1

= 56 − 1

= 55

Hence, the correct answer is 'Option 2'.

Q80. Answer: (d) (31, 8, 246)

The logic followed here is:

Logic: (First Number × Second Number) − 2 = Third Number

For the first set (27, 12, 322)

=> (27 × 12) − 2

=> 324 − 2 = 322.

For the second set (24, 13, 310)

=> (24 × 13) − 2

=> 312 − 2 = 310.

Applying the same logic to the set (31, 8, 246)

=> (31 × 8) − 2

=> 248 − 2 = 246.

Hence, the correct answer is 'Option 4'.

Q81. Answer: (a) Sister's son

The Family tree diagram,

Therefore, X is the son of S, and S is the sister of P. This makes X the Sister's son of P.

Hence, the correct answer is 'Option 1'.

Q82. Answer: (a) Two

Given: Seven boxes L, M, N, O, P, Q and R are kept one over the other but not necessarily in the same order

1. O is placed at the topmost position.

2. Only one box is kept below P.

3. Exactly two boxes are kept between M and P.

Position	Box
7	O
6	
5	M
4	
3	
2	P
1	

1. Exactly two boxes are kept between L and N, and L is kept on one of the positions above N.

2. Q is kept immediately above N.

3. R is kept on one of the positions below N.

Final Arrangement:

7	O
6	L
5	M
4	Q
3	N
2	P
1	R

Thus, there are two boxes (N and P) kept between Q and R.

Hence, the correct answer is 'Option 1'.

Q83. Answer: (d) MH - OJ - QS

The logic followed in this pattern is,

For the triad 'FA - HC - JL':

For the triad 'ID - KF - MO':

Applying the same logic to 'MH - OJ - QS':

Thus, the triad MH - OJ - QS follows the same pattern as the given triads.

Hence, the correct answer is 'Option 4'.

Q84. Answer: (b) CF - EK - GP

The logic follows here,

For HM - JR - LW:

For UL - WQ - YV:

Applying the same logic for CF - EK - GP:

Hence, the correct answer is " Option 2"

Q85. Answer: (b) UVWX

The logic follows here,

BCDF,

UVWX,

HIJL,

OPQS,

Therefore, the letter cluster that is different from the others is UVWX.

Hence, the correct answer is 'Option 2'.

Q86. Answer: (d) UYT

The logic follows here,

NQM,

YBX,

JMI,

UYT

This letter cluster does not follow the rule.

Therefore, the letter cluster that is different from the others is UYT.

Hence, the correct answer is 'Option 4'.

Q87. Answer: (b) Z

Given: Seven people A, B, D, J, O, T and Z are sitting in a row, facing north.

1. Only two people sit to the right of T.

2. Only two people sit between T and B.

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3. Only two people sit between A and Z.
4. Z sits to the immediate left of T.
5. O sits to the immediate right of D
The final seating arrangement is:
From the table, we can see that Z sits immediately to the right of J.
Hence, the correct answer is "Option 2"

Q88. Answer: (b) VZY

The logic follows here,
By combining the obtained letters, the next term in the series is VZY.
Hence, the correct answer is "option 2"

Q89. Answer: (a) RF – NC

The logic follows here,
RF - NC,
KP - GL,
ME - IA,
ZW - VS,
Therefore, the letter-cluster pair that is different from the others is RF - NC.
Hence, the correct answer is 'Option 1'.

Q90. Answer: (b) 4

Given: (Left) 5 3 5 1 5 4 1 2 9 1 1 7 4 8 7 6 6 8 1 5 6 4 1 1 6 6 4 (Right)
Required Conditions: Odd Number → Even Number → Even Number.
(Left) 5 3 5 1 5 4 1 2 9 1 1 7 4 8 7 6 6 8 1 5 6 4 1 1 6 6 4 (Right)
So, the total count of such even numbers is 7 4 8, 7 6 6, 1 5 6, 5 6 4: 4.
Hence, the correct answer is 'Option 2'.

Q91. Answer: (b) THREE

Given number: 6534217

Original Number	**6**	**5**	**3**	**4**	**2**	**1**	**7**
Arranged Number	1	2	3	4	5	6	7

• There are three digits whose positions remain unchanged as compared to the original number. is 3, 4 and 7
Hence, the correct answer is "Option 2".

Q92. Answer: (c) I

Given: Seven people, S, T, I, C, K, E and R, are sitting in a row, facing north.
1. Only two people sit to the right of E.
2. Only two people sit between E and C.
3. Only two people sit between T and S.
4. S sits to the immediate left of E.
5. K sits to the immediate right of R
The Final Arrangement is,
From the table, it is observed that I sits at the third position from the left end of the line.
Hence, the correct answer is "Option 3"

Q93. Answer: (a) IHFH

The logic followed in this pattern is,
For 'WSPO' related to 'SPNN':
For 'TQNL' related to 'PNLK':
Applying the same logic to 'MKHI':

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Thus, MKHI is related to IHFH.

Hence, the correct answer is 'Option 1'.

Q94. Answer: (a) Only conclusion (I) follows

The least possible Venn diagram for the given statements is:

(I) No cherry is an orange - Follows

Since all cherries are entirely inside the bats set, and the bats set has no intersection with oranges, it is impossible for any cherry to be an orange.

(II) Some oranges are bats - Don't Follows

The statement clearly specifies that no bat is an orange, which means the sets are completely disjoint; therefore, no orange can be a bat.

Only conclusion (I) follows.

Hence, the correct answer is "Option 1"

Q95. Answer: (a) Wife's brother

Let us first decode the given symbols and then draw a family tree.

Symbol	÷	#	•	&
Meaning	Son	Wife	Brother	Father

Given : S ÷ D & R + Y # H’

Therefore, S is the brother of Y, who is the wife of H.S is the Wife's brother of H.

Hence, the correct answer is 'Option 1'.

Q96. Answer: (c) EAC

The logic follows here,

Hence, the correct answer is " Option 3"

Q97. Answer: (c) 70

A	B	C	D
÷	×	•	–

Given equation:

43 D 28 C 35 A 7 B 11 = ?

After replacing the letters with their respective mathematical signs, applying the BODMAS rule, the equation becomes:

= 43 − 28 + 35 ÷ 7 × 11

= 43 − 28 + 5 × 11

= 43 + 55 − 28

= 98 − 28

= 70

Hence, the correct answer is "option 3"

Q98. Answer: (b) ZSH -46

The logic follows here,

Hence, the correct answer is "option 2"

Q99. Answer: (d) 571

The logic followed here is:

• 871 − 80 = 791

• 791 − 70 = 721

• 721 − 60 = 661

• 661 − 50 = 611

• 611 − 40 = 571

Thus, the missing term in the series is 571.

Hence, the correct answer is 'Option 4';

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Q100. Answer: (b) Only conclusion (II) follows

The least possible Venn diagram for the given statements is:

(I) All creators are engineers - Doesn't follows (Some creators are engineers and some engineers are creators but all creators are engineers is may be possible but not definite. Hence, it is false)

(II) Some engineers are creators - Follows (Some creators are engineers and some engineers are creators. Hence, uit is true)

Only conclusion (II) follows.

Hence, the correct answer is " Option 2"

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