RRB NTPC (UG) CBT-I Official Paper (Held On: 21 Aug, 2025 Shift 3) (Previous Year Paper)

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

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GENERAL AWARENESS

Q1. Which organisation has released the India Justice Report (IJR) in April 2025?

(a) Ambedkar Trusts
(b) National Trusts
(c) Tata Trusts
(d) Bombay Public Trusts

Q2. Which of the following is a national waterway between Haldia (Sagar) and Prayagraj?

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

Q3. Which Indian sprinter made a successful comeback by winning a silver medal in the women's 4×100m relay at the 2025 Asian Athletics Championships?

(a) Hima Das
(b) Dhanalakshmi Sekar
(c) Dutee Chand
(d) Srabani Nanda

Q4. Which organisation’s support was crucial in India’s globalisation process post 1991 economic crisis?

(a) WHO
(b) UNICEF
(c) IMF
(d) UNESCO

Q5. Which district became the first in India to meet its entire power demand through solar energy, as of 2025?

(a) Silvassa
(b) Kavaratti
(c) Leh
(d) Diu

Q6. In February 2025, a self-cleaning, flexible heating fabric was developed by _____.

(a) IIT Madras
(b) IIT Delhi
(c) IIT Guwahati
(d) IIT Bombay

Q7. When were Bahadur Shah Zafar and his wife Begum Zinat Mahal sent to prison in Rangoon?

(a) April 1857
(b) October 1858
(c) January 1859
(d) October 1857

Q8. Which of the following coast lies in Karnataka and Kerala states?

(a) Kachchh coast
(b) Kathiawar coast
(c) Malabar coast
(d) Konkan coast

Q9. Which Amendment gave Constitutional recognition to the National Commission for Backward Classes (NCBC)?

(a) 98th Amendment Act, 2013
(b) 102nd Amendment Act, 2018
(c) 99th Amendment Act, 2014
(d) 100th Amendment Act, 2015

Q10. Which edition of the BIMSTEC Summit in Thailand did the Indian Prime Minister attend on 4 April 2025?

(a) 6th
(b) 7th
(c) 5th
(d) 8th

Q11. Manimekali, a notable work within early Tamil literature, is categorised as which type of literary composition?

(a) An Epic
(b) An Autobiography
(c) A Treatise
(d) A Memoir

Q12. In dry areas, water from underground comes up through the soil by capillary action and dries quickly, leaving salts behind. These salts form a hard layer called:

(a) hardpans
(b) pedalfer
(c) laterite
(d) granite

Q13. The main objective of British economic policies in India was to:

(a) support rural employment
(b) promote Indian self-sufficiency
(c) benefit the British economy
(d) industrialise India

Q14. Which of the following kings of Kalinga in the 2nd century B.C. professed Jainism in India?

(a) Kharavela
(b) Ashoka
(c) Samprati
(d) Bindusara

Q15. Each modern industrialised country, including India, has a National Metrology Institute (NMI). What is the main role of an NMI?

(a) To maintain standards of measurements
(b) To monitor weather conditions
(c) To regulate internet access in the country
(d) To conduct medical research

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Q16. What is the name of the Act that governs the rules and service conditions of All-India Services?

(a) All-India Civil Act, 1950
(b) Indian Services Governance Act, 1955
(c) All-India Services Act, 1951
(d) Civil Services Regulation Act, 1946

Q17. Colonial policies significantly altered India's trade structure. Which of the following best describes India's foreign trade pattern at the time of independence?

(a) Export of capital goods and import of consumer goods
(b) Export of finished goods and import of raw materials
(c) Balanced trade between agriculture and industry
(d) Export of raw materials and import of manufactured goods

Q18. Which British policy promoted English education to create a loyal class serving British interests in India?

(a) Education Policy
(b) Subsidiary Alliance
(c) Divide and Rule
(d) Trade Policy

Q19. Tussocky grass grows mainly in which type of forests?

(a) Tropical Thorn forests
(b) Tropical Deciduous forests
(c) Evergreen forests
(d) Montane forests

Q20. Which of the following DOES NOT produce Greenhouse gases?

(a) Tidal energy
(b) Natural gas transport fuel
(c) Thermal power plant
(d) Diesel generator

Q21. Dr. Justice DY Chandrachud, former Chief Justice of India, joined which of the following institutions in May 2025 as a distinguished professor?

(a) National Law University, Delhi (NLUD)
(b) Faculty of Law, University of Delhi (DU)
(c) Indian Law Institute (ILI)
(d) Guru Gobind Singh Indraprastha University (GGSIPU)

Q22. Which of the following was a major criticism of the Green Revolution in India?

(a) It reduced agricultural output
(b) It discouraged use of technology.
(c) It promoted organic farming.
(d) It led to regional and crop imbalances.

Q23. Which of the following options best represents the predictions of a Punnett square?

(a) Genotype and phenotype probabilities
(b) Genetic linkage relationships in siblings
(c) Genetic mutations over several generations
(d) DNA sequence in parents

Q24. Which Constitutional Amendment Act abolished the provision for nominating members from the Anglo-Indian community to the State Legislative Assemblies?

(a) 104th Amendment Act, 2019
(b) 105th Amendment Act, 2021
(c) 101st Amendment Act, 2016

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(d) 102nd Amendment Act, 2018

Q25. The Government conducted a crocodile census in the Vishwamitri River to estimate the population of mugger crocodiles. In which state is the Vishwamitri River located?

(a) Gujarat
(b) Maharashtra
(c) Madhya Pradesh
(d) Rajasthan

Q26. Which of the following films is considered the first Indian sound (talkie) film, marking the beginning of Bollywood?

(a) Sholay
(b) Raja Harishchandra
(c) Alam Ara
(d) Mughal-e-Azam

Q27. Who laid the foundation stone of the Bageshwar Dham Medical and Science Research Institute in Madhya Pradesh?

(a) Mangubhai C Pate
(b) Narendra Modi
(c) Mohan Yadav
(d) JP Nadda

Q28. What special provision is granted under Article 371J of the Indian Constitution?

(a) Provision for official language use in Goa and Daman and Diu
(b) Special status for the Hyderabad–Karnataka region
(c) Creation of a common High Court for the northeastern states
(d) Special powers to the Governor of Manipur for law and order

Q29. What significant milestone did Pixxel achieve with its 2025 space launch?

(a) Launch of a reusable rocket
(b) India’s first lunar lander by a startup
(c) Launch of the first private satellite constellation from India
(d) Construction of a domestic space observatory

Q30. Which of the following is the function of the Central Processing Unit (CPU) in a computer?

(a) It receives input from the keyboard and mouse only
(b) It stores all user files permanently.
(c) It processes data and controls operations of all parts of the computer.
(d) It sends output to printers and monitors.

Q31. Which of the following is NOT a feature of India’s federal system, thereby reflecting its unitary character?

(a) Single citizenship for the entire country
(b) Requirement of some Constitutional Amendments to be ratified by States
(c) An upper house of Parliament (Rajya Sabha) representing the states
(d) Division of powers between the Centre and States

Q32. Which Latin American country became the first to pull out of China's Belt and Road Initiative in February 2025?

(a) Panama
(b) Argentina
(c) Chile
(d) Brazil

Q33. The Eleventh Schedule of the Indian Constitution lists various subjects. Which level of government are these subjects intended for?

(a) Urban Municipal Corporations
(b) State Governments (State legislative matters)
(c) Panchayati Raj Institutions (village/local level)

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(d) Central Government (Union ministries)

Q34. What does the abbreviation 'PCB' stand for in operating systems?

(a) Program Control Block
(b) Process Control Block
(c) Primary Communication Bus
(d) Process Communication Block

Q35. Who among the following had given the idea to mobilise all the leading Indian political leaders under a common platform called the Indian National Congress?

(a) A O Hume
(b) W C Bannerjee
(c) Surendranath Bannerjee
(d) Ananda Mohan Bose

Q36. Which fundamental law of chemistry is illustrated by the fact that hydrogen and oxygen always combine in a fixed 1 : 8 mass ratio to form water?

(a) Law of Conservation of Energy
(b) Dalton's Atomic Theory
(c) Law of Multiple Proportions
(d) Law of Constant Proportions

Q37. In how many cities of Bihar were the Khelo India Youth Games 2025 held?

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

Q38. ‘Milind Panho’ is a post-Mauryan text which contains the conversations between the Indo-Greek ruler Menander and the scholar and Buddhist monk _____.

(a) Nagasena
(b) Badarayana
(c) Patanjali
(d) Kapila

Q39. When did Donald Trump officially take office as the 47th President of the United States?

(a) 20 January 2025
(b) 4 March 2025
(c) 1 February 2025
(d) 6 January 2025

Q40. Which Indian city, also called the 'Detroit of India,' hosts manufacturers like Hyundai, BMW, Ford and Ashok Leyland, making it a major automotive hub?

(a) Gurugram
(b) Pune
(c) Sanand
(d) Chennai

MATHEMATICS

Q41. After allowing a discount of 28%, an article is available for Rs. 3,240. Its marked price is _____.

(a) Rs. 4,147
(b) Rs. 4,450
(c) Rs. 4,332
(d) Rs. 4,500

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Q42. If the 6-digit number N84M69 is divisible by 11, then which of the options below can give a possible correct relation between M and N?

(a) M + N = 7
(b) M - N = 1
(c) M = N
(d) M - N = -7

Q43. Pipe A can fill a tank in 12 hours, pipe B can fill the same tank in 22 hours and pipe C can fill the same tank in 8 hours. The time taken by them to fill the same tank if they operate together is::

(a) 463/67hours
(b) 363/67hours
(c) 263/67hours
(d) 563/67hours

Q44. A train that is 220 m long overtakes a man moving at a speed of 10 km/hr (in same direction) in 44 seconds. How much time (in seconds) will it take this train to completely cross another train of a length of 315 m, moving in the opposite direction at a speed of 79 km/hr?

(a) 14
(b) 32
(c) 28
(d) 18

Q45. A sum of Rs. 15,625 amounts to Rs. 24,389 in 3 years at a certain rate of interest per annum, compounded annually. The rate of interest per annum is:

(a) 14%
(b) 16%
(c) 19%
(d) 15%

Q46. Find the value of [868 ÷ {26 + 6 × (3 − 7)}].

(a) 432
(b) 435
(c) 431
(d) 434

Q47. Sapna invested Rs. 21,700 on simple interest, partly at 3% per annum and partly at 12% per annum. If she earns equal interests from the two investments after 7 years, then find the sum invested at 3% per annum (in Rs.).

(a) 17,360
(b) 17,357
(c) 17,361
(d) 17,358

Q48. Which of the following is the greatest number that, when dividing 183, 127 and 211, leaves the same remainder each time?

(a) 25
(b) 28
(c) 30
(d) 32

Q49. Simplify: (sin Atan A)/(1-cosA)

(a) 1+ secA
(b) 1+sin A
(c) 1+cos A
(d) 1+ cosec A

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Q50. The product of two consecutive natural numbers is 182. The greater of the two numbers is:

(a) 14
(b) 28
(c) 7
(d) 27

Q51. If the third proportional of 25 and 35 be x, then what is the value of x?

(a) 52
(b) 51
(c) 49
(d) 50

Q52. The sides of a triangle are 44 cm, 33 cm, and 55 cm. What is its area? (in cm^2)

(a) 732
(b) 726
(c) 742
(d) 749

Q53. A number, when increased by 60%, gives 3570. The number is:

(a) 4462.5
(b) 1115.625
(c) 2231.25
(d) 6693.75

Q54. The number of prime numbers lying between 306 and 313, both included, is:

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

Q55. A jacket is marked at Rs. 12,000. Store A offers two successive discounts of 15% and 10%. Store B offers two successive discounts of 10% and 15%. A customer wants to know which store provides a better deal and by how much?

(a) Store A; by Rs. 150
(b) Store A; by Rs. 100
(c) Store B; by Rs. 100
(d) Both stores A and B offer the same price

Q56. The perimeter of an equilateral triangle ABC is 22.2 cm. What is the area of triangle (in cm^2)?

(a) $13.69\sqrt{3}$
(b) $14.93\sqrt{3}$
(c) $12.76\sqrt{3}$
(d) $11.36\sqrt{3}$

Q57. ABCD is a trapeznun in which BC | AD and AC = CD. If angle ABC = 74° and angle BAC = 54°, then what is the measure of angle ACD (in degree)?

(a) 76°
(b) 91°
(c) 85°
(d) 82°

Q58. If 3 times Mary's present age is 18 years more than 5 times Diya's present age, and 2 times Diya's present age is 3 years less than Mary's present age, then what is the difference (in years) between the ages of Mary and Diya?

(a) 12
(b) 16

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(c) 15
(d) 11

Q59. Find the value of x satisfying: $5(5x^2 - 6) - 5(5x^2 + 2x - 4) = 20$
(a) 2
(b) 1
(c) -3
(d) -1

Q60. The average weight of Mandar, Ketan and Tushar is 45 kg. If the average weight of Mandar and Ketan is 44 kg and that of Ketan and Tushar is 45 kg, then the weight of Ketan (in kg) is:
(a) 53
(b) 63
(c) 43
(d) 58

Q61. Mahesh bought some sharpeners at the rate of Rs. 150 a dozen. He sold them for Rs. 41 each. His profit percentage is _____%.
(a) 226
(b) 230
(c) 232
(d) 228

Q62. The marks scored by 10 students are given below.
18, 13, 14, 14, 19, 14, 17, 17, 14, 20
The mode of the data is:
(a) 13
(b) 14
(c) 18
(d) 19

Q63. Find the value of: 55^(−13) ÷ 55^(14) × 55^(−11)
(a) 55^(-36)
(b) 55^(-48)
(c) 55^(-38)
(d) 55^(-32)

Q64. By selling an article at 6/15 of its actual selling price, Nirbhay incurs a loss of 14%. If he sells it at 54% of its actual selling price, then the profit percentage is:
(a) 18.4%
(b) 18.7%
(c) 16.1%
(d) 16.5%

Q65. Which of the following numbers divides 3,27,087?
(a) 3
(b) 12
(c) 8
(d) 5

Q66. 4 men can complete a piece of work in 18 days, while 9 women can do it in 8 days. In how many days can 3 women and 6 men complete this work?
(a) 11 days
(b) 13 days
(c) 8 days

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(d) 4 days

Q67. A man driving a car at a speed of 41 km/hr crosses a bridge in 2.4 minutes. Find the length of the bridge.

(a) 2.18 km
(b) 2.54 km
(c) 0.69 km
(d) 1.64 km

Q68. A company earns a profit (in Rs.) that is distributed among the company's three partners in the ratio of 14 : 10 : 16. If the difference between the smallest and the largest shares is Rs. 29,547, the total profit (in Rs.) of the company is:

(a) 1,96,892
(b) 1,96,980
(c) 1,97,067
(d) 1,96,943

Q69. A man makes a monthly payment equal to 30% of his monthly salary towards debt repayment. He spends 20% of the remaining salary and saves Rs. 602. His monthly salary (in Rs.) is:

(a) 1,075
(b) 1,072
(c) 1,115
(d) 1,078

Q70. M and N started a business. M invested Rs. 48,000 more than N for 3 months, while N invested for 4 months. M's share is Rs. 498 more than that of N, out of a total profit of Rs. 1,494. Find the capital contributed by M.

(a) Rs. 78,600
(b) Rs. 76,800
(c) Rs. 75,000
(d) Rs. 78,000

GENERAL INTELLIGENCE AND REASONING

Q71. Seven people, I, J, K, L, U, V and W are sitting in a row, facing north. No one sits to the left of V. Only four people sit between V and I. Only three people sit to the right of K. J sits to the immediate left of W. L is not an immediate neighbour of K. Who sits at the rightmost end of the line?

(a) L
(b) K
(c) W
(d) I

Q72. Refer to the following letter-symbol series and answer the question that follows. Counting is to be done from left to right only. (Left) 7 1 $ % 3 $ % 8 < 7 8 1 8 # < 7 @ * 5 5 + (Right)

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

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

Q73. Kabir ranked 27th from the top and 34th from the bottom in his class. How many students are there in his class?

(a) 59
(b) 60
(c) 62
(d) 61

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Q74. In a certain code language, 'MORE' is coded as '1432' and 'MOVE' is coded as '3254'. What is the code for 'V' in the given code language?

(a) 3
(b) 5
(c) 4
(d) 1

Q75. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusion(s) logically follow(s) from the statements.

Statements: All kiwis are bananas. All bananas are grapes.

Conclusions (I): All kiwis are grapes.

Conclusions (II): Some grapes are bananas.

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

Q76. Seven people, I, J, K, L, M, N and O are sitting in a row, facing north. Only two people sit between J and I. Only M sits to the right of K. Only one person sits between I and K. O sits at some place to the right of L but at some place to the left of N. How many people sit between N and L?

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

Q77. B is the father of O. O is the wife of A. A is the brother of T. T is the daughter of S. How is B related to S?

(a) Son's wife's brother
(b) Son's wife's sister
(c) Son's wife's mother
(d) Son's wife's father

Q78. Which of the following options is the closest approximate value that will come in place of question mark (?) in the following equation?

cbrt63.998+5/4 of 120.01% of 399.89 - 29.99 ÷ 3.01 = ?

(a) 544
(b) 594
(c) 449
(d) 494

Q79. XAYA is related to BECE in a certain way based on the English alphabetical order. In the same way, GJHJ is related to KNLN. To which of the given options is MPNP related, following the same logic?

(a) QUQV
(b) QSQT
(c) QTQT
(d) QTRT

Q80. Mr. Tim starts from point A and drives 9 km towards the west. He then takes a left turn, drives 3 km, turns right and drives 11 km. He then takes a right turn and drives 4 km. He takes a final right turn, drives 20 km and stops at Point P. How far (shortest distance) and in which direction should he drive in order to reach Point A again? (All turns are 90- degree turns only unless specified.)

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

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Q81. Refer to the following number and symbol series and answer the question that follows. All numbers are single-digit. Counting to be done from left to right only.

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

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

(a) 5
(b) 3
(c) 1
(d) 2

Q82. What should come in place of the question mark (?) in the given series?

96 102 104 110 112 ?

(a) 118
(b) 116
(c) 120
(d) 119

Q83. What will come in the place of the question mark (?) in the following equation, if '+' and '÷' are interchanged, and '−' and '×' are interchanged?

13 − 2 × 75 + 3 ÷ 24 = ?

(a) 38
(b) 34
(c) 46
(d) 25

Q84. What will come in place of the question mark (?) in the following equation, if '+' and '×' are interchanged and '−' and '÷' are interchanged?

8 + 5 ÷ 40 − 4 × 17 = ?

(a) 52
(b) 47
(c) 58
(d) 40

Q85. Mohit starts from Point Y and drives 35 km towards north. He then takes a right turn, drives 83 km, turns right and drives 49 km. He then takes a right turn and drives 36 km. He takes a right turn, drives 76 km. He then turns left, drives 47 km, turns left again, drives 21 km and stops at Point Z. How far (shortest distance) and towards which direction should he drive in order to reach Point Y again? (All turns are 90° turns only unless specified.)

(a) 37 km towards west
(b) 39 km towards north
(c) 43 km towards east
(d) 41 km towards south

Q86. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) NE-HL
(b) PG-JN
(c) LC-FJ
(d) JA-DG

Q87. Seven boxes D, E, F, G, H, I and X are kept one over the other but not necessarily in the same order. Only F is kept above I. Only X is kept between I and E. Only H is kept below G. How many boxes are kept between D and F?

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

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(d) Four

Q88. VXZA is related to WYAB in a certain way based on the English alphabetical order. In the same way, YACD is related to ZBDE. To which of the following is BDFG related, following the same logic?

(a) CFFH
(b) CEGH
(c) CDFH
(d) CEFH

Q89. In a certain code language, 'the glass broke' is written as 'al tk jb' and 'answer the question ' is coded as ' mo jb tu'. How is 'the' coded in the given language?

(a) mo
(b) tk
(c) jb
(d) al

Q90. URKE is related to ZWPJ in a certain way based on the English alphabetical order. In the same way, OLEY is related to TQJD. To which of the given options is DATN related, following the same logic?

(a) IFYS
(b) IYSF
(c) IFSY
(d) IUOP

Q91. What should come in place of the question mark (?) in the given series?

23 ? 46 59 73 88

(a) 36
(b) 34
(c) 42
(d) 30

Q92. If 1 is subtracted from each odd digit of the number 95423671, then what will be the product of the digits that are repeated more than once in the new number formed?

(a) 8
(b) 48
(c) 24
(d) 16

Q93. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) MPO
(b) YBZ
(c) ORP
(d) EHF

Q94. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) MPO
(b) YBZ
(c) ORP
(d) EHF

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Q95. In a row of 151 students facing north, Mr. Into is 12th from the right end. If Mr. Toni is 16th to the left of Mr. Into; what is Mr. Toni's position from the left end of the line?

(a) 126th
(b) 123rd
(c) 124th
(d) 125th

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

WJO, BHR, GFU, ?, QBA

(a) LDC
(b) LWC
(c) LDX
(d) LMX

Q97. In the following number-pairs, the second number is obtained by applying certain mathematical operation(s) to the first number. Select the number-pair in which the numbers are related in the same way as are the numbers of the following pairs. (NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13 – Operations on 13 such as adding to/subtracting from/multiplying with 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

15, 224

8, 63

(a) 9, 80
(b) 11, 123
(c) 6, 37
(d) 13, 170

Q98. 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 letter-cluster pair that DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) BR-XE
(b) CS-YA
(c) VL-RT
(d) HX-DF

Q99. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

BD 99 GI 97 LN 93 QS 87 ?

(a) VX 79
(b) TV 79
(c) UW 77
(d) VW 77

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 conclusion(s) logically follow(s) from the statements.

Statements:

Some lipsticks are tabs.

No tab is a kite.

Conclusions:

(I): Some lipsticks are kites.

(II): Some tabs are lipsticks.

(a) Only conclusion (II) follows.
(b) Both conclusions (I) and (II) follow.
(c) Only conclusion (I) follows.

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(d) Neither conclusion (I) nor (II) follows.

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (c) Tata Trusts

The correct answer is Tata Trusts.

Key Points

• Tata Trusts is the primary organization responsible for releasing the India Justice Report (IJR). The report was first launched in 2019 and continues to be an annual publication.

• The India Justice Report evaluates and ranks Indian states and Union Territories based on their ability to deliver justice through four pillars: Police, Judiciary, Prisons, and Legal Aid.

• The report is prepared in collaboration with other organizations such as Centre for Social Justice, Commonwealth Human Rights Initiative (CHRI), and Vidhi Centre for Legal Policy, among others.

• The objective of the report is to provide a comprehensive assessment of the justice delivery system in India, helping policymakers and citizens identify areas requiring improvement.

• The report utilizes various quantitative and qualitative indicators, including budgets, infrastructure, vacancies, diversity, and workload, to rank states and Union Territories.

• The 2025 edition of the report, released in April, continues to highlight disparities in justice delivery across India, offering actionable insights for improved governance. Hence, the correct option is Tata Trusts.

Additional Information

• About Tata Trusts:

• Tata Trusts is one of the oldest philanthropic organizations in India, established in 1892 by Jamsetji Tata.

• The trust focuses on areas like education, healthcare, rural development, and governance. The India Justice Report is a part of its commitment to strengthening governance in India.

• Key Features of India Justice Report:

• The report ranks states based on their performance in justice delivery. States are categorized into large and small states for fair comparison.

• Indicators include per capita expenditure on police and judiciary, representation of women, availability of legal aid lawyers, and prison occupancy rates.

• The report aims to highlight gaps in justice delivery and encourage states to prioritize reforms in this domain.

• Other Organizations Mentioned in the Options:

• Ambedkar Trusts: Focuses on social justice and welfare activities, but it does not publish the India Justice Report.

• National Trusts: Primarily works on disability welfare and does not deal with justice reports.

• Bombay Public Trusts: Focuses on charitable and community welfare activities but is not involved in justice system assessments.

Important Points

• Significance of the India Justice Report:

• The report provides data-driven insights to help policymakers and stakeholders address challenges in justice delivery.

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• It serves as a tool for accountability and encourages states to take corrective measures.

• Key Findings of Previous Reports:

• Police: Persistent vacancies, low representation of women, and inadequate training facilities.

• Judiciary: High pendency of cases and lack of adequate infrastructure and human resources.

• Prisons: Overcrowding and poor living conditions for inmates.

• Legal Aid: Limited access to legal aid services for marginalized communities.

Q2. Answer: (a) National Waterways 1

The correct answer is National Waterways 1.

Key Points

• National Waterways 1 (NW-1): It is the waterway connecting Haldia (Sagar) in West Bengal to Prayagraj in Uttar Pradesh. It is the longest National Waterway in India, spanning approximately 1,620 km.

• NW-1 runs along the Ganga-Bhagirathi-Hooghly River System, making it a crucial route for inland water transport and trade.

• This waterway serves as an economic lifeline for the eastern and northern parts of India, facilitating efficient transportation of goods and passengers.

• The development and maintenance of NW-1 are overseen by the Inland Waterways Authority of India (IWAI), which is responsible for ensuring smooth navigation.

• NW-1 is part of India's initiative to boost inland water transport under the Jal Marg Vikas Project, supported by the World Bank.

• The route has multiple terminals and infrastructure facilities, such as Varanasi, Sahibganj, and Haldia, to enhance cargo handling capabilities.

• Key commodities transported along this waterway include fertilizers, coal, food grains, cement, and other industrial goods.

• Hence, the correct answer is National Waterways 1.

Additional Information

• National Waterways in India:

• India has a total of 111 National Waterways, covering major rivers, canals, and lakes across the country.

• They are developed to promote inland water transport (IWT) as a cost-effective and environmentally friendly alternative to road and rail transport.

• Other National Waterways:

• National Waterway 2 (NW-2): Runs along the Brahmaputra River in Assam from Dhubri to Sadiya, spanning approximately 891 km.

• National Waterway 3 (NW-3): Connects Kollam and Kottapuram along the West Coast Canal in Kerala, covering around 205 km.

• National Waterway 4 (NW-4): Links the Krishna and Godavari Rivers in Andhra Pradesh and Tamil Nadu, with a total length of 1,078 km.

• Significance of National Waterways:

• Waterways reduce congestion on roads and lower transportation costs.

• They are eco-friendly and produce lower carbon emissions compared to road or rail transport.

• They enhance connectivity to remote areas and promote regional economic development.

Important Points

• Jal Marg Vikas Project:

• This is a Government of India initiative to develop NW-1 from Haldia to Varanasi.

• It includes the construction of multi-modal terminals, navigation locks, and river information systems to enhance cargo movement.

• Key Challenges:

• Waterways face challenges such as seasonal water availability, maintenance of dredging operations, and environmental concerns.

• Efficient use of waterways requires adequate infrastructure, including terminals, storage facilities, and navigational aids.

Q3. Answer: (d) Srabani Nanda

The correct answer is Srabani Nanda.

Key Points

• Srabani Nanda is an accomplished Indian sprinter who specializes in short-distance track events, particularly the 100m and 200m sprints. She has been a part of various national and international competitions, representing India in athletics.

• At the 2025 Asian Athletics Championships, Srabani Nanda made a significant contribution to the women's 4×100m relay team by winning a silver medal. This marked her successful comeback to competitive athletics after a hiatus.

• Her performance is a testament to her resilience and dedication, showcasing her ability to compete at the highest level despite challenges. Hence, Srabani Nanda is the correct answer.

• The women's 4×100m relay event is a team-based sprinting competition where four athletes run equal distances while passing a baton. Srabani's contribution to this event was crucial for India's success in securing the silver medal.

• Her achievement also highlights India's growing prominence in track and field events at the continental level. It serves as an inspiration for young athletes aspiring to excel in sports. Hence, her comeback is significant.

Additional Information

• Srabani Nanda:

• Born on May 15, 1991, in Odisha, India, Srabani Nanda is a prominent Indian sprinter. She has represented India in multiple international events, including the Commonwealth Games, Asian Games, and World Athletics Championships.

• Her primary events are the 100m and 200m sprints, where she has consistently delivered impressive performances. She is also a key member of India's relay teams.

• Asian Athletics Championships:

• The Asian Athletics Championships is a biennial event organized by the Asian Athletics Association. It serves as a platform for athletes across Asia to showcase their talent in track and field events.

• India has been a consistent performer in this championship, with athletes excelling in various events, including sprints, jumps, and throws.

• Importance of the 4×100m Relay:

• The 4×100m relay is a team event where four athletes run equal distances. The baton exchange is a critical component of the event, requiring precision and coordination.

• India's performance in this event highlights the country's growing capabilities in short-distance track events on the international stage.

Important Points

• Other Key Athletes in the Event:

• Hima Das: Known as the "Dhing Express," Hima Das is another prominent Indian sprinter specializing in the 400m sprint. However, she did not participate in the 2025 Asian Athletics Championships relay team.

• Dhanalakshmi Sekar: An emerging sprinter in Indian athletics, Dhanalakshmi is known for her performances in the 100m and 200m sprints. She was not part of the relay team in this event.

• Dutee Chand: A celebrated Indian athlete specializing in the 100m and 200m sprints, Dutee Chand has represented India in numerous international events. However, she did not feature in the 2025 relay team.

• Relay Strategy and Training:

• Relay races require rigorous training, focusing on baton exchange, speed, and coordination among team members. The success of the Indian team in the 2025 Asian Athletics Championships underscores their preparation and teamwork.

Q4. Answer: (c) IMF

The correct answer is IMF.

Key Points

• The International Monetary Fund (IMF) played a crucial role in supporting India during the 1991 economic crisis. This is the correct option as the IMF provided the necessary financial assistance to stabilize the Indian economy.

• In 1991, India faced a balance of payments crisis, with foreign exchange reserves falling to dangerously low levels, sufficient for only a few weeks of imports.

• The government approached the IMF and the World Bank for financial assistance. The IMF provided a loan of approximately USD 2.2 billion under the Structural Adjustment Program (SAP). This is a correct statement.

• The IMF's support was conditional upon implementing several economic reforms, including liberalization, privatization, and globalization (LPG reforms), which led to significant changes in India's economic policies. Hence, the IMF's role was pivotal in India's globalization process post-1991.

• The reforms included the removal of trade barriers, reduction of import tariffs, and deregulation of industries to encourage foreign investment and competition, which were essential for India's globalization journey.

• Hence, the correct answer is IMF.

Additional Information

• About the IMF:

• The International Monetary Fund (IMF) is an international financial institution headquartered in Washington, D.C., United States.

• It was established in 1944 at the Bretton Woods Conference and officially came into existence on 27 December 1945.

• The IMF's primary purpose is to ensure global monetary cooperation, secure financial stability, facilitate international trade, promote high employment, and reduce poverty worldwide.

• India's Economic Crisis of 1991:

• India faced a severe economic crisis in 1991 due to fiscal mismanagement, the Gulf War, and increasing oil prices, which depleted foreign exchange reserves.

• The reserves fell below USD 1 billion, barely enough to finance two weeks' worth of imports.

• To combat this crisis, the government pledged 67 tons of gold to the Bank of England as collateral to secure a loan and approached the IMF for financial assistance.

• LPG Reforms:

• The IMF's loan was conditional on India implementing the Liberalization, Privatization, and Globalization (LPG) reforms.

• These reforms included:

• Liberalization: Reducing trade restrictions, import quotas, and tariff barriers.

• Privatization: Encouraging the private sector by reducing the dominance of public sector enterprises.

• Globalization: Opening up the economy to foreign direct investment (FDI) and promoting international trade.

• The reforms transformed India's economy, leading to high growth rates and integration into the global market.

• Roles of Other Organizations:

• WHO: The World Health Organization (WHO) focuses on global health issues and played no direct role in India’s economic reforms.

• UNICEF: The United Nations Children's Fund (UNICEF) works for child welfare and development but did not contribute to economic globalization in India.

• UNESCO: The United Nations Educational, Scientific and Cultural Organization (UNESCO) focuses on education, science, and culture, unrelated to India's economic globalization.

Important Points

• Impact of IMF Support:

• India's economy became more open and market-oriented, leading to increased foreign investment and higher GDP growth rates.

• The reforms laid the foundation for India to emerge as a major player in the global economy.

• Legacy of 1991 Reforms:

• The 1991 reforms are often seen as the beginning of India's economic liberalization.

• These reforms helped India transition from a tightly controlled economy to one with a significant global presence.

Q5. Answer: (d) Diu

The correct answer is Diu.

Key Points

• Diu, a district in the Union Territory of Daman and Diu, became the first district in India to meet its entire power demand through solar energy.

• The district achieved this milestone by generating enough solar power to meet the electricity needs of its population.

• Diu has installed a 9 MW solar power plant and rooftop solar plants, which together generate sufficient power to meet the district’s energy needs.

• Through this initiative, Diu has significantly reduced its dependency on conventional power sources and has become a model for adopting clean and renewable energy solutions.

• This achievement was made possible due to the government’s efforts to promote renewable energy, in line with India’s commitment to reducing carbon emissions and combating climate change.

• The project has also helped the local population by bringing down electricity tariffs and providing a more stable and sustainable power supply.

• Diu’s transition to solar energy serves as an example of how small regions can take significant steps towards a clean energy future and contribute to environmental sustainability.

Additional Information

• About Diu:

• Diu is a small district in the Union Territory of Daman and Diu, located on the western coast of India.

• It is known for its scenic beaches, historic forts, and Portuguese colonial architecture.

• Solar Energy in India:

• India is one of the world’s leading countries in solar energy generation, with ambitious targets under the National Solar Mission.

• As of 2023, India aims to achieve a capacity of 280 GW of solar power by 2030.

• Key initiatives to promote solar energy include rooftop solar programs, solar parks, and subsidies for solar installations.

• Other Districts Promoting Solar Energy:

• Leh: Located in Ladakh, Leh is also making significant progress in harnessing solar and wind energy due to its high altitude and

abundant sunlight.

• Kavaratti: The capital of Lakshadweep is working to integrate renewable energy sources into its power grid, but it has not yet achieved complete reliance on solar energy.

• Silvassa: The capital of Dadra and Nagar Haveli has implemented some solar energy initiatives, but it still relies on conventional power sources.

Important Points

• India's Renewable Energy Goals:

• India is committed to achieving net-zero carbon emissions by 2070, as announced at the COP26 Climate Summit.

• The country has set a target of 500 GW of non-fossil fuel capacity by 2030.

• Advantages of Solar Energy:

• Solar energy is a clean, renewable, and sustainable source of power that reduces dependence on fossil fuels.

• It helps in reducing greenhouse gas emissions and combating climate change.

• Solar energy systems have lower operational costs and can provide energy security to remote areas.

Q6. Answer: (c) IIT Guwahati

The correct answer is IIT Guwahati.

Key Points

• In February 2025, researchers at IIT Guwahati developed a revolutionary self-cleaning, flexible heating fabric. This innovative fabric combines functionalities of heating and self-cleaning, making it a significant advancement in the textile and wearable technology industries.

• The fabric was engineered using advanced nanotechnology and materials science. The primary aim was to create a material capable of maintaining hygiene while also providing heating capabilities, especially for use in extreme cold weather conditions.

• The self-cleaning feature is achieved through the application of hydrophobic coatings or nanomaterials, which repel water and dirt particles, ensuring that the fabric remains clean without requiring frequent washing. Hence, the development aligns with sustainability goals.

• The heating property is integrated into the fabric using conductive materials such as graphene or carbon-based composites. These materials allow the fabric to generate heat when an electric current is passed through it.

• The product is expected to have applications in wearable technology, healthcare, and extreme climate survival. These features make it an ideal choice for outdoor workers, defense personnel, or individuals living in cold regions.

Additional Information

• Indian Institute of Technology (IIT) Guwahati:

• Location: Situated in Guwahati, Assam, IIT Guwahati is one of India's premier institutions for research and innovation.

• Specialization: Known for its cutting-edge research in nanotechnology, materials science, and engineering.

• Recognition: It is recognized globally for its contributions to technology development and sustainable solutions.

• Characteristics of the Self-Cleaning and Heating Fabric:

• Self-Cleaning Property: The fabric is coated with nanomaterials that repel water, oil, and dust particles.

• Heating Capability: Conductive materials like graphene allow the fabric to generate heat when powered by a small electric current.

• Durability: Designed to withstand extreme weather conditions and prolonged usage.

• Applications: Suitable for military uniforms, outdoor sportswear, and medical textiles.

• Comparative Analysis of IITs:

• IIT Madras: Known for its excellence in data science, AI, and robotics.

• IIT Delhi: Specializes in electronics, telecommunication, and entrepreneurship development.

• IIT Bombay: Renowned for mechanical engineering, automobile engineering, and design innovation.

Important Points

• Sustainability Goals:

• The development of self-cleaning fabric aligns with global efforts to reduce water wastage in washing and promote eco-friendly textiles.

• The heating fabric is energy-efficient, providing maximum utility with minimal power consumption.

• Future Prospects:

• Potential for commercialization in industries like defense, sports, and healthcare.

• Scope for further research in integrating smart sensors for health monitoring and environmental adaptation.

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Q7. Answer: (b) October 1858

The correct answer is October 1858.

Key Points

• Bahadur Shah Zafar, the last Mughal Emperor, was a symbolic figure during the Indian Rebellion of 1857. He was proclaimed the leader by the rebels but lacked actual power or authority.

• After the British successfully suppressed the rebellion, Bahadur Shah Zafar was captured by the British forces in September 1857.

• He was tried in a military court for his role in the rebellion and charged with treason. The trial lasted for several months and culminated in his sentencing. Hence, statement regarding his capture is correct.

• In October 1858, Bahadur Shah Zafar, along with his wife Begum Zinat Mahal and some family members, was deported to Rangoon (present-day Yangon, Myanmar).

• He lived the remainder of his life in exile in Rangoon, where he passed away in November 1862, marking the end of the Mughal dynasty. Hence, the date October 1858 is correct.

Additional Information

• Bahadur Shah Zafar's Role in the Revolt of 1857:

• Although Bahadur Shah Zafar was an aged and powerless ruler, the rebels declared him their leader during the Indian Rebellion of 1857.

• This was a symbolic move to unite Indians under the banner of the once-powerful Mughal Empire.

• Exile in Rangoon:

• Bahadur Shah Zafar's exile was a part of the British strategy to eliminate any remnants of the Mughal Empire and assert their dominance.

• The British chose Rangoon as the place of exile to ensure that Zafar remained isolated and incapable of influencing Indian affairs.

• He spent the last four years of his life in Rangoon, dying in 1862. His death marked the formal end of the Mughal dynasty.

• Impact of the Revolt:

• The failure of the 1857 Revolt led to significant changes in Indian administration, including the transfer of power from the East India Company to the British Crown in 1858.

• The exile of Bahadur Shah Zafar was a symbolic end to the Mughal rule and the beginning of direct British governance.

Important Points

• Historical Significance:

• Bahadur Shah Zafar is remembered as a tragic figure and a symbol of the end of Mughal sovereignty in India.

• His poetry, written during his exile, reflects his sorrow and longing for his homeland.

• End of the Mughal Empire:

• The deportation of Zafar to Rangoon marked the formal end of the Mughal dynasty, which had ruled parts of India for over three centuries.

• His death symbolized the consolidation of British authority in India.

Q8. Answer: (c) Malabar coast

The correct answer is Malabar Coast.

Key Points

• Malabar Coast is the coastal region that lies in the states of Karnataka and Kerala. It stretches along the western coastline of India and is known for its distinct geographical and cultural features.

• The coast is part of the Western Ghats, a UNESCO World Heritage site, making it an ecologically sensitive zone.

• It is characterized by a series of backwaters, lagoons, and rivers that make it a unique geographical feature. Hence, Malabar Coast is the correct answer.

• The coast has historical importance, as it was a major trade route for spices and other goods during ancient and medieval times. It was frequented by traders from Arab countries, Europe, and China.

• It is also famous for lush greenery, plantations of coconut and spices, and its unique cultural heritage, including classical dance forms like Mohiniyattam and Kathakali.

• The Malabar Coast is home to important cities such as Kochi, Mangalore, and Kozhikode, which are significant centers for tourism, trade, and culture.

• The coast is well known for its monsoon climate, which supports rich biodiversity and agricultural productivity. Hence, the statement regarding the Malabar Coast being in Karnataka and Kerala is correct.

Additional Information

• Geographical Features:

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• The Malabar Coast is a narrow coastal plain flanked by the Western Ghats on the east and the Arabian Sea on the west.

• It includes a network of backwaters and canals, which are used for transportation, fishing, and tourism.

• Historical Significance:

• The Malabar Coast was historically significant for its role in the spice trade, particularly for pepper, which earned the region the name "Pepper Coast".

• Portuguese explorer Vasco da Gama landed at Kozhikode (Calicut) in 1498, marking the beginning of European colonization in India.

• Ecological Importance:

• The Malabar Coast is part of the Western Ghats, which is a biodiversity hotspot hosting endemic species of flora and fauna.

• The region's backwaters and wetlands provide habitat for numerous aquatic species and migratory birds.

Important Points

• Other Coastal Regions in India:

• Kachchh Coast: Located in Gujarat, this coast is famous for the Rann of Kachchh, a vast salt marsh.

• Kathiawar Coast: Lies in Gujarat and is known for its peninsular location and historical sites like Somnath Temple.

• Konkan Coast: Extends from Maharashtra to Karnataka and is characterized by rugged terrain, coastal villages, and ports like Goa.

• Tourism Potential:

• Malabar Coast: Famous for serene backwaters like Alleppey and houseboat cruises, attracting tourists globally.

• The region also hosts traditional festivals like Onam and offers culinary delights such as Malabar biryani.

Q9. Answer: (b) 102nd Amendment Act, 2018

The correct answer is 102nd Amendment Act, 2018.

Key Points

• The 102nd Constitutional Amendment Act, 2018 provided constitutional status to the National Commission for Backward Classes (NCBC).

• This amendment introduced Article 338B in the Indian Constitution, which specifically deals with the structure, duties, and powers of the NCBC.

• It also amended Article 342A, which empowers the President to specify the socially and educationally backward classes in consultation with the Governor of the concerned state. Hence, the statement is correct.

• The NCBC was established as a statutory body under the National Commission for Backward Classes Act, 1993. However, the 102nd Amendment Act provided it with constitutional recognition.

• The primary objective of this amendment was to ensure greater autonomy and authority for NCBC in addressing issues related to the backward classes. Hence, the correct answer is 102nd Amendment Act, 2018.

Additional Information

• National Commission for Backward Classes (NCBC):

• The NCBC was originally established in 1993 as a statutory body under the National Commission for Backward Classes Act.

• Its purpose was to hear grievances and recommend inclusion or exclusion of communities in the central list of Other Backward Classes (OBCs).

• 102nd Constitutional Amendment Act:

• Introduced Article 338B, which defines the composition, functions, and powers of NCBC as a constitutional body.

• Introduced Article 342A, which gives the President the authority to specify socially and educationally backward classes in consultation with the Governor.

• This amendment ensured the NCBC's autonomy and accountability in addressing issues related to backward classes.

• Significance of the Amendment:

• It strengthened the NCBC by granting it constitutional status, making it more authoritative and independent.

• Enhanced its ability to address grievances and ensure the welfare of backward classes across the country.

Important Points

• Key Features of NCBC:

• The NCBC is responsible for identifying and recommending backward classes for inclusion in the central list of OBCs.

• It has the power to hear grievances of OBCs and recommend solutions to the government.

• Role of Articles 338B and 342A:

• Article 338B empowers NCBC to investigate and monitor matters related to backward classes and present reports to the President.

• Article 342A empowers the President to classify socially and educationally backward classes, ensuring a systematic approach to

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welfare policies.

Q10. Answer: (a) 6th

The correct answer is 6th.

Key Points

• The 6th BIMSTEC Summit was held in Thailand on 4 April 2025. The Indian Prime Minister attended this summit, showcasing India's commitment to regional cooperation and integration.

• The BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) is an international organization involving seven member countries: Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand. Its primary focus is on fostering economic and technical cooperation in the Bay of Bengal region.

• The 6th Summit was particularly significant as it focused on key issues like regional connectivity, trade enhancement, and climate change mitigation, which are vital for sustainable development in the region.

• The Indian Prime Minister emphasized the importance of maritime security, trade facilitation, and renewable energy collaboration in his address during the summit.

• The summit provided a platform for member countries to discuss strategies for strengthening economic cooperation and regional integration, aligning with India's vision for the Indo-Pacific region.

Additional Information

• About BIMSTEC:

• BIMSTEC was established in 1997. It aims to bridge South and Southeast Asia and promote economic, technical, and cultural cooperation among its member countries.

• The organization works on multiple sectors, including trade, technology, energy, transport, tourism, and fisheries. It also focuses on combating transnational crimes and addressing climate change.

• The BIMSTEC Secretariat is located in Dhaka, Bangladesh.

• Key Objectives of BIMSTEC:

• Promote regional cooperation and integration in the Bay of Bengal region.

• Enhance connectivity among member countries for economic growth and development.

• Facilitate collaboration in sectors like energy, environment, and disaster management.

• Important Points about the 6th BIMSTEC Summit:

• The summit focused on the BIMSTEC Master Plan for Transport Connectivity, aimed at improving regional transport infrastructure.

• India highlighted the importance of joint efforts in maritime security and the development of the Blue Economy during the summit.

• The summit addressed the challenges of climate change and emphasized the need for regional cooperation in disaster management and renewable energy projects.

Important Points

• BIMSTEC Summits:

• 1st BIMSTEC Summit (2004): Held in Bangkok, Thailand, focusing on regional economic integration.

• 4th BIMSTEC Summit (2018): Took place in Kathmandu, Nepal, where leaders discussed connectivity and poverty alleviation.

• 5th BIMSTEC Summit (2022): Hosted virtually by Sri Lanka, emphasizing the need for post-pandemic recovery and cooperation.

• India's Role in BIMSTEC:

• India plays a leading role in initiatives such as energy cooperation, maritime security, and disaster management within the BIMSTEC framework.

• The country is committed to strengthening regional connectivity through projects like the Kaladan Multi-Modal Transit Transport Project and BBIN (Bangladesh, Bhutan, India, Nepal) Motor Vehicle Agreement.

Q11. Answer: (a) An Epic

The correct answer is An Epic.

Key Points

• Manimekalai is one of the five great epics of early Tamil literature. It is considered a masterpiece and a significant work of Tamil literary tradition.

• This epic was composed by Sithalai Sattanar, a poet who lived during the Sangam age, around the 6th century CE.

• The story revolves around Manimekalai, the daughter of Kovalan and Madhavi, who chooses to follow the path of renunciation rather than pursuing worldly pleasures. Hence, the work is categorized as an Epic.

• The narrative embodies Buddhist philosophy, ethics, and teachings, showing the influence of Buddhism on Tamil culture and literature during its time.

• Manimekalai is a continuation of the epic Silappadikaram, another great Tamil epic, depicting the journey of Kovalan and

Madhavi's lineage.

• Unlike autobiographies or treatises, which are generally factual and analytical, Manimekalai is a poetic work with a strong narrative and moral message, aligning with the characteristics of an epic.

• The work also highlights the socio-cultural environment of the Tamil region, including its values, religious practices, and philosophical outlook during its era. Hence, the correct category for Manimekalai is Epic.

Additional Information

• Epics in Tamil Literature:

• Manimekalai is part of the Five Great Epics of Tamil literature, which includes Silappadikaram, Civaka Cintamani, Valayapathi, and Kundalakesi.

• Epics are long narrative poems that often depict heroic deeds, moral lessons, and cultural values. They serve as a mirror to the society and age in which they were composed.

• Manimekalai's Themes and Significance:

• Buddhism: The epic is heavily influenced by Buddhist philosophy, focusing on themes of renunciation, compassion, and the pursuit of enlightenment.

• It critiques the caste system and advocates equality, highlighting the progressive thoughts of the time.

• The protagonist, Manimekalai, gains mystical powers and uses them to serve humanity, reflecting the importance of selflessness and altruism in Buddhist teachings.

• Comparison with Other Literary Categories:

• Autobiography: An autobiography involves the self-narration of a person's life and experiences, which is not the case with Manimekalai.

• Treatise: Treatises are analytical works focused on a specific topic or argument, unlike the poetic and narrative style of Manimekalai.

• Memoir: Memoirs are personal accounts of specific events or periods, which again does not align with the epic nature of Manimekalai.

Important Points

• Historical and Cultural Context:

• Manimekalai reflects the cultural and religious diversity of the Tamil region during the Sangam age, showcasing influences from Buddhism, Jainism, and Hinduism.

• It is a valuable resource for understanding the social dynamics, ethical values, and philosophical outlook of ancient Tamil society.

• Legacy:

• As an epic, Manimekalai continues to be studied and revered for its literary excellence and its contribution to Tamil literature and philosophy.

• Its narrative style, philosophical depth, and moral lessons make it a timeless classic in the realm of world literature.

Q12. Answer: (a) hardpans

The correct answer is hardpans..

Key Points

• In dry areas, water from underground rises to the surface through the soil by capillary action. This process is common in arid and semi-arid regions.

• As this water evaporates quickly due to high temperatures, it leaves behind dissolved salts and minerals on the surface. These salts accumulate over time.

• These accumulated salts form a hard, compact layer on the soil surface, known as hardpans. Hardpans are impermeable, making it difficult for water and roots to penetrate the soil. Hence, the correct term for the described phenomenon is hardpans.

• Hardpans can negatively impact soil fertility and agricultural productivity because they restrict root growth and water movement.

• The term "hardpan" specifically refers to this hardened layer caused by salinity accumulation, and it differs from other soil types such as pedalfer, laterite, or granite. Hence, other options like pedalfer, laterite, or granite do not describe this phenomenon.

Additional Information

• Characteristics of Hardpans:

• Hardpans are formed due to the accumulation of salts, especially in areas with poor drainage and high evaporation rates.

• They are typically found in arid and semi-arid regions, where water movement is restricted below the soil surface.

• Hardpans can vary in thickness and hardness depending on the degree of salt accumulation and soil conditions.

• Explanation of Other Options:

• Pedalfer: A type of soil rich in aluminum and iron, commonly found in humid regions. It is not related to salinity accumulation or capillary action.

• Laterite: A soil type formed under tropical conditions, rich in iron and aluminum, but it forms due to weathering and not salinity accumulation.

• Granite: A type of igneous rock and not a soil type or phenomenon related to capillary action or salt accumulation.

• Impact of Hardpans:

• Hardpans reduce soil permeability, which affects water infiltration and root penetration, leading to reduced agricultural productivity.

• Farmers often need to break hardpans mechanically or apply soil amendments to improve soil conditions and support plant growth.

Important Points

• Strategies to Manage Hardpans:

• Mechanical methods like plowing or subsoiling can break hardpans to improve soil aeration and water infiltration.

• Addition of organic matter, gypsum, or other soil amendments can help reduce salinity and improve soil structure.

• Significance in Agriculture:

• Understanding hardpans is crucial for farmers in arid regions to improve soil health and optimize crop yield.

• Proper soil management practices can mitigate the negative effects of hardpans on agricultural productivity.

Q13. Answer: (c) benefit the British economy

The correct answer is benefit the British economy.

Key Points

• The primary goal of British economic policies in India was to serve the interests of the British economy. The policies were designed to ensure maximum economic exploitation of India, benefiting Britain at the expense of Indian resources and economy.

• The British established a system where raw materials like cotton, indigo, and jute were sourced from India at cheap rates. These were then transported to Britain for processing into finished goods, which were sold back in India and other parts of the world at higher prices.

• The introduction of policies such as land revenue systems (e.g., Permanent Settlement, Ryotwari, and Mahalwari systems) and high taxes forced Indian farmers into poverty while ensuring a steady inflow of revenue to the British government. This was aimed at benefiting the British economy.

• The British discouraged Indian industries, especially traditional handicrafts and textiles, to promote British-manufactured goods. For example, the decline of the Indian textile industry was directly linked to the influx of British factory-made textiles. This was a deliberate move to create a dependent market for British exports.

• Indian railways, ports, and communication systems were developed primarily to facilitate the transport of raw materials to ports for export to Britain and to distribute imported British goods within India. These developments were not aimed at India's growth but rather at benefiting British trade. This further highlights their economic motives.

Additional Information

• Impact of British Economic Policies on India:

• Deindustrialization: India's traditional industries, such as handicrafts, collapsed due to competition from cheap, machine-made British goods. This led to widespread unemployment and a decline in artisanal skills.

• Drain of Wealth: A significant portion of India's wealth was transferred to Britain in the form of taxes, profits from British companies, and salaries paid to British officials. This concept was termed the "Drain Theory" by Dadabhai Naoroji.

• Agrarian Distress: Excessive taxation under land revenue systems and the focus on cash crops like indigo and cotton led to food shortages, famines, and a decline in the standard of living for Indian peasants.

• Railway Network: While the British established a railway network in India, it was primarily designed to transport raw materials to ports for export. It did little to benefit India's internal trade or economy.

• Explanation of Other Options:

• Support rural employment: This was not the aim of British economic policies. In fact, the decline of traditional industries and excessive taxation led to unemployment and poverty in rural areas.

• Promote Indian self-sufficiency: The British policies aimed at making India dependent on British goods and services. Self-sufficiency was actively discouraged to maintain economic dependency.

• Industrialize India: The British did not promote industrialization in India. Instead, they focused on using India as a supplier of raw materials and a market for British goods, leaving Indian industries to stagnate.

Important Points

• Drain of Wealth Theory: Propounded by Dadabhai Naoroji, it highlighted how India's wealth was systematically drained to Britain through unfair trade practices, taxes, and salaries of British officials.

• Famines: Excessive focus on cash crops and export-oriented agriculture led to frequent famines, with major famines occurring in 1770, 1876-78, and 1899-1900, causing the deaths of millions.

• Examples of Exploitation: The indigo plantations in Bengal and Bihar exploited Indian farmers, forcing them to grow indigo

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instead of food crops under oppressive conditions.

• Decline in GDP: India's share in the global GDP fell from about 23% in 1700 to less than 4% by 1950 due to British exploitation.

Q14. Answer: (a) Kharavela

The correct answer is Kharavela.

Key Points

• Kharavela was a prominent king of the Kalinga region in the 2nd century B.C. and one of the most famous rulers of the Mahameghavahana dynasty.

• He was a devout follower of Jainism, which significantly influenced his reign and policies.

• As per inscriptions such as the Hathigumpha Inscription in Udayagiri hills, Odisha, Kharavela patronized Jainism and worked to restore and promote it during his rule.

• He is credited with the revival of Jainism in Kalinga after it had declined due to the impact of Ashoka’s patronage of Buddhism.

• He undertook various public works to propagate Jainism, including the construction of Jain caves and temples, promoting the religion's teachings and practices.

• Kharavela's reign is noted for his efforts to spread peace and prosperity, as well as religious tolerance, while maintaining a strong focus on Jain principles.

Additional Information

• Kharavela:

• Kharavela was a warrior-king as well as a patron of art, culture, and religion.

• The Hathigumpha Inscription, a significant source of information about him, details his military conquests, administrative policies, and religious endeavors.

• He constructed and renovated numerous Jain temples and monasteries, emphasizing his dedication to the Jain faith.

• Kharavela's reign is considered a golden period for Jainism in eastern India, particularly in Kalinga.

• Jainism in Ancient India:

• Jainism is an ancient religion originating in India, emphasizing non-violence, truth, and asceticism.

• During the 2nd century B.C., Jainism received patronage from rulers like Kharavela, helping it flourish alongside other religions such as Hinduism and Buddhism.

• Jainism's principles were spread through the construction of temples, caves, and inscriptions, many of which remain preserved today.

• Other Kings Mentioned:

• Ashoka: While Ashoka is famous for his adoption and propagation of Buddhism after the Kalinga War, there is no evidence that he professed Jainism.

• Samprati: He was a Mauryan king known for his patronage of Jainism, but he ruled in the 3rd century B.C., not in the 2nd century B.C.

• Bindusara: Bindusara, the father of Ashoka, was a follower of Ajivika, another ascetic religion, and did not profess Jainism.

Important Points

• Hathigumpha Inscription:

• The Hathigumpha Inscription, located in Odisha, is a 17-line inscription in the Brahmi script that provides a detailed account of Kharavela's reign.

• It highlights his military achievements, administrative reforms, and contributions to Jainism.

• This inscription is one of the earliest records of Jain kings in India.

• Religious Tolerance:

• Kharavela is known for his religious tolerance, promoting Jainism while respecting other religious traditions.

• He encouraged cultural and artistic developments, enhancing the overall prosperity of his kingdom.

• Kalinga:

• Kalinga, located in present-day Odisha and parts of Andhra Pradesh, was a significant region in ancient India with a rich cultural and religious heritage.

• The region played an essential role in the history of Jainism and Buddhism due to its rulers' patronage.

Q15. Answer: (a) To maintain standards of measurements

The correct answer is To maintain standards of measurements.

Key Points

• National Metrology Institute (NMI): Every modern industrialized country, including India, has its own National Metrology Institute (NMI) responsible for maintaining the standards of measurement in the country.

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• The primary role of an NMI is to establish, maintain, and disseminate national measurement standards that ensure consistency and accuracy in measurements across industries, research, trade, and daily life. Hence, the statement "To maintain standards of measurements" is correct.

• An NMI ensures traceability, which means connecting measurements to internationally recognized standards, improving global uniformity and trust in measurements and calibration. Hence, this is the correct answer.

• The statement "To monitor weather conditions" is incorrect as weather monitoring is done by meteorological departments (e.g., India Meteorological Department, IMD).

• The statement "To regulate internet access in the country" is incorrect as internet regulation is managed by communication and regulatory bodies such as TRAI (Telecom Regulatory Authority of India).

• The statement "To conduct medical research" is incorrect as medical research is carried out by health departments, research institutions, and bodies such as the Indian Council of Medical Research (ICMR).

• Hence, the correct answer is To maintain standards of measurements.

Additional Information

• Functions of National Metrology Institute (NMI):

• An NMI develops and maintains primary measurement standards that serve as the highest reference point for measurements within the nation.

• It ensures accuracy and uniformity of measurements, which are critical for industrial production, scientific research, and international trade.

• In India, the National Physical Laboratory (NPL) serves as the NMI and oversees the calibration and dissemination of measurement standards.

• Examples of Standards Maintained:

• Standards for mass, length, temperature, time, electrical measurements, and other physical quantities.

• For instance, the NPL maintains the Indian standard for the kilogram and ensures it aligns with the International Bureau of Weights and Measures (BIPM).

• International Cooperation:

• NMIs collaborate globally to ensure international traceability, enabling seamless trade and scientific advancements.

• India's NPL works in coordination with other NMIs and participates in the activities of BIPM, the International Organization of Legal Metrology (OIML), and other international bodies.

Important Points

• Key Legal and Organizational Framework:

• The NPL, India's NMI, operates under the CSIR (Council of Scientific and Industrial Research) and provides calibration services to industries, laboratories, and other institutions.

• The Weights and Measures Act governs the use of standardized measurements in India to ensure consistency in trade and industry.

• Global Importance of NMIs:

• NMIs are vital for ensuring precision and reliability in measurements, which are crucial for modern technological advancements, industrial production, and scientific research.

• For example, the role of NMIs was critical in redefining the kilogram in 2019 based on the Planck constant to improve measurement accuracy worldwide.

Q16. Answer: (c) All-India Services Act, 1951

The correct answer is All-India Services Act, 1951.

Key Points

• All-India Services Act, 1951: The All-India Services Act, 1951 was enacted to regulate the recruitment, conditions of service, and disciplinary control of personnel belonging to the All-India Services, such as the Indian Administrative Service (IAS), Indian Police Service (IPS), and Indian Forest Service (IFS).

• The Act empowers the central government to make rules and regulations for these services in consultation with the state governments. This ensures uniformity in service conditions across the country.

• This Act serves as the legal framework for the functioning of the All-India Services, which are vital for maintaining administrative cohesion and uniformity in governance across states.

• The Act also ensures that the service rules, such as promotions, disciplinary action, and retirement benefits, are applied consistently to officers of these services.

• Hence, the correct answer is All-India Services Act, 1951.

Additional Information

• All-India Services:

• The All-India Services include the Indian Administrative Service (IAS), Indian Police Service (IPS), and Indian Forest Service (IFS). These services are unique as they serve both the central and state governments.

• Officers of these services are recruited and trained under the guidance of the central government but are allotted to different states or union territories to work under the respective state governments.

• Purpose of All-India Services Act, 1951:

• The Act was enacted to provide a structured and uniform framework for the recruitment, training, and service conditions of officers in the All-India Services.

• It ensures that officers can be transferred between the central and state governments, contributing to administrative efficiency and fostering national integration.

• Key Features of the Act:

• The Act gives power to the President of India to make rules for regulating recruitment and service conditions of All-India Services officers.

• It provides for disciplinary action and ensures uniformity in applying service rules across different states and union territories.

Important Points

• Comparison with Other Options:

• The All-India Civil Act, 1950 mentioned in Option 1 is incorrect as no such act exists.

• The Indian Services Governance Act, 1955 mentioned in Option 2 is also incorrect as no such act has been enacted.

• The Civil Services Regulation Act, 1946 mentioned in Option 4 does not relate to the All-India Services but pertains to civil services in general.

• Significance of All-India Services:

• The All-India Services play a crucial role in maintaining administrative coordination and ensuring the implementation of central government policies at the state level.

• These services contribute to fostering national unity and ensuring equitable governance across the country.

Q17. Answer: (d) Export of raw materials and import of manufactured goods

The correct answer is Export of raw materials and import of manufactured goods.

Key Points

• During the colonial period, British policies were designed to suit their industrial and economic interests in England, which significantly affected India's trade structure.

• The primary focus was on making India a supplier of raw materials for British industries and a market for their manufactured goods. This disrupted India's self-sustaining economy.

• At the time of independence in 1947, India's trade pattern was structured such that the country mainly exported raw materials like cotton, jute, and indigo.

• Simultaneously, India imported large quantities of manufactured goods, particularly textiles and machinery, from Britain. This led to a dependency on British goods and a decline in Indian handicrafts and industries.

• The policy of exporting raw materials and importing manufactured goods left India with a trade deficit and a weak industrial base, which persisted at the time of independence.

• Hence, the correct answer is Export of raw materials and import of manufactured goods.

Additional Information

• Colonial Impact on India’s Trade:

• Colonial policies transformed India into an agrarian economy focused on producing cash crops like cotton, tea, and jute for export, rather than food crops for domestic consumption.

• The export of raw materials such as cotton, jute, and indigo was heavily promoted to feed Britain's industrial revolution.

• India became a significant importer of British-manufactured goods, especially textiles, as traditional Indian industries were deliberately suppressed through policies like high tariffs on Indian exports.

• Characteristics of Trade Pattern at Independence:

• India’s trade structure was highly imbalanced, with a focus on primary goods exports and finished goods imports.

• This led to a lack of diversification in the economy and made India dependent on foreign goods for industrial and consumer needs.

• Role of British Policies:

• The Drain of Wealth Theory, as proposed by Dadabhai Naoroji, highlighted how wealth was systematically drained from India by the British through such trade patterns.

• Heavy taxes on Indian manufacturers and incentives for British imports ensured the collapse of Indian industries.

• Examples:

• Textile Industry: India, once a leading exporter of textiles, became an importer of British-manufactured textiles due to policies

that discouraged domestic production.

• Indigo: Indigo plantations were set up to meet the demand for dyes in Britain, often at the expense of Indian farmers' livelihoods.

Important Points

• Option Analysis:

• Option 1: Export of capital goods and import of consumer goods – This is incorrect as India did not focus on capital goods production during the colonial period.

• Option 2: Export of finished goods and import of raw materials – This is incorrect as India exported raw materials and imported finished goods, not the other way around.

• Option 3: Balanced trade between agriculture and industry – This is incorrect as trade was highly imbalanced, favoring British interests.

• Option 4: Export of raw materials and import of manufactured goods – This is the correct answer as it aligns with India's trade pattern during British rule.

• Economic Consequences:

• Colonial trade policies led to deindustrialization in India, with traditional industries declining and a lack of modern industrial development.

• India's dependence on agriculture increased, but without adequate focus on productivity or diversification.

Q18. Answer: (a) Education Policy

The correct answer is Education Policy.

Key Points

• Education Policy introduced by the British in India aimed at promoting English education to create a class of Indians who would assist in administrative functions and remain loyal to British interests.

• Lord Macaulay, in his famous Minute on Indian Education (1835), advocated English as the medium of instruction, stating that it would help create a class of people who were "Indian in blood and color but English in taste, opinions, morals, and intellect."

• The objective of this policy was to produce a small group of educated Indians who could act as intermediaries between the British rulers and the Indian masses and support colonial governance. Hence, the option "Education Policy" is correct.

• By promoting English education, the British also aimed to suppress indigenous learning systems and create a dependency on Western knowledge and culture.

• This policy led to the establishment of schools, colleges, and universities where English was the primary language of instruction, such as the University of Calcutta (1857).

• The promotion of English education also laid the foundation for India's intellectual awakening, which ultimately contributed to the rise of nationalist movements. Hence, the statement is correct.

Additional Information

• Subsidiary Alliance:

• Subsidiary Alliance was a strategic political and military policy introduced by Lord Wellesley, the Governor-General of India (1798–1805).

• It required Indian princely states to accept British forces within their territory and pay for their maintenance, effectively reducing their independence.

• Divide and Rule Policy:

• The Divide and Rule policy aimed to create divisions among various religious, social, and ethnic groups in India to weaken unity and maintain British control.

• This policy was prominently used during the partition of Bengal in 1905 and later during the partition of India in 1947.

• Trade Policy:

• The British trade policy focused on exploiting India's resources and turning it into a market for British goods, leading to the deindustrialization of Indian handicrafts and industries.

• India was transformed into an agrarian economy, and the export of raw materials like cotton and jute increased significantly under colonial rule.

Important Points

• Impact of British Education Policy:

• The introduction of English education led to the emergence of a middle class in India, which became influential in socio-political reforms and the freedom struggle.

• While it created opportunities for Indians to access modern Western knowledge, it also eroded traditional systems of education and culture.

• Key Developments:

• 1835: Lord Macaulay's Minute on Indian Education advocated the promotion of English and Western education.

• 1854: Wood's Dispatch emphasized the need for establishing universities and improving education infrastructure in India.

• 1857: Universities in Calcutta, Bombay, and Madras were established as centers of higher education.

Q19. Answer: (a) Tropical Thorn forests

The correct answer is Tropical Thorn Forests.

Key Points

• Tussocky grass refers to a type of grass that grows in clumps or tufts, often found in arid and semi-arid regions.

• Tropical Thorn Forests are characterized by their dry conditions and sparse vegetation. These forests predominantly occur in regions with low rainfall, typically below 70 cm annually.

• The vegetation in these forests consists of thorny bushes, scattered trees, and a significant presence of tussocky grass, which is well-adapted to dry climates and poor soil conditions. Hence, the correct answer is Tropical Thorn Forests.

• These forests are typically found in regions such as parts of Rajasthan, Gujarat, Punjab, Haryana, and the Deccan Plateau in India.

• The tussocky grass in these forests provides essential forage for grazing animals, which is crucial for the pastoral economy of the local population.

Additional Information

• Tropical Thorn Forests:

• These forests are found in regions with low rainfall (below 70 cm annually) and extreme temperatures ranging from very hot summers to cold winters.

• The vegetation is sparse and consists of thorny plants and scattered trees such as acacias, euphorbias, and palms. These plants are adapted to conserve water in dry conditions.

• Characteristics of Tussocky Grass:

• It is a type of perennial grass that grows in small clumps or tufts, making it well-suited to arid and semi-arid environments.

• The grass is drought-resistant and can survive in poor soil conditions, making it a crucial plant species in tropical thorn forests.

• Example: Species like Chrysopogon fulvus and Cenchrus ciliaris are commonly found tussocky grasses in these regions.

• Other Types of Forests in the Options:

• Tropical Deciduous Forests: Found in regions with moderate rainfall (70-200 cm), these forests shed their leaves during the dry season. They are characterized by trees such as sal, teak, and mahua.

• Evergreen Forests: Found in regions with heavy rainfall (over 200 cm), these forests are dense and remain green throughout the year. They contain trees like mahogany, ebony, and rosewood.

• Montane Forests: Found in mountainous regions, these forests vary depending on altitude. They include species like deodars, pines, and firs.

Important Points

• Adaptations of Vegetation in Tropical Thorn Forests:

• Plants in these forests have long roots to access deep underground water sources.

• Leaves are modified into spines or are small to reduce water loss through transpiration.

• Thick bark and waxy coatings on leaves help in preventing water loss.

• Examples of Wildlife:

• Animals such as camels, foxes, and blackbucks are commonly found in tropical thorn forest regions.

• These animals are adapted to survive with minimal water and harsh climatic conditions.

Q20. Answer: (a) Tidal energy

The correct answer is Tidal Energy.

Key Points

• Tidal Energy: Tidal energy is generated by harnessing the kinetic and potential energy of tidal movements caused by the gravitational forces of the Moon and Sun. It is a clean, renewable source of energy that does not produce Greenhouse Gases (GHGs). Hence, the correct answer is Tidal Energy.

• Natural Gas Transport Fuel: While natural gas is considered a relatively cleaner fossil fuel compared to coal and oil, its combustion still produces carbon dioxide (CO_2), a major greenhouse gas. Additionally, methane leaks during production and transport exacerbate its greenhouse gas footprint. Hence, statement 2 is incorrect.

• Thermal Power Plants: Thermal power plants burn fossil fuels such as coal, natural gas, or oil to generate electricity. This process releases significant amounts of greenhouse gases like CO_2 and nitrous oxide. Hence, statement 3 is incorrect.

• Diesel Generators: Diesel generators are widely used for backup power but emit greenhouse gases during operation due to the combustion of diesel. They release CO_2, nitrous oxides, and particulate matter, contributing to air pollution and global warming. Hence, statement 4 is incorrect.

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Additional Information

• Tidal Energy:

• Tidal energy is harnessed using tidal barrages, tidal streams, or tidal lagoons. These systems convert the energy of moving water into electricity using turbines.

• It is a renewable and sustainable energy source as tides are predictable and consistent due to celestial gravitational forces.

• Example: The La Rance Tidal Power Station in France is one of the oldest tidal power stations, showcasing the efficiency of this clean energy source.

• Natural Gas Transport Fuel:

• Natural gas vehicles (NGVs) use compressed natural gas (CNG) or liquefied natural gas (LNG) as fuel. While they emit less CO_2 compared to diesel or petrol vehicles, their greenhouse gas emissions are still significant.

• Methane Leaks: Methane, the primary component of natural gas, is a potent greenhouse gas with a global warming potential approximately 25 times higher than CO_2.

• Thermal Power Plants:

• Thermal power plants are one of the largest sources of greenhouse gas emissions globally, primarily due to the burning of fossil fuels.

• Coal-fired power plants release substantial amounts of CO_2, as well as sulfur dioxide and nitrogen oxides, which contribute to acid rain and air pollution.

• Example: The United States and China are among the largest producers of electricity from thermal power plants.

• Diesel Generators:

• Diesel generators are used in areas with unreliable electricity supply or during power outages. However, they are inefficient and contribute heavily to greenhouse gas emissions.

• Particulate Matter: In addition to GHG emissions, diesel generators release particulate matter, which poses health risks such as respiratory and cardiovascular issues.

Important Points

• Why Tidal Energy is Considered Green:

• Tidal energy systems do not involve combustion processes, which means they do not produce greenhouse gases like CO_2 or methane.

• Moreover, they have minimal environmental impact compared to fossil fuel-based systems, making them a sustainable option for combating climate change.

• Global Examples of Tidal Energy:

• South Korea: The Sihwa Lake Tidal Power Plant is the largest tidal energy installation globally, producing 254 MW.

• United Kingdom: The Swansea Bay Tidal Lagoon project aims to showcase the potential of tidal energy to meet renewable energy targets.

Q21. Answer: (a) National Law University, Delhi (NLUD)

The correct answer is National Law University, Delhi (NLUD).

Key Points

• Dr. Justice DY Chandrachud, the former Chief Justice of India (CJI), is a distinguished legal scholar and jurist with significant contributions to India's judicial system. He has been involved in landmark judgments related to fundamental rights, privacy, and constitutional law.

• In May 2025, he joined the National Law University, Delhi (NLUD), as a distinguished professor, contributing his expertise in law and judicial practices to nurture the next generation of legal professionals.

• NLUD is a premier legal institution in India, established in 2008, and is known for its rigorous legal education, interdisciplinary research, and world-class faculty. Hence, this is the correct option.

• The association of a former Chief Justice with NLUD highlights the institution's commitment to academic excellence and practical legal training, bridging the gap between theoretical knowledge and real-world application.

• Other institutions mentioned in the options are also notable but do not match the described scenario of Dr. Justice DY Chandrachud joining as a distinguished professor in May 2025. Hence, other options are incorrect.

Additional Information

• National Law University, Delhi (NLUD):

• NLUD was established in 2008 through the National Law University Act, Delhi. It is located in Dwarka, New Delhi.

• The university offers undergraduate, postgraduate, and doctoral programs in law, focusing on interdisciplinary legal education and research.

• It is recognized for its contributions to legal education in India, consistently ranking among the top law schools in the country.

• NLUD is known for its centers of excellence that promote research in diverse areas like human rights, intellectual property, and

environmental law.

• Dr. Justice DY Chandrachud:

• Dr. DY Chandrachud served as the 50th Chief Justice of India from November 9, 2022, to his retirement in November 2024.

• He is known for delivering landmark judgments on key issues like privacy (Puttaswamy Case), decriminalization of homosexuality (Section 377), and gender equality.

• His tenure as CJI was marked by progressive reforms and efforts to enhance transparency and efficiency in the judiciary.

• Role of Distinguished Professors:

• Distinguished professors bring their practical experience and academic insights to universities, enriching the learning environment for students.

• They contribute to curriculum development, mentor students, and often engage in collaborative research.

Important Points

• Other Institutions in the Options:

• Faculty of Law, University of Delhi: One of India's oldest law schools, established in 1924, offering comprehensive law programs.

• Indian Law Institute (ILI): Founded in 1956, it focuses on advanced legal studies and research.

• Guru Gobind Singh Indraprastha University (GGSIPU): Established in 1998, offering various undergraduate and postgraduate programs, including law.

• Significance of Dr. Chandrachud's Appointment:

• His association with NLUD enhances its reputation and provides students with access to unparalleled legal expertise.

• It reflects the importance of bridging academia and judiciary for holistic legal education.

Q22. Answer: (d) It led to regional and crop imbalances.

The correct answer is It led to regional and crop imbalances..

Key Points

• The Green Revolution in India, initiated in the 1960s, focused on increasing agricultural production through the use of high-yield variety (HYV) seeds, chemical fertilizers, pesticides, and irrigation technologies.

• While it significantly increased food grain production, it led to regional imbalances. The benefits were concentrated in regions like Punjab, Haryana, and Western Uttar Pradesh, while other regions like Eastern and Southern India were relatively neglected.

• It also caused crop imbalances by emphasizing the production of certain crops, primarily wheat and rice. This sidelined other crops, including pulses and coarse grains, which are essential for nutritional security and crop diversity.

• The heavy reliance on specific crops and regions led to issues of monoculture, which made agriculture in those areas more vulnerable to pests, diseases, and climatic variations.

• The overuse of chemical fertilizers and pesticides, promoted during the Green Revolution, caused soil degradation, water table depletion, and environmental pollution. This further exacerbated the regional inequalities, as certain regions were better equipped to handle these issues than others.

• The focus on wheat and rice caused a decline in the cultivation of traditional and indigenous crops. This not only affected biodiversity but also impacted the dietary diversity of the population in certain regions.

Additional Information

• Regional Imbalances:

• The Green Revolution mainly benefited regions with access to irrigation facilities, leaving rainfed and drought-prone regions behind.

• Punjab and Haryana became the breadbaskets of India, but states like Bihar, Odisha, and parts of Central India remained largely unaffected by the revolution.

• Crop Imbalances:

• The focus on high-yield crops like wheat and rice led to a significant decline in the production of pulses, oilseeds, and coarse cereals.

• The decline in these crops affected nutritional security, as pulses are the primary source of protein for a large section of India's population.

• Environmental Impact:

• The extensive use of chemical fertilizers and pesticides led to the depletion of soil health and contamination of water bodies.

• The overuse of groundwater for irrigation caused a decline in water tables, especially in regions like Punjab and Haryana.

• Social and Economic Disparities:

• The Green Revolution primarily benefited large and wealthy farmers who could afford the inputs, leading to increased inequalities.

• Small and marginal farmers struggled to compete, leading to economic disparities in rural areas.

Important Points

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• Benefits of the Green Revolution:

• The Green Revolution helped India achieve self-sufficiency in food grains and reduced dependence on imports.

• It significantly increased agricultural productivity, particularly in the production of wheat and rice.

• Limitations of the Green Revolution:

• The focus on specific crops and regions created imbalances in agriculture and rural development.

• The environmental and social consequences of the Green Revolution have been a cause of concern over the years.

Q23. Answer: (a) Genotype and phenotype probabilities

The correct answer is Genotype and phenotype probabilities.

Key Points

• Punnett Square: A Punnett square is a diagram that is used to predict the possible genotypes and phenotypes of offspring resulting from a genetic cross between two parents. It is especially useful in studying inheritance patterns.

• Genotype Probabilities: It helps calculate the likelihood of specific genetic combinations (e.g., homozygous dominant, homozygous recessive, or heterozygous) in the offspring. This feature is one of the key predictions of the Punnett square.

• Phenotype Probabilities: Based on the genotypes, the Punnett square also determines the chances of physical traits (phenotypes) being expressed in the offspring. For example, dominant traits might be expressed more frequently than recessive ones.

• Example: In a monohybrid cross, if one parent is heterozygous (Aa) and the other is homozygous recessive (aa), the Punnett square will show the probabilities of offspring being Aa (50%) or aa (50%), which also corresponds to the phenotypic expression of the dominant or recessive trait.

• Why Other Options Are Incorrect:

• Genetic linkage relationships in siblings: Punnett squares do not study genetic linkage, which refers to genes located close together on a chromosome that are inherited together.

• Genetic mutations over several generations: The Punnett square does not track mutations or predict their occurrence over generations; it only deals with existing alleles.

• DNA sequence in parents: Punnett squares do not analyze the DNA sequence directly but focus on the inheritance of alleles and traits.

Additional Information

• Applications of Punnett Square:

• It is widely used in Mendelian genetics to study monohybrid and dihybrid crosses.

• Helps predict the probability of inheriting genetic diseases like sickle cell anemia or cystic fibrosis.

• Used in breeding programs to select for desired traits in plants and animals.

• Limitations of the Punnett Square:

• It assumes that genes assort independently, which may not be true in cases of genetic linkage.

• It does not account for polygenic traits (traits controlled by multiple genes) or environmental influences.

• Terms Related to the Punnett Square:

• Homozygous: An individual with two identical alleles for a trait (e.g., AA or aa).

• Heterozygous: An individual with two different alleles for a trait (e.g., Aa).

• Dominant allele: An allele that masks the expression of a recessive allele in a heterozygous individual.

• Recessive allele: An allele that is only expressed when two copies are present (homozygous recessive).

Important Points

• History: The Punnett square was devised by Reginald C. Punnett, a British geneticist, in the early 20th century as part of Mendelian genetics.

• Mendel’s Laws: The Punnett square is based on two key principles:

• Law of Segregation: Each parent contributes one allele for a trait to the offspring.

• Law of Independent Assortment: Genes for different traits are inherited independently (if unlinked).

• Modern Use: While the Punnett square is simple, it forms the foundation for more advanced genetic studies, including probabilistic modeling and population genetics.

Q24. Answer: (a) 104th Amendment Act, 2019

The correct answer is 104th Amendment Act, 2019.

Key Points

• The 104th Amendment Act, 2019 abolished the provision for nominating members from the Anglo-Indian community to the State Legislative Assemblies and the Lok Sabha.

• Before the amendment, under Article 331 and Article 333 of the Indian Constitution, the President and Governors could nominate two members of the Anglo-Indian community to the Lok Sabha and State Legislative Assemblies, respectively.

• The Anglo-Indian community was provided this representation as they were considered a minority group with unique cultural and historical significance in India.

• The 104th Amendment Act repealed this provision, as it was deemed that the Anglo-Indian community had integrated well into Indian society and no longer needed reserved representation in legislative bodies.

• This amendment is significant as it reflects the evolving approach of the Indian Constitution to the representation of minority communities in legislative institutions.

Additional Information

• Anglo-Indian Community:

• The term Anglo-Indian refers to people of mixed Indian and European ancestry. This group played an important role during British rule in India.

• Historically, the Anglo-Indian community worked in the railways, education, and government services. They had a distinct identity and were given reserved representation post-Independence to safeguard their interests.

• Articles Related to Anglo-Indian Reservation:

• Article 331: Allowed the President to nominate two Anglo-Indians to the Lok Sabha if he/she felt that the community was not adequately represented.

• Article 333: Allowed Governors to nominate one member of the Anglo-Indian community to the State Legislative Assembly under the same conditions.

• Other Key Features of the 104th Amendment Act:

• The amendment extended the reservation of seats for Scheduled Castes (SCs) and Scheduled Tribes (STs) in the Lok Sabha and State Legislative Assemblies for another 10 years, until 2030.

• While the reservation for SCs and STs was extended, the provision for Anglo-Indian representation was abolished as it was considered no longer necessary.

Important Points

• Constitutional Amendments:

• 104th Constitutional Amendment Act was passed by the Parliament in December 2019 and came into effect on January 25, 2020.

• The amendment required a two-thirds majority in both Houses of Parliament and was supported across party lines.

• Other Constitutional Amendments Related to Elections:

• 101st Amendment Act, 2016: Introduced the Goods and Services Tax (GST), which is unrelated to the topic of representation.

• 102nd Amendment Act, 2018: Gave constitutional status to the National Commission for Backward Classes (NCBC).

• 105th Amendment Act, 2021: Restored the power of states to identify and notify Socially and Educationally Backward Classes (SEBCs).

Q25. Answer: (a) Gujarat

The correct answer is Gujarat.

Key Points

• The Vishwamitri River is located in the state of Gujarat, India. It flows through the city of Vadodara, which is also known as Baroda.

• The river is home to a large population of mugger crocodiles, a species of crocodile primarily found in the Indian subcontinent. The Vishwamitri River is significant for its biodiversity.

• The Government of Gujarat has conducted a crocodile census to monitor and estimate the population of mugger crocodiles along the Vishwamitri River. Hence, the statement is correct.

• The city of Vadodara is particularly known for its proximity to the Vishwamitri River, and the presence of crocodiles in urban areas has led to efforts to protect and conserve these reptiles.

• The census is aimed at addressing the human-crocodile conflict in urban areas, ensuring both the safety of humans and the conservation of crocodiles. This highlights the importance of the Vishwamitri River as a habitat for wildlife.

Additional Information

• About the Vishwamitri River:

• The Vishwamitri River originates from the Pavagadh Hills in Gujarat and flows through Vadodara city before merging into the Arabian Sea.

• The river is named after the sage Vishwamitra from Hindu mythology and has cultural and ecological significance in the region.

• Mugger Crocodiles:

• The mugger crocodile (Crocodylus palustris) is a medium to large-sized crocodilian species found in freshwater habitats such as

rivers, lakes, and marshes.

• They are listed as Vulnerable on the IUCN Red List due to habitat loss, human-wildlife conflict, and poaching.

• The Vishwamitri River is one of the few urban river systems where these crocodiles coexist with human populations.

• Conservation Efforts:

• The Gujarat government has taken initiatives such as regular crocodile censuses, public awareness campaigns, and habitat conservation projects to protect these reptiles.

• Efforts are also being made to reduce human-crocodile conflicts, as the proximity of these animals to urban areas poses challenges.

• Important Facts:

• The crocodile census helps in tracking population trends, identifying threats, and planning conservation strategies for the species.

• Vadodara is often referred to as the "City of Crocodiles" due to its large population of mugger crocodiles.

Important Points

• Crocodile Conservation in India:

• Project Crocodile was launched by the Government of India in 1975 to conserve and protect crocodilian species, including muggers, gharials, and saltwater crocodiles.

• The Madras Crocodile Bank Trust (MCBT) in Tamil Nadu is a major center for crocodile conservation and awareness.

• Human-Wildlife Conflict:

• Urban rivers like the Vishwamitri often see human-wildlife interactions, necessitating better management practices to ensure coexistence.

• Steps such as fencing, public awareness, and relocation of crocodiles in extreme cases have been implemented to address conflicts.

Q26. Answer: (c) Alam Ara

The correct answer is Alam Ara.

Key Points

• Alam Ara (1931) was the first Indian sound film, marking the beginning of the "talkie" era in Indian cinema.

• Directed by Ardeshir Irani, Alam Ara was released on 14 March 1931. It was a milestone in Indian cinema and paved the way for the Bollywood industry.

• The film featured dialogue and songs, making it revolutionary compared to silent movies that existed before. Hence, Alam Ara is considered the first Indian talkie film.

• Raja Harishchandra, made by Dadasaheb Phalke in 1913, was India's first full-length silent feature film. It does not qualify as the first sound film. Hence, statement 2 is incorrect.

• Sholay (1975) and Mughal-e-Azam (1960) were significant films in Indian cinema but were not the first sound films. Hence, statements 1 and 4 are incorrect.

• Alam Ara featured seven songs and introduced playback singing in Indian cinema. The song "De de khuda ke naam par" sung by Wazir Mohammed Khan became iconic.

• The film's themes revolved around royal intrigue, love, and family drama, setting a precedent for Bollywood's storytelling style. Hence, statement 3 is correct.

Additional Information

• Alam Ara:

• Production: Alam Ara was produced by Imperial Movietone. Ardeshir Irani used the Tantra system to record sound, which was cutting-edge technology at the time.

• Plot: The story revolved around a love triangle between a prince, a gypsy girl, and a princess. It included themes of romance, betrayal, and conflict.

• Impact: Alam Ara inspired the production of sound films across India, creating a shift from silent cinema to talkies.

• Raja Harishchandra:

• Directed by: Dadasaheb Phalke, considered the "Father of Indian Cinema".

• Release: 1913, it marked the beginning of Indian cinema but was a silent film.

• Significance: It laid the foundation for India's film industry but did not feature sound.

• Sound in Indian Cinema:

• The advent of sound films brought new opportunities for Indian cinema, including dialogue, playback singing, and sound effects.

• Example: Alam Ara set the tone for Bollywood's musical and dramatic themes.

Important Points

• Technological Advancements:

• Sound Recording: Alam Ara was recorded using the Tanar system, which was the first sound recording technology used in India.

• Playback Singing: The concept of playback singing was introduced, which later became a hallmark of Indian cinema.

• Legacy of Alam Ara:

• The film is no longer available as the prints of Alam Ara were destroyed. However, it remains a crucial part of Indian cinematic history.

• Recognition: Alam Ara is remembered as the first Indian sound film, a pioneer in integrating sound and storytelling.

Q27. Answer: (b) Narendra Modi

The correct answer is Narendra Modi.

Key Points

• Bageshwar Dham Medical and Science Research Institute: This institute is a newly proposed medical and scientific research facility located in Madhya Pradesh. It aims to foster research and development in medical sciences and related fields.

• Foundation Stone: The foundation stone of the institute was laid by Narendra Modi, who is the current Prime Minister of India. This event highlights the government's emphasis on healthcare and scientific advancements.

• Significance: The establishment of the institute will contribute to the medical research landscape in Madhya Pradesh, supporting innovation and providing healthcare solutions to the region and beyond.

• Government Initiative: This development is part of India's larger efforts to improve healthcare infrastructure and promote scientific research, aligning with the goals of schemes such as Ayushman Bharat and other healthcare policies.

• Narendra Modi: As the Prime Minister of India, Narendra Modi has inaugurated and initiated several projects across various sectors, including healthcare, education, and infrastructure. His involvement signifies the importance of the institute in national development. Hence, the correct answer is Narendra Modi.

Additional Information

• About Narendra Modi:

• Narendra Modi is the 14th Prime Minister of India, serving since 2014. His administration has focused on economic growth, infrastructure development, and welfare schemes for all sectors, including healthcare.

• He has launched multiple initiatives such as Ayushman Bharat, aimed at providing affordable healthcare to Indian citizens. His vision includes strengthening India's research capabilities and infrastructure.

• Healthcare in India:

• India has been focusing on improving healthcare infrastructure, particularly in rural and underserved areas. The development of institutes like Bageshwar Dham Medical and Science Research Institute aligns with these goals.

• Ayushman Bharat, launched in 2018, is a flagship program to provide healthcare coverage to economically vulnerable sections, covering hospital expenses and promoting preventive care.

• Example: The All India Institute of Medical Sciences (AIIMS) network has been expanded across various states to improve access to advanced medical care.

• Scientific Research in India:

• India has a rich history of scientific innovation. Establishing research institutes like the Bageshwar Dham Medical and Science Research Institute will further enhance the nation's capability in medical research.

• These institutes are critical for conducting clinical trials, developing new treatments, and promoting technological innovation in healthcare.

• Example: The Indian Council of Medical Research (ICMR) plays a pivotal role in advancing medical research and addressing public health challenges.

Important Points

• Role of Prime Minister:

• The Prime Minister of India often takes part in inaugurating major projects to signify their importance to national development and ensure their successful implementation.

• Narendra Modi has been actively involved in launching initiatives across sectors, emphasizing healthcare, education, and infrastructure.

• Development in Madhya Pradesh:

• Madhya Pradesh has been witnessing infrastructural and healthcare development, with projects like this institute aiming to enhance its contribution to national growth.

• The state government works in collaboration with the central government to improve facilities like hospitals, research centers, and educational institutes.

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Q28. Answer: (b) Special status for the Hyderabad–Karnataka region

The correct answer is Special status for the Hyderabad–Karnataka region.

Key Points

• Article 371J of the Indian Constitution grants special provisions for the Hyderabad–Karnataka region.

• This article was introduced through the 98th Constitutional Amendment Act, 2012, aimed at addressing the socio-economic backwardness of the region.

• The Hyderabad–Karnataka region includes districts like Bidar, Gulbarga, Yadgir, Raichur, Koppal, and Bellary, which were historically under the Nizam's rule and faced developmental challenges.

• Under Article 371J, the region is provided with special status, enabling the Karnataka state government to take measures for its development, including reservation in educational institutions and government jobs.

• A separate development board is established to ensure targeted policies and investments for improving infrastructure and socio-economic conditions in the region.

• The Governor of Karnataka is empowered to oversee the functioning of the development board and ensure equitable allocation of resources.

• The special provisions under Article 371J have been instrumental in bringing attention to the developmental needs of the Hyderabad–Karnataka region.

Additional Information

• Background of Article 371J:

• The Hyderabad–Karnataka region faced economic and social backwardness due to historical reasons, including its rule under the Nizam of Hyderabad.

• The 98th Constitutional Amendment Act was passed in 2012 to address these challenges and provide special provisions for development.

• Key Features of Article 371J:

• A development board is created for the region to ensure targeted allocation of funds and resources.

• The state government can provide reservation in education and employment for the residents of the region.

• The Governor monitors the implementation of the provisions and ensures equitable resource distribution.

• Comparative Analysis with Other Articles:

• Article 371: Provides special provisions for various states like Maharashtra, Gujarat, and Nagaland, addressing their specific developmental needs.

• Article 371A: Grants Nagaland special provisions to preserve its cultural and social practices.

• Article 371D: Addresses employment and education issues in Andhra Pradesh.

Important Points

• Development and Impact:

• Article 371J has helped in improving educational opportunities, including the establishment of universities and colleges in the region.

• The region has witnessed an increase in employment opportunities due to reservations and targeted developmental policies.

• Infrastructure development, including roads, hospitals, and public services, has been prioritized under the provisions of Article 371J.

Q29. Answer: (c) Launch of the first private satellite constellation from India

The correct answer is Launch of the first private satellite constellation from India.

Key Points

• Pixxel, a Bengaluru-based startup, achieved a significant milestone by launching the first private satellite constellation from India. This marked an important step in India's growing private space sector.

• The satellite constellation comprises a series of small yet powerful satellites designed to provide high-resolution hyperspectral imaging capabilities.

• The purpose of the constellation is to monitor the Earth for various applications like climate monitoring, agricultural analysis, urban planning, and disaster management.

• Pixxel's 2025 space launch has placed India on the global map for private space exploration and satellite technology.

• The company is contributing to India's thriving space economy by leveraging innovative technology and fostering collaboration with government organizations like the Indian Space Research Organisation (ISRO).

• This achievement aligns with the Indian government's push toward privatizing the space sector and encouraging startups to participate in space exploration and satellite technology.

• The satellite constellation enables real-time data collection and analysis, providing critical insights for industries across the globe.

• The launch demonstrates India's capability to compete in the global commercial satellite market and showcases the growing

potential of indigenous talent and innovation.

Additional Information

• About Pixxel:

• Pixxel is a space-tech startup based in Bengaluru, India, founded in 2019.

• The company focuses on building hyperspectral imaging satellites capable of capturing data across the electromagnetic spectrum.

• Pixxel aims to address challenges like climate change, resource management, and disaster mitigation using its satellite data.

• Significance of the Satellite Constellation:

• The satellite constellation delivers high-resolution images that help in analyzing environmental changes and detecting early signs of natural disasters.

• It has applications in agriculture (e.g., crop health monitoring), urban development, and defense.

• Hyperspectral imaging allows for greater detail and precision compared to traditional imaging technologies.

• India’s Space Privatization:

• India’s space privatization efforts are led by the Indian National Space Promotion and Authorization Center (IN-SPACe), established in 2020.

• The government encourages private players to collaborate with ISRO for launch services, satellite development, and data analysis.

• Pixxel’s achievement highlights the success of these initiatives and strengthens India’s position in the global space economy.

• Comparison with Other Options:

• Launch of a reusable rocket: While this is a significant milestone in space exploration, it is not related to Pixxel’s 2025 achievement.

• India’s first lunar lander by a startup: This is not relevant to Pixxel, as the company focuses on satellite technology rather than lunar exploration.

• Construction of a domestic space observatory: This is unrelated to Pixxel’s contribution, as their focus is on satellite constellations, not observatories.

Important Points

• Hyperspectral Imaging Technology:

• Unlike traditional imaging, hyperspectral imaging captures data across multiple wavelengths of light.

• This technology is essential for applications like precision agriculture, environmental monitoring, and mineral exploration.

• Government Support for Space Startups:

• India’s space privatization policies encourage startups to participate in space research and satellite launches.

• Collaboration with ISRO has enabled startups like Pixxel to access critical infrastructure and expertise.

• Impact on the Global Market:

• With the successful launch of its satellite constellation, Pixxel positions India as a key player in the global space industry.

• The data generated from Pixxel’s satellites will be used by governments, corporations, and research organizations worldwide.

Q30. Answer: (c) It processes data and controls operations of all parts of the computer.

The correct answer is It processes data and controls operations of all parts of the computer..

Key Points

• The Central Processing Unit (CPU) is often referred to as the "brain" of the computer because it is responsible for carrying out critical functions such as executing instructions and managing system operations.

• The primary function of the CPU is to process data and control operations of all parts of the computer. It ensures that the input from the user is processed and the desired output is generated. Hence, this is correct.

• The CPU does not store user files permanently. That function is performed by storage devices like the hard disk or SSD. Hence, this statement is incorrect.

• While the CPU receives input from devices such as the keyboard and mouse, it is not limited to these devices. It processes input from other peripherals as well, such as scanners and microphones. Hence, this statement is incorrect.

• The CPU does not directly send output to printers and monitors; it processes the data that is then sent to these output devices via other components like the GPU or I/O controllers. Hence, this statement is incorrect.

Additional Information

• Components of the CPU:

• Arithmetic Logic Unit (ALU): Responsible for performing arithmetic operations (e.g., addition, subtraction) and logical operations (e.g., comparisons).

• Control Unit (CU): Manages the execution of instructions by directing the flow of data and coordinating between the CPU and

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other components of the system.

• Registers: Small, high-speed storage locations within the CPU that temporarily hold data and instructions during processing.

• CPU Operations:

• Fetch: The CPU retrieves instructions from memory.

• Decode: The CPU interprets the instructions to determine the operation to be performed.

• Execute: The CPU performs the operation, such as calculations or data transfer.

• Examples of CPUs:

• Intel Core: A popular CPU series for desktops and laptops.

• AMD Ryzen: Known for offering high performance at competitive prices.

Important Points

• CPU Performance Factors:

• Clock Speed: Measured in GHz, it determines how many cycles a CPU can perform per second.

• Core Count: Multiple cores allow a CPU to perform multiple tasks simultaneously.

• Cache Memory: High-speed memory that stores frequently accessed data to improve performance.

• Applications:

• Used in personal computers, servers, and embedded systems like smartphones and IoT devices.

• Specialized CPUs like GPUs are used for tasks like gaming, video editing, and AI computations.

Q31. Answer: (a) Single citizenship for the entire country

The correct answer is Single citizenship for the entire country.

Key Points

• India follows a single citizenship system, meaning that all Indian citizens are recognized as citizens of India regardless of the state or territory they belong to. This ensures unity across the country and reflects the unitary character of the Indian Constitution. Hence, this feature is NOT federal and is unitary in nature.

• The requirement of certain Constitutional Amendments to be ratified by the states is a federal feature. Such provisions ensure the participation of states in the amendment process, protecting the federal balance. Hence, this statement reflects federalism.

• The existence of an upper house of Parliament, the Rajya Sabha, representing the states is a distinct federal feature. Rajya Sabha members are elected by the legislative assemblies of states, ensuring state representation at the central level. Hence, this statement reflects federalism.

• The division of powers between the Centre and the States is the cornerstone of federalism in India. It is implemented through the division of subjects in the Union, State, and Concurrent Lists under the Constitution. Hence, this statement reflects federalism.

Additional Information

• Single Citizenship:

• Unlike countries like the United States or Canada, where citizens hold dual citizenship at the national and state/provincial levels, India provides single citizenship. This ensures that every citizen is recognized uniformly under Indian law.

• The provision of single citizenship is enshrined in Part II of the Indian Constitution (Articles 5-11). It avoids complexities in legal and administrative matters and promotes the idea of national unity.

• Federal Features:

• India's federal structure includes features such as the division of powers between the Centre and states, a written Constitution, an independent judiciary, and bicameralism with the Rajya Sabha representing the states.

• However, the federal system in India is not absolute. It is described as a "quasi-federal" system with a strong tilt toward centralization. This is evident in provisions like single citizenship.

• Important Examples of Federal Features:

• The 73rd and 74th Amendments introduced local self-government institutions (Panchayats and Municipalities), reflecting India's decentralized governance model.

• The role of the Finance Commission in recommending financial allocations between the Centre and states is another key federal feature.

Important Points

• Unitary Features of Indian Constitution:

• The Indian Constitution incorporates several unitary features like single citizenship, a unified judiciary, and the authority of the Union over states during emergencies. These features centralize power and ensure national integrity.

• During national emergencies under Articles 352, 356, and 360, India's federal structure transforms into a more unitary system, with significant powers vested in the Centre.

• Key Developments:

• The single citizenship provision has helped maintain India's unity and prevent regionalism, ensuring that all citizens enjoy equal rights across the country irrespective of their state or territory.

• This feature has been significant in avoiding legal complexities that could arise from dual citizenship systems, as seen in other federal nations like the United States.

Q32. Answer: (a) Panama

The correct answer is Panama.

Key Points

• Panama became the first Latin American country to withdraw from China's Belt and Road Initiative (BRI) in February 2025. This marked a significant geopolitical shift in the region's relationship with China.

• The Belt and Road Initiative (BRI) is China's global development strategy aimed at infrastructure and investment projects across the globe, involving nearly 150 countries and international organizations.

• Panama initially joined the BRI in 2017 to strengthen trade and infrastructure ties with China. It was part of China's strategy to expand its influence in the Americas.

• The decision to withdraw from the BRI reflects growing concerns about the debt trap diplomacy associated with China's projects, as well as geopolitical tensions with the United States, which maintains a significant influence in the region.

• The withdrawal was also influenced by the growing criticism of China's opaque project financing, which often leads to mounting debts for participant countries. This made Panama reconsider its participation in the initiative.

• Panama’s withdrawal is likely to have broader implications for other Latin American countries involved in the BRI, as it may encourage them to reassess their commitments to China's initiative.

• This move emphasizes the importance of ensuring that international partnerships align with a nation's long-term economic and strategic interests.

Additional Information

• About the Belt and Road Initiative (BRI):

• The BRI was launched by China in 2013 under the leadership of President Xi Jinping. It aims to connect Asia, Europe, Africa, and Latin America through a network of trade routes and infrastructure projects.

• It consists of two main components: the Belt, representing the overland Silk Road Economic Belt, and the Road, referring to the Maritime Silk Road.

• As of 2023, the BRI includes over 140 countries, making it one of the largest global infrastructure and development initiatives.

• Critics argue that the BRI often leads to unsustainable debt burdens for participating countries, as loans from Chinese banks come with high interest rates and stringent repayment conditions.

• Panama's Role in the BRI:

• Panama joined the BRI in 2017, shortly after establishing diplomatic ties with China in exchange for cutting ties with Taiwan.

• As a major hub for global trade through the Panama Canal, the country was a strategic partner for China's global aspirations.

• China invested in various infrastructure projects in Panama, including the construction of ports and energy facilities.

• However, Panama's withdrawal from the BRI signals a shift in priorities, influenced by concerns over sovereignty, debt sustainability, and relations with the United States.

• Other Latin American Countries in the BRI:

• Several Latin American nations, including Argentina, Chile, and Brazil, are part of the BRI. They have benefited from China's investments in infrastructure, energy, and technology.

• However, these countries also face challenges related to debt repayment and fears of overreliance on China.

• Panama's exit might prompt these nations to reevaluate their participation in the initiative.

Important Points

• Reasons for Panama's Withdrawal:

• Concerns about debt sustainability due to China's high-interest loans.

• Pressure from the United States, which has historically maintained a strong influence in Panama due to the strategic importance of the Panama Canal.

• Desire to maintain sovereignty and reduce reliance on Chinese investments.

• Growing criticism of China's lack of transparency and accountability in BRI projects.

• Impact of Panama's Withdrawal:

• It may encourage other countries in the region to reconsider their participation in the BRI.

• It highlights the importance of balancing geopolitical and economic interests in international partnerships.

• It underscores the growing competition between the United States and China for influence in Latin America.

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Q33. Answer: (c) Panchayati Raj Institutions (village/local level)

The correct answer is Panchayati Raj Institutions (village/local level).

Key Points

• Eleventh Schedule: The Eleventh Schedule was introduced in the Constitution of India by the 73rd Constitutional Amendment Act, 1992. It contains a list of 29 subjects that have been allocated to the Panchayati Raj Institutions (PRIs).

• These subjects are meant to decentralize the power and ensure local self-governance at the village and rural levels.

• The subjects include matters like agriculture, irrigation, rural housing, rural electrification, education, health, and sanitation, among others. These functions are intended to empower the grassroots governance system. Hence, the correct answer is Panchayati Raj Institutions.

• The objective of the Eleventh Schedule is to enhance participation in governance by bringing decision-making closer to the people and ensuring development at the local level.

• It is also aligned with the principle of subsidiarity, which states that governance should be handled at the lowest possible level, where it is most effective.

Additional Information

• Panchayati Raj System:

• The Panchayati Raj system in India is a three-tier system of governance at the village, block, and district levels. It was institutionalized through the 73rd Constitutional Amendment Act, 1992.

• It aims to promote democratic decentralization and ensure governance at the grassroots level by empowering elected local bodies.

• Subjects under the Eleventh Schedule:

• The 29 subjects listed in the Eleventh Schedule include critical areas such as agriculture, water management, health, education, rural housing, social welfare, and poverty alleviation programs.

• These subjects ensure that Panchayati Raj Institutions have the authority to address local needs and concerns effectively.

• Constitutional Provisions:

• The Article 243G of the Indian Constitution empowers the Panchayati Raj Institutions to function as units of self-governance and take decisions on these subjects.

• This provision ensures that the local bodies have the authority to plan and implement schemes for economic development and social justice.

Important Points

• Significance of the Eleventh Schedule:

• The Eleventh Schedule ensures the empowerment of rural areas by providing Panchayati Raj Institutions with the authority to manage resources and implement development initiatives.

• It plays a crucial role in promoting inclusive governance and addressing the specific needs of rural communities.

• Comparison with other options:

• The subjects under the Eleventh Schedule are not intended for Urban Municipal Corporations, as these fall under the Twelfth Schedule of the Constitution.

• Similarly, these subjects are not primarily the responsibility of the State Governments or Central Government, as they are specifically allocated to the Panchayati Raj Institutions.

Q34. Answer: (b) Process Control Block

The correct answer is Process Control Block.

Key Points

• The Process Control Block (PCB) is a data structure used by the operating system to store all information about a process. It is crucial for process management and scheduling.

• The PCB contains several fields, including process state, program counter, CPU registers, memory management information, and I/O status information. These fields are vital for the operating system to manage processes efficiently.

• The process state field records the current state of a process, such as ready, running, waiting, or terminated. It allows the system to determine the next action for the process.

• The program counter field holds the address of the next instruction to be executed for the process. This ensures that the process resumes correctly after an interruption.

• The CPU registers field stores the values of the process's registers when it is not executing. This enables the process to resume execution without losing its state.

• The memory management information includes details about the memory allocated to the process, such as base and limit registers, page tables, and segment tables. This ensures proper memory access and protection.

• The I/O status information field tracks the I/O devices allocated to the process and its status. It helps the operating system

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manage I/O operations effectively.

• The PCB enables context switching, which is the process of saving the state of a currently running process and restoring the state of another process. This ensures multitasking and system efficiency.

Additional Information

• Functions of Process Control Block:

• The PCB is crucial for process scheduling, as it allows the operating system to determine which process should run next based on its priority and state.

• It facilitates inter-process communication (IPC) by storing information about the resources shared among processes.

• The PCB helps in process synchronization, ensuring that processes do not conflict when accessing shared resources.

• Comparison of Other Options:

• Program Control Block: This is incorrect as no such term exists in the context of operating systems. It may be confused with the Process Control Block.

• Primary Communication Bus: This term refers to the hardware bus system used for data transfer among components in a computer. It is unrelated to the process management functionality of an operating system.

• Process Communication Block: While this term may seem plausible, it is not a standard term in operating system terminology. Process communication is handled by IPC mechanisms, not by a separate block named Process Communication Block.

Important Points

• Key Components of PCB:

• The PCB contains process identification information, such as process ID, parent process ID, and user ID. This helps the operating system uniquely identify and manage processes.

• The process priority field determines the priority of a process for scheduling purposes. Higher-priority processes are executed before lower-priority ones.

• The PCB also includes accounting information, such as CPU usage, time limits, and job or process numbers. This data is essential for resource utilization tracking and billing in multi-user systems.

• Practical Applications:

• The PCB is used in multitasking systems to ensure seamless switching between processes. For example, in a multitasking operating system like Linux, the PCB is essential for efficient process management.

• In real-time operating systems (RTOS), the PCB plays a crucial role in maintaining process deadlines and ensuring timely task execution.

Q35. Answer: (a) A O Hume

The correct answer is A O Hume.

Key Points

• A O Hume is credited with the idea of mobilizing leading Indian political leaders under a common platform, which later became the Indian National Congress (INC).

• He was a retired British civil servant and was motivated by his belief that an organized platform for Indians would help address their grievances and prevent potential unrest against British rule.

• Hume's efforts culminated in the first session of the Indian National Congress, which was held in Bombay (now Mumbai) in December 1885. Hence, the correct option is A O Hume.

• The founding of the INC marked a significant moment in the Indian freedom struggle, as it provided a platform for Indians to voice their political and social concerns.

• Hume's initiative was supported by other early leaders like W C Bannerjee, who became the first president of INC, along with Surendranath Bannerjee and Ananda Mohan Bose, who were prominent leaders in the Indian political sphere.

Additional Information

• A O Hume and the Formation of INC:

• Allan Octavian Hume was a British administrator and reformer. He believed that providing a political platform for Indians would help establish a dialogue between the British administration and Indian society.

• Hume acted as a mediator between Indians and the British government, ensuring that political demands were conveyed peacefully.

• His initiative led to the first session of the INC in December 1885, with 72 delegates attending the meeting.

• Role of Other Leaders:

• W C Bannerjee was the first president of INC and played a crucial role in shaping the early objectives of the organization.

• Surendranath Bannerjee was a prominent nationalist leader and was involved in early political movements like the Indian Association, which later merged with the INC.

• Ananda Mohan Bose was an advocate of Indian self-rule and contributed significantly to the political discourse at the time.

• Objectives of the Indian National Congress:

• The INC was established to promote political awareness and unity among Indians and to act as a platform for articulating their demands.

• Initially, its demands were moderate, focusing on administrative reforms, representation in government, and safeguarding Indian interests.

Important Points

• Key Contributions of A O Hume:

• A O Hume's efforts in organizing the INC are considered instrumental in laying the foundation for India's freedom movement.

• He emphasized non-violent methods and negotiation as tools for achieving political goals.

• Though a British civil servant, Hume's sympathy towards Indian causes earned him respect among early nationalist leaders.

• Legacy of the INC:

• The INC eventually became the primary organization leading the Indian independence movement, with leaders like Mahatma Gandhi, Jawaharlal Nehru, and Sardar Patel.

• It evolved from a moderate organization into a mass movement demanding complete independence from British rule.

Q36. Answer: (d) Law of Constant Proportions

The correct answer is Law of Constant Proportions.

Key Points

• The Law of Constant Proportions, also known as the Law of Definite Proportions, was proposed by Joseph Proust in the year 1799.

• According to this law, a chemical compound always contains the same elements in the same proportion by mass, regardless of its source or the method of preparation.

• In the case of water, it is always composed of hydrogen and oxygen in a fixed mass ratio of 1:8. This means that for every 1 gram of hydrogen, there are 8 grams of oxygen in water.

• This law is universally applicable for pure chemical substances. For example, the ratio of sodium to chlorine in sodium chloride (NaCl) is always constant.

• In the given question, the fixed mass ratio of hydrogen and oxygen in water (1:8) is a direct illustration of the Law of Constant Proportions.

• Hence, the correct answer is Law of Constant Proportions.

Additional Information

• Law of Conservation of Energy:

• This law states that energy can neither be created nor destroyed; it can only change from one form to another.

• It does not apply directly to chemical compositions or fixed mass ratios but rather to energy transformations in physical and chemical processes.

• Dalton's Atomic Theory:

• Proposed by John Dalton in 1808, this theory laid the foundation for modern chemistry.

• It states that all matter is composed of indivisible atoms, and atoms of a given element are identical in mass and properties.

• While the theory aligns with the concept of fixed proportions, it does not specifically address the fixed mass ratio in compounds.

• Law of Multiple Proportions:

• Proposed by John Dalton, this law states that when two elements combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element are in a ratio of small whole numbers.

• An example of this is carbon dioxide (CO_2) and carbon monoxide (CO), where the ratio of oxygen in CO_2 to CO is 2:1 for the same amount of carbon.

• This law does not specifically explain the fixed ratio in water but deals with combinations forming multiple compounds.

• Examples of the Law of Constant Proportions:

• Water (H_2O): Contains hydrogen and oxygen in the mass ratio of 1:8.

• Carbon dioxide (CO_2): Contains carbon and oxygen in the mass ratio of 3:8.

• Sodium chloride (NaCl): Contains sodium and chlorine in the ratio of 23:35.5 by mass.

Important Points

• Application of the Law of Constant Proportions:

• This law is applicable only to pure substances. Impure substances or mixtures do not follow this law.

• The law is essential in chemical analysis and in determining molecular formulas of compounds.

• It forms the basis for stoichiometry, which deals with the quantitative relationships between reactants and products in a chemical reaction.

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• Limitations of the Law of Constant Proportions:

• It does not apply to non-stoichiometric compounds, which do not have a fixed chemical composition (e.g., ferrous oxide).

• Isotopes of elements may cause variations in mass ratios in some cases.

• The law is valid only for homogeneous compounds and fails for heterogeneous mixtures.

Q37. Answer: (b) 5

The correct answer is 5 cities.

Key Points

• The Khelo India Youth Games is an annual multi-disciplinary sports event in India aimed at promoting sports culture and identifying young talent across the nation.

• In the 2025 Khelo India Youth Games, the event was hosted in 5 different cities of Bihar. This is a significant development as it reflects the growing emphasis on promoting sports in various regions of India, including Bihar.

• The choice of 5 cities highlights the state's initiative to decentralize sports activities and ensure accessibility to athletes from different parts of Bihar. Hence, the correct answer is 5 cities.

• Bihar has been actively involved in hosting sports events as part of the Khelo India initiative, which focuses on grassroots sports development and infrastructure improvement.

• The hosting of Khelo India Youth Games across multiple cities in Bihar is expected to inspire young athletes and contribute to the overall growth of sports culture in the state.

Additional Information

• Khelo India Youth Games:

• Khelo India is a flagship program launched by the Government of India in 2018 to develop grassroots sports infrastructure and nurture young sporting talent across the country.

• The event aims to encourage participation in sports by providing opportunities for athletes under the age of 17 and 21 to compete in various disciplines.

• Sports Development in Bihar:

• Bihar, as a state, has been witnessing gradual development in sports infrastructure, with initiatives under the Khelo India scheme contributing significantly to this progress.

• Hosting events in multiple cities ensures that sports facilities and participation opportunities reach athletes from different regions within the state.

• Examples of Sports Events in Bihar:

• The state has hosted various sports events, including the Kabaddi championships, athletics meets, and volleyball tournaments, contributing to the growth of sports culture.

Important Points

• Significance of Khelo India:

• The Khelo India program aims to create a robust sports ecosystem in India, fostering participation, infrastructure development, and identification of talent.

• It also serves as a platform for young athletes to showcase their skills and get recognized at the national level.

• Impact on Bihar:

• Hosting events like the Khelo India Youth Games in Bihar reflects the government's commitment to improving sports facilities in the state.

• It also boosts the state's image as a hub for sporting activities and encourages local talent to participate in national and international events.

Q38. Answer: (a) Nagasena

The correct answer is Nagasena.

Key Points

• ‘Milind Panho’ is a post-Mauryan text written in the form of a dialogue or conversation between the Indo-Greek king Menander I (Milinda) and the Buddhist monk Nagasena. This statement is correct.

• The text is an important work in Buddhist literature and is considered a classic in Pali literature. It is a unique blend of Indian and Hellenistic thought.

• The text is primarily a philosophical discourse where Nagasena answers various questions posed by Menander related to Buddhist philosophy, ethics, and metaphysical issues. This is correct.

• The text is significant for its role in spreading Buddhism beyond India, particularly to the Hellenistic world during the post-Mauryan period. It highlights the interaction between Indian and Greek cultures.

• The Milind Panho is divided into seven books, each focusing on different aspects of Buddhist teachings and philosophy.

• Nagasena's arguments in the text are seen as a masterful exposition of Buddhist thought, and the work remains influential in Buddhist studies.

• Hence, the correct answer is Nagasena.

Additional Information

• About Nagasena:

• Nagasena was a Buddhist monk and scholar who played a vital role in explaining and spreading Buddhist teachings during the post-Mauryan era.

• He was known for his sharp intellect and ability to explain complex philosophical concepts in simple terms.

• Menander I (Milinda):

• Menander I was an Indo-Greek king who ruled during the 2nd century BCE. His kingdom included parts of modern-day Afghanistan, Pakistan, and northern India.

• Menander I is remembered for his patronage of Buddhism. After his interactions with Nagasena, it is believed that he converted to Buddhism and became a great supporter of the religion.

• Features of Milind Panho:

• The text is written in the form of a dialogue, which was a common method of teaching and explaining philosophical ideas in ancient India.

• It includes discussions on topics such as the nature of self, karma, rebirth, and the path to enlightenment.

• The text also highlights the cultural and intellectual exchanges between the Indian and Greek civilizations.

Important Points

• Other Options Explained:

• Badarayana: He was an ancient Indian philosopher and the author of the Brahma Sutras, a foundational text of Vedanta philosophy. He was not related to the Milind Panho.

• Patanjali: He was the author of the Yoga Sutras, which form the basis of classical yoga philosophy. He is not connected to the Milind Panho.

• Kapila: He was an ancient Indian sage and the founder of the Samkhya school of philosophy. There is no connection between him and the Milind Panho.

• Significance of the Milind Panho:

• It serves as a historical document showcasing the interaction between Hellenistic and Indian cultures during the post-Mauryan period.

• The text is an important source for understanding Buddhist philosophy and its spread beyond India.

Q39. Answer: (a) 20 January 2025

The correct answer is 20 January 2025.

Key Points

• Donald Trump served as the 45th President of the United States from January 20, 2017, to January 20, 2021.

• The next presidential term after the 2024 US elections begins officially on January 20, 2025, as per the US Constitution. Hence, option 1 is correct.

• The date of January 20 for presidential inaugurations has been fixed since the adoption of the 20th Amendment to the US Constitution in 1933. This amendment moved the inauguration date from March 4 to January 20.

• Options like March 4, February 1, and January 6 are incorrect because they do not align with the stipulated inauguration date as per the 20th Amendment. Hence, these options are incorrect.

• Presidential inaugurations are held in Washington D.C., typically at the US Capitol, where the elected President takes the oath of office administered by the Chief Justice of the United States.

• Hence, the correct answer is Mon Jan 20 2025 00:00:00 GMT+0530 (India Standard Time).

Additional Information

• US Presidential Inauguration:

• The US Constitution mandates that a new President officially takes office on January 20 following the presidential election year.

• This date was established by the 20th Amendment to shorten the transition period between the election and the start of the new term.

• The inauguration typically involves the elected President taking the Oath of Office, delivering an inaugural address, and participating in celebratory events.

• 20th Amendment:

• Ratified in 1933, the 20th Amendment changed the presidential inauguration date from March 4 to January 20 to reduce the "lame-duck" period.

• It also specifies that if a President-elect dies before taking office, the Vice President-elect becomes President.

• Historical Context:

• Before the 20th Amendment, the long gap between the election and inauguration caused delays in addressing national issues.

• The amendment was passed to ensure the government could transition efficiently and promptly.

Important Points

• Key Legal Considerations:

• The Oath of Office is administered by the Chief Justice of the US Supreme Court. It is a key constitutional requirement for the President to officially take office.

• The inaugural ceremonies include speeches, parades, and formalities that symbolize the peaceful transfer of power.

• Historical Inauguration Dates:

• March 4: The original inauguration date set by the US Constitution before the 20th Amendment.

• January 20: The current inauguration date, ensuring a shorter transition period between election and office-taking.

Q40. Answer: (d) Chennai

The correct answer is Chennai.

Key Points

• Chennai is popularly known as the ‘Detroit of India’ due to its significant contribution to the automotive industry.

• It serves as a major hub for automobile manufacturing, hosting prominent companies such as Hyundai, BMW, Ford, and Ashok Leyland.

• The city is strategically located and benefits from excellent infrastructure, including proximity to ports, making it ideal for exporting vehicles. Hence, Chennai is a leading automotive hub.

• Chennai contributes significantly to the Indian economy through its automotive sector, with large-scale production of cars, buses, and trucks.

• The presence of both domestic and international manufacturers has established Chennai as a global player in the automobile industry. Thus, the statement in the question is correct.

Additional Information

• Why Chennai is called the ‘Detroit of India’:

• Chennai earned this title because of its extensive automobile manufacturing facilities. It is home to over one-third of India’s automobile industry.

• Major players such as Hyundai, BMW, Ford, and Ashok Leyland have set up manufacturing plants here, boosting the city's industrial growth.

• The city's geographical advantages, including proximity to ports and well-developed road networks, make it ideal for exporting vehicles.

• Other Automotive Hubs in India:

• Pune: Known for its automobile industry, Pune hosts manufacturers like Tata Motors and Bajaj Auto. However, it is not as dominant as Chennai.

• Sanand: A developing hub in Gujarat, Sanand is known for Tata Motors' Nano plant but does not match Chennai's scale.

• Gurugram: An emerging industrial hub near Delhi, Gurugram hosts companies like Maruti Suzuki but lacks the extensive automotive history of Chennai.

• Chennai’s Automotive Ecosystem:

• The city has a well-established supplier network, including manufacturers of automotive components, which supports the growth of car production facilities.

• Skilled workforce: Chennai benefits from a trained workforce and educational institutions that focus on engineering and manufacturing.

• Export hub: Chennai ports facilitate the export of vehicles, making it a significant contributor to India’s automobile exports.

Important Points

• Chennai’s Automotive Achievements:

• Chennai is responsible for manufacturing around 40% of India’s automobile exports, making it a key player in the global market.

• Hyundai Motor India: Hyundai's plant in Chennai is one of its largest outside South Korea, producing millions of vehicles annually.

• Comparison with Other Cities:

• While cities like Pune and Gurugram are important industrial hubs, Chennai’s scale of production and export capabilities surpass them.

• Sanand is still developing as an automotive hub and lacks the historical significance of Chennai.

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Q41. Answer: (d) Rs. 4,500

Shortcut Trick

Let the Marked Price be 100%. After allowing a 28% discount, the Selling Price = 100% − 28% = 72%.

We are given that 72% corresponds to Rs. 3,240.

1% corresponds to 3240 ÷ 72 = Rs. 45

Marked Price (100%) = 45 × 100 = Rs. 4,500

Therefore The correct answer is Rs. 4,500.

Alternate Method

Given:

Selling Price (SP) = Rs. 3,240

Discount Percentage = 28%

Formula Used:

Marked Price (MP) = (SP × 100) ÷ (100 − Discount%)

SP = 72%

Discount = 28%

Rs. 3,240

Marked Price = 100% = ?

Calculations:

=> MP = (3240 × 100) ÷ (100 − 28)

=> MP = 324000 ÷ 72

=> MP = 4500

Therefore The correct answer is Rs. 4,500.

Additional Information

Marked Price and Discount

Discount is always given on the Marked Price (MP) of an article. Selling Price (SP) is obtained after deducting the discount from the Marked Price.

Successive Discounts

If two successive discounts of x% and y% are allowed, then Equivalent Single Discount = x + y − (x × y) ÷ 100.

Profit/Loss Percentage

Unlike discount which acts on Marked Price, Profit or Loss is always calculated on the Cost Price (CP). Profit % = [(SP − CP) ÷ CP] × 100.

Q42. Answer: (d) M - N = -7

Shortcut Trick

For divisibility by 11, the difference between the sums of alternate digits must be 0 or a multiple of 11.

Sum of digits at odd places = N + 4 + 6 = N + 10

Sum of digits at even places = 8 + M + 9 = M + 17

Difference = (M + 17) − (N + 10) = M − N + 7

Equating the difference to 0 gives: M − N + 7 = 0 => M − N = −7

Therefore The correct answer is M − N = −7.

Alternate Method

Given:

The 6-digit number is N84M69.

The number is completely divisible by 11.

Concept Used:

A number is divisible by 11 if the difference of the alternating sum of its digits is exactly 0 or a multiple of 11 (such as 11, 22, -11).

Calculation:

=> Sum of digits at odd positions (from left) = N + 4 + 6 = N + 10

=> Sum of digits at even positions (from left) = 8 + M + 9 = M + 17

=> Difference between the two sums = (M + 17) − (N + 10)

=> Difference = M − N + 7

=> For the number to be divisible by 11, M − N + 7 = 0, 11, 22, etc.

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=> Case 1: M − N + 7 = 0 => M − N = −7

=> Case 2: M − N + 7 = 11 => M − N = 4

=> Checking the given options, the relation M − N = −7 is available as a valid relation.

Therefore The correct answer is M − N = −7.

Additional Information

Divisibility Rule of 3 and 9

A number is completely divisible by 3 or 9 if the sum of all its digits is divisible by 3 or 9, respectively.

Divisibility Rule of 4 and 8

A number is divisible by 4 if the number formed by its last two digits is divisible by 4. It is divisible by 8 if the number formed by its last three digits is divisible by 8.

Divisibility Rule of 7, 11 and 13

A large number is divisible by 7, 11, or 13 if the alternating difference of blocks of three digits starting from right to left is a multiple of 7, 11, or 13.

Q43. Answer: (b) 363/67hours

Shortcut Trick

Total work = LCM(12, 22, 8) = 264 units.

Combined efficiency = (264 ÷ 12) + (264 ÷ 22) + (264 ÷ 8) = 22 + 12 + 33 = 67 units/hour.

Time taken = Total work ÷ Combined efficiency = 264 ÷ 67 = 3 ^(63)/67 hours.

Therefore The correct answer is 3 ^(63)/67 hours.

Alternate Method

Given:

Time taken by Pipe A = 12 hours

Time taken by Pipe B = 22 hours

Time taken by Pipe C = 8 hours

Formula Used:

Total Work = Time × Efficiency

Pipe	Hours	Total Work	Efficiency
Pipe A	12	264	22
Pipe B	22	12	
Pipe C	8	33	

Calculations:

=> Total Efficiency of Pipe A, Pipe B and Pipe C = 22 + 12 + 33 = 67 units/hour.

=> Time taken by them together = Total Work ÷ Total Efficiency

=> Time taken = 264 ÷ 67 = 3 ^(63)/67 hours.

Therefore The correct answer is 3 ^(63)/67 hours.

Additional Information

Pipes and Cisterns Basics

If a pipe can fill a tank in 'x' hours, then the part of the tank filled in 1 hour is 1/x. The total work is simply considered as the LCM of all the individual times given.

Emptying Pipes

If an outlet pipe is connected that empties a full tank in 'y' hours, its efficiency is treated as a negative value. The part emptied in 1 hour becomes −1/y.

Combined Work Formula

If two filling pipes take 'a' and 'b' hours respectively to fill a tank separately, the total time taken to fill it together is calculated directly using (a × b) ÷ (a + b) hours.

Q44. Answer: (d) 18

Shortcut Trick

Relative speed of Train 1 and man = 220 ÷ 44 = 5 m/s = 18 km/hr.

Since they move in the same direction, Train 1 speed = 18 + 10 = 28 km/hr.

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For crossing Train 2 in opposite direction, Relative Speed = 28 + 79 = 107 km/hr = 107 × (5 / 18) m/s.
Time to cross = Total Length ÷ Relative Speed = (220 + 315) ÷ [107 × (5 / 18)].
Time = 535 × 18 ÷ 535 = 18 seconds.
Therefore The correct answer is 18 seconds.
Alternate Method
220 m
Speed: 28 km/hr →
315 m
← Speed: 79 km/hr
Opposite Direction: Relative Speeds Add Up
Total Distance = 220 + 315 = 535 m
Given:
Length of Train 1 (L1) = 220 m
Speed of man = 10 km/hr
Time taken to cross man = 44 seconds
Length of Train 2 (L2) = 315 m
Speed of Train 2 (V2) = 79 km/hr
Formula Used:
Distance = Speed × Time
km/hr to m/s conversion: multiply by 5/18
Relative speed (opposite direction) = V1 + V2
Calculations:
=> Relative speed of Train 1 and man = L1 ÷ Time
=> Relative speed = 220 ÷ 44 = 5 m/s
=> Converting to km/hr = 5 × (18 ÷ 5) = 18 km/hr
=> Since both are moving in the same direction, Relative Speed = V1 − Speed of man
=> V1 − 10 = 18
=> V1 = 28 km/hr
=> For crossing Train 2, Relative speed (opposite direction) = 28 + 79 = 107 km/hr
=> Relative speed in m/s = 107 × (5 ÷ 18) = 535 / 18 m/s
=> Total distance to be covered = L1 + L2 = 220 + 315 = 535 m
=> Time required = Total Distance ÷ Relative Speed
=> Time = 535 ÷ (535 ÷ 18)
=> Time = (535 × 18) ÷ 535 = 18 seconds
Therefore The correct answer is 18 seconds.
Additional Information
Relative Speed
When two bodies move in the same direction, relative speed = V1 − V2. In opposite directions, it is V1 + V2.
Crossing Objects
When a train crosses a stationary pole or moving man, the distance covered is just the length of the train. When crossing a platform or another train, the total distance is the sum of both lengths.
Speed Conversion
To convert km/hr to m/s, multiply the value by 5/18. To convert m/s to km/hr, multiply by 18/5.

Q45. Answer: (b) 16%

Shortcut Trick
Ratio of Amount to Principal = 24389 : 15625
For 3 years, calculate the cube root of the ratio to get the 1-year multiplying factor.
$\sqrt[3]{24389} : \sqrt[3]{15625} \rightarrow 29 : 25$
This means a principal of 25 amounts to 29 in 1 year, generating an interest of 4 units.
Rate % = (4 ÷ 25) × 100 = 16%
Therefore The correct answer is 16%.

Alternate Method

Principal

Rs. 15,625

Amount

Rs. 24,389

Time = 3 Years

Rate = ? p.a. (CI)

Given:

Principal (P) = Rs. 15,625

Amount (A) = Rs. 24,389

Time (n) = 3 years

Formula Used:

$A = P(1 + R \div 100)^n$

Where R is the rate of interest per annum.

Calculation:

$\Rightarrow 24389 = 15625(1 + R \div 100)^3$

$\Rightarrow 24389 \div 15625 = (1 + R \div 100)^3$

$\Rightarrow (29)^3 \div (25)^3 = (1 + R \div 100)^3$

$\Rightarrow (29 \div 25)^3 = (1 + R \div 100)^3$

Taking the cube root on both sides:

$\Rightarrow 29 \div 25 = 1 + R \div 100$

$\Rightarrow R \div 100 = (29 \div 25) - 1$

$\Rightarrow R \div 100 = 4 \div 25$

$\Rightarrow R = (4 \times 100) \div 25$

$\Rightarrow R = 16$

Therefore The correct answer is 16%.

Additional Information

Compound Interest Formula

The fundamental formula to calculate the amount in compound interest is $A = P(1 + R \div 100)^n$, where P is the Principal, R is the rate of interest, and n is the time period.

Multiplying Factor Method

For n years, the ratio of Amount to Principal is the n^(th) power of the 1-year multiplying factor. Taking the n^(th) root gives the 1-year principal-amount ratio, allowing direct calculation of the rate.

Simple Interest vs Compound Interest

In Simple Interest, the principal remains constant every year, resulting in equal interest amounts annually. In Compound Interest, the interest earned in each period is added to the principal to compute the interest for the next period.

Q46. Answer: (d) 434

Shortcut Trick

Apply the BODMAS rule directly to simplify the given expression.

$\Rightarrow 868 \div \{26 + 6 \times (3 - 7)\}$

$\Rightarrow 868 \div \{26 + 6 \times (-4)\}$

$\Rightarrow 868 \div \{26 - 24\}$

$\Rightarrow 868 \div 2 = 434$

Therefore The correct answer is 434.

Alternate Method

Given:

Expression: $868 \div \{26 + 6 \times (3 - 7)\}$

Concept Used:

BODMAS Rule: Brackets, Of, Division, Multiplication, Addition, Subtraction.

Calculations:

=> Step 1: Solve the innermost round brackets first.

=> (3 − 7) = −4

=> Expression becomes: 868 ÷ {26 + 6 × (−4)}

=> Step 2: Multiply the values inside the curly brackets.

=> 6 × (−4) = −24

=> Expression becomes: 868 ÷ {26 − 24}

=> Step 3: Perform addition/subtraction inside the curly brackets.

=> 26 − 24 = 2

=> Expression becomes: 868 ÷ 2

=> Step 4: Perform the final division.

=> 868 ÷ 2 = 434

Therefore The correct answer is 434.

Additional Information

BODMAS Priority

Mathematical equations are solved strictly in this sequence: Brackets → Of → Division → Multiplication → Addition → Subtraction.

Order of Brackets

When solving multiple nested brackets, always proceed from inside out: Line bracket → Round brackets () → Curly brackets { } → Square brackets [].

Sign Rules

Multiplying numbers with different signs yields a negative result: (+) × (−) = (−). Multiplying numbers with the same sign yields a positive result: (−) × (−) = (+).

Q47. Answer: (a) 17,360

Shortcut Trick

When Simple Interest and Time are equal for two investments, the principal ratio is inversely proportional to the rates.

Ratio of parts (P1 : P2) = R2 : R1 = 12 : 3 = 4 : 1

Total units = 4 + 1 = 5 units.

Since 5 units = Rs. 21,700, then 1 unit = Rs. 4,340.

Sum invested at 3% (P1) = 4 units = 4 × Rs. 4,340 = Rs. 17,360.

Therefore The correct answer is Rs. 17,360.

Alternate Method

Total Investment = Rs. 21,700

Part 1 (P1)

Rate = 3%, Time = 7 yr

Interest = SI1

Part 2 (P2)

Rate = 12%, Time = 7 yr

Interest = SI2

Condition: SI1 = SI2

Given:

Total Investment = Rs. 21,700

Rate 1 (R1) = 3% p.a., Rate 2 (R2) = 12% p.a.

Time (T) = 7 years for both parts

Formula Used:

SI = (P × R × T) ÷ 100

Calculations:

Let the amount invested at 3% be P1 and at 12% be P2.

=> P1 + P2 = 21700

Given that the simple interest earned from both investments after 7 years is equal:

=> (P1 × 3 × 7) ÷ 100 = (P2 × 12 × 7) ÷ 100

=> 21 × P1 = 84 × P2

=> P1 ÷ P2 = 84 ÷ 21 = 4 ÷ 1

=> Total ratio parts = 4 + 1 = 5 units

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=> 5 units = Rs. 21,700

=> 1 unit = 21700 ÷ 5 = 4340

=> Sum invested at 3% = 4 units

=> 4 units = 4 × 4340 = 17360

Therefore The correct answer is Rs. 17,360.

Additional Information

Equal Simple Interest Rule

If a certain sum is divided into multiple parts such that their simple interests are equal, the ratio of the divided principals is 1/(R1T1) : 1/(R2T2) : 1/(R3T3).

Equal Amount Rule

If a sum is divided into multiple parts such that the total amount (Principal + SI) from each part is equal, the principal ratio is 1/(100 + R1T1) : 1/(100 + R2T2).

Effective Simple Interest

The overall accumulated simple interest percentage over T years is simply R × T %. The total SI amount is calculated directly as (R × T)% of the Principal.

Q48. Answer: (b) 28

Shortcut Trick

The greatest number leaving the same remainder is the HCF of their absolute differences.

Differences = |183 − 127|, |211 − 127|, |211 − 183|

Differences = 56, 84, 28

Required Number = HCF(56, 84, 28) = 28

Therefore The correct answer is 28.

Alternate Method

Given:

The numbers are 183, 127, and 211.

Formula Used:

The greatest number that will divide x, y, and z leaving the same remainder in each case is given by the HCF of |x − y|, |y − z|, and |z − x|.

Calculations:

=> Difference 1 = |183 − 127| = 56

=> Difference 2 = |127 − 211| = 84

=> Difference 3 = |211 − 183| = 28

=> Now, we need to find the HCF of 56, 84, and 28.

=> Factors of 28 = 2 × 2 × 7

=> Factors of 56 = 2 × 2 × 2 × 7

=> Factors of 84 = 2 × 2 × 3 × 7

=> The common factors are 2, 2, and 7.

=> HCF = 2 × 2 × 7 = 28

Therefore The correct answer is 28.

Additional Information

Greatest number leaving specific remainders

The greatest number that divides x, y, and z leaving remainders a, b, and c respectively is the HCF of (x − a), (y − b), and (z − c).

Smallest number leaving the same remainder

The smallest number which when divided by x, y, and z leaves the same remainder r in each case is LCM(x, y, z) + r.

LCM and HCF Relation

For any two numbers A and B, the product of the numbers is equal to the product of their HCF and LCM: A × B = HCF × LCM.

Q49. Answer: (a) 1+ secA

Shortcut Trick

Let us assume an angle, say A = 60°.

Value of given expression = (sin 60° × tan 60°) / (1 − cos 60°)

=> [(√3 / 2) × √3] / (1 − 1/2) = (3/2) / (1/2) = 3

Checking the options, only Option 1 yields: 1 + sec 60° = 1 + 2 = 3.

Therefore The correct answer is 1 + sec A.

Alternate Method

Given:

(sin A × tan A) / (1 − cos A)

Formulas Used:

tan A = sin A / cos A

$\sin^2 A = 1 - \cos^2 A$

$a^2 - b^2 = (a - b)(a + b)$

Calculation:

=> [sin A × (sin A / cos A)] / (1 − cos A)

=> $(\sin^2 A / \cos A) / (1 - \cos A)$

=> $\sin^2 A / [\cos A \times (1 - \cos A)]$

Substituting $\sin^2 A = 1 - \cos^2 A$:

=> $(1 - \cos^2 A) / [\cos A \times (1 - \cos A)]$

=> [(1 − cos A)(1 + cos A)] / [cos A × (1 − cos A)]

=> (1 + cos A) / cos A

=> (1 / cos A) + (cos A / cos A)

=> sec A + 1

Therefore The correct answer is 1 + sec A.

Additional Information

Basic Trigonometric Identities

$\sin^2 A + \cos^2 A = 1$ | $\sec^2 A - \tan^2 A = 1$ | $\text{cosec}^2 A - \cot^2 A = 1$

Reciprocal Relations

sin A = 1 / cosec A | cos A = 1 / sec A | tan A = 1 / cot A

Value Substitution Method

When simplifying trigonometric expressions, assuming standard angles like 30°, 45°, or 60° helps eliminate incorrect options quickly. Always avoid angles that make the denominator zero (e.g., A = 0° in this case).

Q50. Answer: (a) 14

Shortcut Trick

For two consecutive natural numbers, their product is close to the square of either number.

√182 ≈ 13.49

The consecutive natural numbers closest to 13.49 are 13 and 14.

Since 13 × 14 = 182, the two numbers are indeed 13 and 14.

Therefore The correct answer is 14.

Alternate Method

Given:

The product of two consecutive natural numbers is 182.

Method Used:

Let the two consecutive natural numbers be x and (x + 1).

Calculations:

=> x(x + 1) = 182

=> $x^2 + x = 182$

=> $x^2 + x - 182 = 0$

=> $x^2 + 14x - 13x - 182 = 0$

=> x(x + 14) − 13(x + 14) = 0

=> (x − 13)(x + 14) = 0

=> x = 13 or x = −14

=> Since x must be a positive natural number, we reject −14 and take x = 13.

=> The two consecutive numbers are 13 and 13 + 1 = 14.

=> The greater number among the two is 14.

Therefore The correct answer is 14.

Additional Information

Natural Numbers

Counting numbers starting from 1 (1, 2, 3, ...). They do not include zero, fractions, decimals, or negative numbers.

Consecutive Numbers

Numbers that follow each other continuously from smallest to largest without any gaps (e.g., n, n+1, n+2).

Quadratic Equation

An equation of the form $ax^2 + bx + c = 0$. The roots can be found by factorisation or by using the quadratic formula $x = (-b \pm \sqrt{(b^2 - 4ac)}) \div 2a$.

Q51. Answer: (c) 49

Shortcut Trick

For two numbers a and b, the third proportional x is given by the direct formula: $x = b^2 \div a$.

Here, a = 25 and b = 35.

$x = (35 \times 35) \div 25$

$x = 1225 \div 25 = 49$

Therefore The correct answer is 49.

Alternate Method

Given:

First number (a) = 25

Second number (b) = 35

Let the third proportional be x.

Third Proportional Concept

25

:

35

::

35

:

x

Formula Used:

If three numbers a, b, and x are in continued proportion, then:

a : b :: b : x

=> a ÷ b = b ÷ x

Calculations:

=> 25 ÷ 35 = 35 ÷ x

=> 5 ÷ 7 = 35 ÷ x

=> 5 × x = 35 × 7

=> x = (35 × 7) ÷ 5

=> x = 7 × 7

=> x = 49

Therefore The correct answer is 49.

Additional Information

Third Proportional

For two numbers a and b, their third proportional c satisfies the condition a : b = b : c. The direct formula is $c = b^2 \div a$.

Mean Proportional

The mean proportional between two numbers a and b is given by $\sqrt{(a \times b)}$. It represents the middle term in a continued proportion.

Fourth Proportional

For three numbers a, b, and c, their fourth proportional d satisfies a : b = c : d. The direct formula is $d = (b \times c) \div a$.

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Q52. Answer: (b) 726

Shortcut Trick

The sides of the triangle are 33 cm, 44 cm, and 55 cm.

Ratio of sides = 33 : 44 : 55 = 3 : 4 : 5

Since the sides form a Pythagorean triplet, the triangle is right-angled.

Area of a right-angled triangle = 1/2 × Base × Perpendicular Height

Area = 1/2 × 33 × 44 = 33 × 22 = 726

Therefore The correct answer is 726 cm².

Alternate Method

33 cm

44 cm

55 cm

A

B

C

Given:

The sides of the triangle are a = 44 cm, b = 33 cm, and c = 55 cm.

Formula Used:

Heron's Formula for the area of a triangle = √(s(s − a)(s − b)(s − c))

Where semi-perimeter (s) = (a + b + c) ÷ 2

Calculations:

=> s = (44 + 33 + 55) ÷ 2

=> s = 132 ÷ 2 = 66 cm

=> Area = √(66 × (66 − 44) × (66 − 33) × (66 − 55))

=> Area = √(66 × 22 × 33 × 11)

=> Area = √(11 × 6 × 11 × 2 × 11 × 3 × 11)

=> Area = √(11^4 × 36)

=> Area = 11² × 6

=> Area = 121 × 6 = 726 cm²

Therefore The correct answer is 726 cm².

Additional Information

Heron's Formula

Used to find the area of a scalene triangle when all three sides are known: Area = √(s(s − a)(s − b)(s − c)).

Right-Angled Triangle Properties

A triangle is right-angled if the square of its largest side equals the sum of the squares of the other two sides (a² + b² = c²). The area is calculated as 1/2 × base × perpendicular height.

Common Pythagorean Triples

Sets of integers that satisfy the Pythagoras theorem. Common base forms include (3, 4, 5), (5, 12, 13), (8, 15, 17), and (7, 24, 25). Any constant multiple of these forms is also a Pythagorean triplet.

Q53. Answer: (c) 2231.25

Shortcut Trick

An increase of 60% means the new number is 160% of the original number.

Given, 160% of the number = 3570

Therefore, 100% of the number = (3570 ÷ 160) × 100

=> 100% = 22.3125 × 100 = 2231.25

Therefore The correct answer is 2231.25.

Alternate Method

Given:

A number when increased by 60% gives 3570.

Formula Used:

Final Value = Initial Value × (1 + Percentage Increase ÷ 100)

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Original Number (100%)

• 60% Increase

Total: 160% = 3570

? (To Find)

Calculations:

=> Let the original number be x.

=> x + (60% of x) = 3570

=> x × (1 + 60 ÷ 100) = 3570

=> x × (160 ÷ 100) = 3570

=> 1.6x = 3570

=> x = 3570 ÷ 1.6

=> x = 35700 ÷ 16

=> x = 2231.25

Therefore The correct answer is 2231.25.

Additional Information

Percentage Increase Formula

Final Value = Initial Value × (1 + Percentage Increase ÷ 100).

Base Change in Percentages

When a value is increased by R%, the new value becomes (100 + R)% of the original base value.

Fraction to Percentage Equivalents

Using fraction equivalents speeds up calculation. For example, 60% is equal to 3/5. Thus, an increase of 60% means the new value is 1 + 3/5 = 8/5 of the original.

Q54. Answer: (c) 3

Shortcut Trick

The numbers in the given range are: 306, 307, 308, 309, 310, 311, 312, 313.

Skip all even numbers and numbers ending in 5. This leaves only the odd numbers: 307, 309, 311, 313.

309 is a multiple of 3 (sum of digits 3 + 0 + 9 = 12), so it is not prime.

The remaining numbers 307, 311, and 313 are not divisible by any prime number up to 17 (since √313 ≈ 17.6), hence they are all prime.

The prime numbers are 307, 311, and 313, giving a total of 3 numbers.

Therefore The correct answer is 3 prime numbers.

Alternate Method

Given:

The range of numbers is from 306 to 313, both included.

Method Used:

To check if a number N is prime, we evaluate its divisibility by all prime numbers less than or equal to √N.

Calculations:

=> The given numbers are: 306, 307, 308, 309, 310, 311, 312, 313.

=> Eliminate the even numbers (306, 308, 310, 312) directly as they are divisible by 2.

=> The remaining odd numbers to check are: 307, 309, 311, 313.

=> 309 is not prime because the sum of its digits (3 + 0 + 9 = 12) is a multiple of 3.

=> For the rest, we test divisibility by primes up to 17 (since √313 ≈ 17.6). The test primes are 2, 3, 5, 7, 11, 13, and 17.

=> 307: Not divisible by 2, 3, 5, 7, 11, 13, or 17 → Prime.

=> 311: Not divisible by 2, 3, 5, 7, 11, 13, or 17 → Prime.

=> 313: Not divisible by 2, 3, 5, 7, 11, 13, or 17 → Prime.

=> The prime numbers identified are 307, 311, and 313.

=> Total count of prime numbers found in the range = 3.

Therefore The correct answer is 3 prime numbers.

Additional Information

Prime Number Test

To rapidly check if a large number N is prime, find its approximate square root √N. Test its divisibility using only the prime numbers

up to √N. If N is not divisible by any of them, it is a prime number.

Divisibility Rule of 3

A number is divisible by 3 if the sum of its digits is a multiple of 3. This is an essential check to eliminate non-primes quickly. For instance, 309 has a digit sum of 12, marking it as a composite number.

Twin Primes

Two prime numbers whose difference is exactly 2 are called twin primes (e.g., 11 and 13). In the given range, 311 and 313 form a continuous twin prime pair.

Q55. Answer: (d) Both stores A and B offer the same price

Shortcut Trick

The order of successive discounts does not change the final effective discount.

Effective discount for Store A = 15 + 10 − (15 × 10)/100 = 23.5%

Effective discount for Store B = 10 + 15 − (10 × 15)/100 = 23.5%

Since both stores offer the identical effective discount of 23.5%, the final price is the same.

Therefore The correct answer is Both stores A and B offer the same price.

Alternate Method

Given:

Marked Price of jacket = Rs. 12,000

Store A successive discounts = 15% and 10%

Store B successive discounts = 10% and 15%

Formula Used:

Selling Price = Marked Price × (100 − D1)/100 × (100 − D2)/100

Store A

Rs. 12,000

−15%

Rs. 10,200

−10%

Rs. 9,180

Store B

Rs. 12,000

−10%

Rs. 10,800

−15%

Rs. 9,180

Both stores offer identical final selling prices

Calculation:

For Store A:

=> Selling Price = 12000 × (100 − 15)/100 × (100 − 10)/100

=> SP_A = 12000 × 85/100 × 90/100

=> SP_A = 120 × 85 × 9/10 = 12 × 85 × 9 = Rs. 9,180

For Store B:

=> Selling Price = 12000 × (100 − 10)/100 × (100 − 15)/100

=> SP_B = 12000 × 90/100 × 85/100

=> SP_B = 120 × 90 × 85/100 = 12 × 9 × 85 = Rs. 9,180

=> SP_A = SP_B = Rs. 9,180

Therefore The correct answer is Both stores A and B offer the same price.

Additional Information

Commutative Property of Successive Discounts

The final selling price is independent of the order in which successive discounts are applied. Discounting by A% then B% is exactly equal to discounting by B% then A%.

Equivalent Discount Formula

For two successive discounts d1% and d2%, the single equivalent discount D is given by D = d1 + d2 − (d1 × d2)/100.

Marked Price vs Selling Price

Discount is always calculated on the Marked Price (MP). The formula connecting them is SP = MP × (100 − Discount%)/100.

Q56. Answer: (a) 13.69√3

Shortcut Trick

Side of the equilateral triangle = Perimeter ÷ 3 = 22.2 ÷ 3 = 7.4 cm

Area = (√3 ÷ 4) × (side)²

Area = (√3 ÷ 4) × 7.4 × 7.4 = 13.69√3 cm²

Therefore The correct answer is 13.69√3 cm².

Alternate Method

Given:

Perimeter of the equilateral triangle ABC = 22.2 cm

Formula Used:

Perimeter of an equilateral triangle = 3 × a

Area of an equilateral triangle = (√3 ÷ 4) × a²

where a is the side length.

A

B

C

a = 7.4 cm

a = 7.4 cm

a = 7.4 cm

Calculations:

=> 3 × a = 22.2

=> a = 22.2 ÷ 3 = 7.4 cm

=> Area = (√3 ÷ 4) × a²

=> Area = (√3 ÷ 4) × 7.4 × 7.4

=> Area = (√3 ÷ 4) × 54.76

=> Area = 13.69√3 cm²

Therefore The correct answer is 13.69√3 cm².

Additional Information

Equilateral Triangle Properties

All three sides and angles are equal, with each angle measuring exactly 60°.

Height of an Equilateral Triangle

The altitude h can be calculated directly using the side length with the formula h = (√3 ÷ 2) × a.

Inradius and Circumradius

The inradius r = a ÷ (2√3) and the circumradius R = a ÷ √3, providing the specific standard relation R = 2 × r.

Q57. Answer: (a) 76°

Shortcut Trick

In ΔABC, angle BCA = 180° − (74° + 54°) = 52°.

Since BC || AD, alternate interior angle angle CAD = angle BCA = 52°.

In ΔACD (where AC = CD), opposite angles are equal, so angle ADC = angle CAD = 52°.

angle ACD = 180° − (52° + 52°) = 76°.

Therefore The correct answer is 76°.

Alternate Method

74° 54° 52° 52° 52° ? A B C D

Given:

Trapezium ABCD where BC || AD.

Diagonal AC = CD.

angle ABC = 74° and angle BAC = 54°.

Formula Used:

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Sum of interior angles of a triangle = 180°.

Alternate interior angles between parallel lines are equal.

Angles opposite to equal sides of a triangle are equal.

Calculations:

=> In ΔABC, sum of angles = 180°

=> 74° + 54° + angle BCA = 180°

=> angle BCA = 180° − 128° = 52°

=> Since BC || AD, transversal AC creates equal alternate interior angles

=> angle CAD = angle BCA = 52°

=> In ΔACD, since AC = CD, the angles opposite to them are equal

=> angle ADC = angle CAD = 52°

=> Now, in ΔACD, sum of angles = 180°

=> angle ACD + angle CAD + angle ADC = 180°

=> angle ACD + 52° + 52° = 180°

=> angle ACD = 180° − 104° = 76°

Therefore The correct answer is 76°.

Additional Information

Properties of a Trapezium

A quadrilateral with at least one pair of parallel sides. The sum of consecutive interior angles along the non-parallel sides is exactly 180°.

Alternate Interior Angles Theorem

When a transversal line intersects two parallel lines, the alternate interior angles formed are equal. In geometric figures, a diagonal typically acts as a transversal line between the parallel bases.

Isosceles Triangle Property

In any given triangle, the angles opposite to the equal sides are also equal in measure. Identifying equal sides accurately helps in deducing the missing symmetric angles seamlessly.

Q58. Answer: (a) 12

Shortcut Trick

Mary's age is 3 more than twice Diya's age.

So, 3 times Mary's age will be 9 more than 6 times Diya's age.

We are given that 3 times Mary's age is 18 more than 5 times Diya's age.

Equating both: 6 times Diya + 9 = 5 times Diya + 18 => Diya = 9 years.

Mary's age = 2 × 9 + 3 = 21 years, making the difference 21 − 9 = 12.

Therefore The correct answer is 12 years.

Alternate Method

Given:

3 times Mary's age is 18 more than 5 times Diya's age.

2 times Diya's age is 3 less than Mary's age.

Formula Used:

Linear equations in two variables: ax + by = c

Mary

21 years

Diya

9 years

Difference = 12

Calculations:

Let Mary's present age be M and Diya's present age be D.

=> From the first condition: 3M = 5D + 18 --- (Equation 1)

=> From the second condition: 2D = M − 3

=> Rewriting this, we get: M = 2D + 3 --- (Equation 2)

=> Substitute the value of M from Equation 2 into Equation 1:

=> 3 × (2D + 3) = 5D + 18

=> 6D + 9 = 5D + 18

=> 6D − 5D = 18 − 9

=> D = 9 years

=> Substitute D = 9 into Equation 2 to find Mary's age:

=> M = 2 × 9 + 3

=> M = 18 + 3 = 21 years

=> Now, calculate the difference between their ages:

=> Difference = M − D = 21 − 9 = 12 years

Therefore The correct answer is 12 years.

Additional Information

Linear Equations in Two Variables

Used to model problems with two unknown quantities. They are typically structured as ax + by = c and can be solved algebraically using substitution or elimination methods.

Ratio of Ages

If the ratio of the present ages of two individuals A and B is given as x:y, their respective ages can be assumed as kx and ky, where k acts as a common constant multiplier.

Past and Future Ages

When formulating age equations, if an individual's present age is x, their age 'n' years ago was (x − n) and their future age 'n' years hence will be (x + n).

Q59. Answer: (c) -3

Shortcut Trick

Divide the entire equation by 5 to simplify calculations directly.

=> $(5x^2 - 6) - (5x^2 + 2x - 4) = 4$

Notice that the $5x^2$ terms perfectly cancel each other out.

=> $-6 - 2x + 4 = 4$

=> $-2x - 2 = 4$ => $-2x = 6$ => $x = -3$

Therefore The correct answer is -3.

Alternate Method

Given:

$5(5x^2 - 6) - 5(5x^2 + 2x - 4) = 20$

Calculation:

Expand the brackets by multiplying 5 with each term:

=> $(25x^2 - 30) - (25x^2 + 10x - 20) = 20$

Carefully apply the negative sign to every term inside the second bracket:

=> $25x^2 - 30 - 25x^2 - 10x + 20 = 20$

Cancel out the $25x^2$ terms:

=> $-10x - 10 = 20$

=> $-10x = 30$

=> $x = 30 \div (-10)$

=> $x = -3$

Therefore The correct answer is -3.

Additional Information

BODMAS Rule

Always follow the order of Brackets, Orders, Division, Multiplication, Addition, and Subtraction. When opening brackets with a negative sign outside, you must invert the sign of every single term inside.

Linear Equations

Even if an equation initially contains quadratic terms (x^2), they may cancel out to form a simple linear equation of the form ax + b = 0, which always has a single solution given by x = −b/a.

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Q60. Answer: (c) 43

Shortcut Trick

Weight of Ketan = (Sum of Mandar and Ketan) + (Sum of Ketan and Tushar) − (Sum of all three)

Weight of Ketan = (44 × 2) + (45 × 2) − (45 × 3)

Weight of Ketan = 88 + 90 − 135

Weight of Ketan = 178 − 135 = 43 kg

Therefore The correct answer is 43 kg.

Alternate Method

Given:

Average weight of Mandar, Ketan, and Tushar = 45 kg

Average weight of Mandar and Ketan = 44 kg

Average weight of Ketan and Tushar = 45 kg

Formula Used:

Total sum = Average × Number of observations

M + K + T = 135 kg

Mandar (M)

Ketan (K)

Tushar (T)

M + K = 88 kg

K + T = 90 kg

Calculations:

Let the weights of Mandar, Ketan, and Tushar be M, K, and T respectively.

=> Total weight of all three (M + K + T) = 45 × 3 = 135 kg ... (Equation 1)

=> Total weight of Mandar and Ketan (M + K) = 44 × 2 = 88 kg ... (Equation 2)

=> Total weight of Ketan and Tushar (K + T) = 45 × 2 = 90 kg ... (Equation 3)

=> Adding Equation 2 and Equation 3:

=> (M + K) + (K + T) = 88 + 90

=> M + 2K + T = 178 kg

=> Rearranging the terms: (M + K + T) + K = 178 kg

=> Substituting the value from Equation 1:

=> 135 + K = 178

=> K = 178 − 135 = 43 kg

Therefore The correct answer is 43 kg.

Additional Information

1. Weighted Average

If group 1 has n1 items with average A1 and group 2 has n2 items with average A2, the combined average is given by: (n1 × A1 + n2 × A2) ÷ (n1 + n2).

2. Net Deviation Method

The sum of deviations of all individual values from their exact average is always zero. This method is highly useful for finding missing terms by balancing the positive and negative deviations from an assumed average.

3. Change in Average

If the same value 'x' is added, subtracted, multiplied, or divided from all observations, the new average also gets added, subtracted, multiplied, or divided by 'x' respectively.

Q61. Answer: (d) 228

Shortcut Trick

Convert both to a single item unit for direct comparison:

Cost Price (CP) of 1 sharpener = 150 ÷ 12 = Rs. 12.5

Selling Price (SP) of 1 sharpener = Rs. 41

Profit % = ((SP − CP) ÷ CP) × 100

=> ((41 − 12.5) ÷ 12.5) × 100 = (28.5 ÷ 12.5) × 100 = 228%

Therefore The correct answer is 228%.

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Alternate Method

Given:

Total CP of 1 dozen (12 sharpeners) = Rs. 150

SP of 1 sharpener = Rs. 41

Formula Used:

Total Profit = Total SP − Total CP

Profit % = (Total Profit ÷ Total CP) × 100

Total CP

Rs. 150

Total SP

Rs. 492

Profit = Rs. 342

• 228%

Calculations:

=> Total SP for 1 dozen = 41 × 12 = Rs. 492

=> Total Profit = 492 − 150 = Rs. 342

=> Profit % = (342 ÷ 150) × 100

=> Profit % = 34.2 ÷ 15 × 100 = 2.28 × 100 = 228%

Therefore The correct answer is 228%.

Additional Information

Profit and Loss Basics

Profit occurs when Selling Price (SP) > Cost Price (CP). Profit % is always calculated on the CP unless explicitly stated otherwise: Profit % = (Profit ÷ CP) × 100.

Marked Price and Discount

Discount is a reduction offered on the Marked Price (MP) of an article. Selling Price = MP − Discount. Discount % = (Discount ÷ MP) × 100.

Dishonest Dealer

When a dealer uses a false weight, the actual CP corresponds to the false weight given, while SP corresponds to the claimed weight. Profit % = (True Weight − False Weight) ÷ False Weight × 100.

Q62. Answer: (b) 14

Shortcut Trick

The mode is simply the value that appears most frequently in the given dataset.

Given data: 18, 13, 14, 14, 19, 14, 17, 17, 14, 20

By quick observation, the number 14 is repeated the most (4 times).

Therefore The correct answer is 14 marks.

Alternate Method

Given:

Marks scored by 10 students: 18, 13, 14, 14, 19, 14, 17, 17, 14, 20

Concept Used:

Mode = The observation with the highest frequency in a data set

Calculations:

=> Let us sort the data and list the frequencies of each unique score.

=> Frequency of 13 marks = 1

=> Frequency of 14 marks = 4

=> Frequency of 17 marks = 2

=> Frequency of 18 marks = 1

=> Frequency of 19 marks = 1

=> Frequency of 20 marks = 1

=> The mark 14 has the highest frequency (4).

Therefore The correct answer is 14 marks.

Additional Information

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Mean

Mean is the average of a dataset, calculated as the sum of all observations divided by the total number of observations.

Median

Median is the middle value of an ordered dataset. For an even number of data points, it is the average of the two central values.

Empirical Relationship

For moderately skewed distributions, the measures of central tendency are related by the formula: Mode ≈ 3 × Median − 2 × Mean.

Bimodal Distribution

If two distinct values in a dataset share the highest frequency, the dataset is said to have two modes and is called bimodal.

Q63. Answer: (c) 55^(-38)

Shortcut Trick

By the laws of exponents, for the same base, subtract exponents for division and add for multiplication from left to right.

Expression: 55^(−13) ÷ 55^(14) × 55^(−11)

=> 55^(−13 − 14 + (−11))

=> 55^(−38)

Therefore The correct answer is 55^(−38).

Alternate Method

Given:

55^(−13) ÷ 55^(14) × 55^(−11)

Formula Used:

a^m ÷ aⁿ = a^(m−n)

a^m × aⁿ = a^(m+n)

Calculations:

=> According to the BODMAS rule, continuous division and multiplication should be solved from left to right.

=> First, evaluate the division part: 55^(−13) ÷ 55^(14)

=> 55^(−13 − 14)

=> 55^(−27)

=> Next, multiply the above result by the remaining term: 55^(−27) × 55^(−11)

=> 55^(−27 + (−11))

=> 55^(−27 − 11)

=> 55^(−38)

Therefore The correct answer is 55^(−38).

Additional Information

Product Rule of Exponents

When multiplying terms with the same base, add their exponents together: a^m × aⁿ = a^(m+n).

Quotient Rule of Exponents

When dividing terms with the same base, subtract the exponent of the denominator from the numerator's exponent: a^m ÷ aⁿ = a^(m−n).

Power of a Power Rule

When a base raised to a power is raised to another power, multiply the exponents: (a^m)ⁿ = a^(m×n).

Negative Exponents

A negative exponent signifies that the base is on the wrong side of a fraction line, so a^(−n) is equivalent to 1 ÷ aⁿ.

Q64. Answer: (c) 16.1%

Shortcut Trick

Selling at 6/15 (or 40%) of Actual SP gives a 14% loss (which is 86% of CP).

=> 40% of Actual SP = 86% of CP

=> 1% of Actual SP = 2.15% of CP

=> 54% of Actual SP = 54 × 2.15% of CP = 116.1% of CP

=> Profit = 116.1% − 100% = 16.1%

Therefore The correct answer is 16.1%.

Alternate Method

Initial SP

86

Cost Price

100

New SP

116.1

Actual SP

215

−14% (Loss)

+16.1% (Profit)

54% of 215

Given:

Selling price is 6/15 of the Actual SP and loss is 14%.

New Selling Price is 54% of the Actual SP.

Calculation:

=> Let the Cost Price (CP) of the article be 100.

=> At a 14% loss, Initial Selling Price = 100 − 14 = 86

=> Initial SP = 6/15 × Actual SP

=> 86 = 2/5 × Actual SP

=> Actual SP = 86 × 5 ÷ 2 = 215

=> New Selling Price = 54% of Actual SP

=> New SP = (54 ÷ 100) × 215 = 116.1

=> Profit % = New SP − CP

=> Profit % = 116.1 − 100 = 16.1%

Therefore The correct answer is 16.1%.

Additional Information

Profit and Loss Basics

Profit or loss is always calculated on the Cost Price (CP) unless stated otherwise. Profit % = (Profit ÷ CP) × 100 and Loss % = (Loss ÷ CP) × 100.

Marked Price and Discount

Discount is always offered on the Marked Price (MP). The Selling Price (SP) after a discount is calculated as SP = MP × (100 − Discount %) ÷ 100.

Relationship between CP, SP and MP

A direct relationship combining profit and discount is: CP × (100 + Profit %) = MP × (100 − Discount %).

Q65. Answer: (a) 3

Shortcut Trick

By the divisibility rule of 3, a number is divisible by 3 if the sum of its digits is a multiple of 3.

Sum of digits of 3,27,087 = 3 + 2 + 7 + 0 + 8 + 7 = 27.

Since 27 is perfectly divisible by 3, the entire number is also divisible by 3.

Therefore The correct answer is 3.

Alternate Method

Given:

The number to be checked is 3,27,087.

Method Used:

We apply standard divisibility rules for each given option to find the exact divisor.

Calculations:

=> For 12: A number must be divisible by both 3 and 4. The last two digits (87) are odd and not divisible by 4. So, it is not divisible by 12.

=> For 8: Any number divisible by 8 must be an even number. Since 3,27,087 ends in 7, it is odd and cannot be divisible by 8.

=> For 5: A number is divisible by 5 only if its last digit is 0 or 5. Here, the last digit is 7, so it is not divisible by 5.

=> For 3: The sum of the digits = 3 + 2 + 7 + 0 + 8 + 7 = 27.

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=> As 27 is divisible by 3, the given number 3,27,087 is perfectly divisible by 3.

Therefore The correct answer is 3.

Additional Information

Divisibility Rule of 4 and 8

A number is divisible by 4 if its last two digits form a number divisible by 4. It is divisible by 8 if its last three digits form a number divisible by 8.

Divisibility Rule of 9

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

Divisibility Rule of 11

A number is divisible by 11 if the difference between the sum of digits at odd positions and the sum of digits at even positions is either 0 or perfectly divisible by 11.

Q66. Answer: (c) 8 days

Shortcut Trick

Equating total work: M1 × D1 = M2 × D2

=> 4M × 18 = 9W × 8 => 72M = 72W => M/W = 1/1

=> Total work = 4 × 1 × 18 = 72 units

=> Time required for (3W + 6M) = Total Work ÷ Combined Efficiency

=> Time = 72 ÷ (3 × 1 + 6 × 1) = 72 ÷ 9 = 8 days

Therefore The correct answer is 8 days.

Alternate Method

Given:

4 men complete a piece of work in 18 days.

9 women complete it in 8 days.

Formula Used:

Total Work = LCM of time taken

Efficiency = Total Work ÷ Time

Person	Days	Total Work	Efficiency
4 Men	18	72	72 ÷ 18 = 4
9 Women	8	72 ÷ 8 = 9	

=> Efficiency of 4 Men = 4 units/day

=> Efficiency of 1 Man = 4 ÷ 4 = 1 unit/day

=> Efficiency of 9 Women = 9 units/day

=> Efficiency of 1 Woman = 9 ÷ 9 = 1 unit/day

=> Total Efficiency of 3 Women and 6 Men = (3 × 1) + (6 × 1) = 3 + 6 = 9 units/day

=> Time required = Total Work ÷ Combined Efficiency

=> Time required = 72 ÷ 9 = 8 days

Therefore The correct answer is 8 days.

Additional Information

Chain Rule (MDH Concept)

M1 × D1 × H1 ÷ W1 = M2 × D2 × H2 ÷ W2, where M = Men, D = Days, H = Hours, and W = Work.

Efficiency vs Time Relation

Efficiency is inversely proportional to the time taken to complete a given task. If the ratio of time taken by A and B is a:b, their efficiency ratio is b:a.

Work and Wages

Wages are always distributed in the proportion of the amount of work done. If the number of days worked is the same, wages are distributed in the ratio of their efficiencies.

Q67. Answer: (d) 1.64 km

Shortcut Trick

Directly convert the given time into hours and multiply by the speed to find the distance.

Distance = Speed × Time

Distance = 41 × (2.4 ÷ 60)
Distance = 41 × 0.04 = 1.64 km
Therefore The correct answer is 1.64 km.
Alternate Method
Given:
Speed of the car = 41 km/hr
Time taken to cross the bridge = 2.4 minutes
Formula Used:
Distance = Speed × Time
Distance = Length of Bridge
Speed = 41 km/hr | Time = 2.4 min
Calculations:
=> Convert the given time from minutes to hours to match the unit of speed.
=> Time in hours = 2.4 ÷ 60
=> Time = 24 ÷ 600 = 0.04 hours
=> Now apply the formula to find the distance:
=> Distance = 41 × 0.04
=> Distance = 1.64 km
Therefore The correct answer is 1.64 km.
Additional Information
Unit Conversions
To convert speed from km/hr to m/s, multiply the value by 5 ÷ 18. To convert from m/s to km/hr, multiply by 18 ÷ 5.
Average Speed
If equal distances are covered at two different speeds x and y, the Average Speed over the whole journey is (2 × x × y) ÷ (x + y).
Relative Speed
For two objects moving in opposite directions at speeds S1 and S2, Relative Speed = S1 + S2. If moving in the same direction, Relative Speed = S1 − S2.

Q68. Answer: (b) 1,96,980

Shortcut Trick
Total ratio parts = 14 + 10 + 16 = 40 units.
Difference between largest and smallest ratio parts = 16 − 10 = 6 units.
Total profit = (Total parts ÷ Difference in parts) × Value of difference
=> Total profit = (40 ÷ 6) × 29547 = (20 ÷ 3) × 29547 = 20 × 9849 = Rs. 1,96,980
Therefore The correct answer is Rs. 1,96,980.
Alternate Method
Given:
Profit ratio of the three partners = 14 : 10 : 16
Difference between the smallest and largest shares = Rs. 29,547
Partner A
14x
Partner B
10x
Partner C
16x
Diff = 6x
(= Rs. 29,547)
Calculation:
=> Let the shares of the three partners be 14x, 10x, and 16x respectively.
=> Smallest share = 10x
=> Largest share = 16x
=> Difference between largest and smallest share = 16x − 10x = 6x

=> According to the question, 6x = 29547

=> x = 29547 ÷ 6 = 4924.5

=> Total profit of the company = 14x + 10x + 16x = 40x

=> Total profit = 40 × 4924.5

=> Total profit = 196980

Therefore The correct answer is Rs. 1,96,980.

Additional Information

Partnership Ratios

When specific time periods or initial investments are not provided separately, the profit is directly distributed based on the given consolidated ratio.

Unitary Method in Ratios

When given a real-world absolute difference corresponding to a ratio gap, you can find the value of 1 ratio unit by directly dividing the actual difference by the difference in ratio parts.

Q69. Answer: (a) 1,075

Shortcut Trick

Let the total monthly salary be 100%.

Net percentage of salary saved = (100% − 30%) × (100% − 20%)

=> Savings % = 70% × 80% = 56%

Given, 56% of Salary = Rs. 602

=> Total Salary = (602 ÷ 56) × 100 = 10.75 × 100 = 1075

Therefore The correct answer is Rs. 1075.

Alternate Method

Given:

Amount paid towards debt = 30% of monthly salary

Amount spent = 20% of the remaining salary

Final savings = Rs. 602

Salary = 100x

Debt Repayment

30x

Remaining

70x

Spend (20% of 70x)

14x

Savings (80%)

56x = Rs. 602

Calculations:

Let the total monthly salary of the man be x.

=> Amount left after paying debt = x − 0.30x = 0.70x

He spends 20% of the remaining amount, which implies he saves exactly 80% of the remaining amount.

=> Savings = 80% of 0.70x

=> Savings = 0.80 × 0.70x = 0.56x

It is given that his savings are Rs. 602.

=> 0.56x = 602

=> x = 602 ÷ 0.56

=> x = 60200 ÷ 56

=> x = Rs. 1075

Therefore The correct answer is Rs. 1075.

Additional Information

Income and Expenditure Relationship

The total income of a person is always equal to the sum of their total expenditure and total savings (Income = Expenditure + Savings).

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Successive Percentage Changes

When successive deductions are made on a sequence of remaining values, the final value can be calculated directly by multiplying the respective multiplying factors together: Final Value = Base Value × (1 − P1/100) × (1 − P2/100).

Importance of Base in Percentage

Notice that "20% of the remaining" is mathematically completely different from "20% of the total". Always identify the correct reference base before multiplying the percentage value.

Q70. Answer: (b) Rs. 76,800

Shortcut Trick

Total Profit = Rs. 1,494 | Profit Difference = Rs. 498

Profit Ratio (M : N) = (1494 + 498) : (1494 − 498) = 1992 : 996 = 2 : 1

Capital Ratio = (Profit Ratio) ÷ Time = (2 ÷ 3) : (1 ÷ 4) = 8 : 3

Difference in Capital parts = 8 − 3 = 5 parts = Rs. 48,000

=> 1 part = Rs. 9,600 => M's Capital (8 parts) = 8 × 9,600 = Rs. 76,800

Therefore The correct answer is Rs. 76,800.

Alternate Method

Given:

Total profit = Rs. 1,494

Difference in profit (M − N) = Rs. 498

M's investment time = 3 months, N's investment time = 4 months

Formula Used:

Profit = Capital × Time => Capital = Profit ÷ Time

M's Capital

N's Capital

8 parts

3 parts

5 parts = Rs. 48,000

M's Investment = 8 × 9600 = Rs. 76,800

Calculation:

Let M's profit be P_M and N's profit be P_N.

=> P_M + P_N = 1494

=> P_M − P_N = 498

Adding both equations:

=> 2 × P_M = 1992 => P_M = 996

=> P_N = 1494 − 996 = 498

=> Profit Ratio (M : N) = 996 : 498 = 2 : 1

Now, finding the ratio of their investments (Capital):

=> Capital Ratio (M : N) = (P_M ÷ T_M) : (P_N ÷ T_N)

=> Capital Ratio = (2 ÷ 3) : (1 ÷ 4) = 8 : 3

Let M's capital be 8x and N's capital be 3x.

Given, M invested Rs. 48,000 more than N:

=> 8x − 3x = 48,000

=> 5x = 48,000 => x = 9,600

=> M's Capital = 8x = 8 × 9,600 = 76,800

Therefore The correct answer is Rs. 76,800.

Additional Information

Compound Partnership

When investments are for different time periods, equivalent capitals are calculated for a unit of time. Profit ratio = (Capital1 × Time1) : (Capital2 × Time2).

Active and Sleeping Partners

An active partner manages the business and receives a fixed salary or a percentage of the total profit for management before the remaining profit is divided in the ratio of their investments.

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Simple Partnership

When investments of all partners are for the same period of time, the profit or loss is distributed purely in the ratio of their original initial investments.

Q71. Answer: (a) L

Given: Seven people, I, J, K, L, U, V and W are sitting in a row, facing north.

1) No one sits to the left of V.

2) Only four people sit between V and I.

3) Only three people sit to the right of K. J sits to the immediate left of W.

4) L is not an immediate neighbour of K.

5) N is not an immediate neighbour of O.

So, L sits at the rightmost end of the line.

Hence, the correct answer is "Option 1".

Q72. Answer: (d) Three

Given: (Left) 7 1 $ % 3 $ % 8 < 7 8 1 8 # < 7 @ * 5 5 + (Right)

Now,

Numbers which is immediately preceded by a symbol and also immediately followed by a symbol.

So, Needed pattern is: Symbol - Number- Symbol.

There are Three Numbers which is immediately preceded by a symbol and also immediately followed by a symbol.

Hence, the correct answer is 'Option 4'.

Q73. Answer: (b) 60

Given:

Kabir 's rank from the top = 27th

Kabir 's rank from the bottom = 34th

Total students = Rank from top + Rank from bottom − 1

Total Students = 27 + 34 − 1 = 60

So, there are 60 students in Kabir’s class.

Hence, the correct answer is "Option 2".

Q74. Answer: (b) 5

The logic followed here is:

MORE is coded as 1432

MOVE is coded as 3254

Common Letters: M, O, E

Common Digits: The digits 1, 2, 3, 4 appear in both codes.

Since, V is in MOVE and is the third letter, and the code 5 is unique to that code sequence, the code for V is 5.

Hence, the correct answer is 'Option 2'.

Q75. Answer: (d) Both conclusions (I) and (II) follow.

Given Statements:

All kiwis are bananas.

All bananas are grapes.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) All kiwis are grapes:

From Statement 1, we know that all kiwis are bananas.

From Statement 2, we know that all bananas are grapes.

Therefore, if all kiwis are bananas, and all bananas are grapes, then all kiwis must be grapes.

Conclusion (I) logically follows.

(II) Some grapes are bananas:

Statement 2 tells us that all bananas are grapes, which means that bananas are a subset of grapes.

Since there are bananas that are also grapes, it follows that some grapes are bananas.

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Conclusion (II) logically follows.
Thus, Both conclusions (I) and (II) follow.
Hence, the correct answer is "Option 4".

Q76. Answer: (a) Two

Given: Seven people, I, J, K, L, M, N and O are sitting in a row, facing north.
1) Only two people sit between J and I.
2) Only M sits to the right of K.
3) Only one person sits between I and K.
4) O sits at some place to the right of L but at some place to the left of N.
So, 2 people sit between N and L.
Hence, the correct answer is "Option 1".

Q77. Answer: (d) Son's wife's father

Family Chart:
It means:
B is the father of O.
O is the wife of A.
A is the brother of T.
T is the daughter of S.
So, B is the 'Son's wife's father' of S.
Hence, the correct answer is "Option 4".

Q78. Answer: (b) 594

Calculation:
Logic: Approximate values are taken.
$\sqrt[3]{63.998}$ + 5/4 of 120.01% of 399.89 – (29.99 ÷ 3.01)
Applying approximation concept,
=> $\sqrt[3]{64}$ + 5/4 of 120% of 400 – (30 ÷ 3)
=> 4 + 5/4 × 120/100 × 400 - 10
=> 4 + 600 - 10
=> 604 - 10 = 594
Hence, the correct answer is 'Option 2'.

Q79. Answer: (d) QTRT

The logic followed here is:
For, XAYA is related to BECE
For, GJHJ is related to KNLN
Similarly, for MPNP
So, MPNP will be related to QTRT.
Hence, the correct answer is "Option 4".

Q80. Answer: (a) 1 km to the south

Given:
Mr. Tim starts from point A and drives 9 km towards the west.
He then takes a left turn, drives 3 km, turns right and drives 11 km.
He then takes a right turn and drives 4 km.
He takes a final right turn, drives 20 km and stops at Point P.
So, He should drive 1 km to the south in order to reach Point A again.
Hence, the correct answer is "Option 1".

Q81. Answer: (a) 5

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

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Symbols which is immediately preceded by a number and also immediately followed by another number.
So, Needed pattern is: Number - Symbol - Number.
There are 5 Symbols which is immediately preceded by a number and also immediately followed by another number.
Hence, the correct answer is 'Option 1'.

Q82. Answer: (a) 118

The logic followed here is:
thus, "118" will replace the question mark in the given series.
Hence, the correct option is "Option 1".

Q83. Answer: (d) 25

BODMAS Table:
Given equation: 13 − 2 × 75 + 3 ÷ 24 = ?
Now, if '+' and '-' and '×' and '÷' are interchanged, then:
=> 13 × 2 − 75 ÷ 3 + 24 = ?
=> 26 − 25 + 24 = ?
=> 26 − 25 + 24= 1 + 24 = 25
Hence, the correct answer is "Option 4".

Q84. Answer: (b) 47

BODMAS Table:
Given equation: 8 + 5 ÷ 40 − 4 × 17 = ?
Now, if '+' and '-' and '×' and '÷' are interchanged, then:
=> 8 × 5 − 40 ÷ 4 + 17 = ?
=> 40 − 10 + 17 = ?
=> 40 − 10 + 17= 30 + 17 = 47
Hence, the correct answer is "Option 2".

Q85. Answer: (d) 41 km towards south

Given:
Mohit starts from Point Y and drives 35 km towards north.
He then takes a right turn, drives 83 km, turns right and drives 49 km.
He then takes a right turn and drives 36 km. He takes a right turn, drives 76 km.
He then turns left, drives 47 km, turns left again, drives 21 km and stops at Point Z.
So, He should drive 41 km towards south in order to reach Point Y again.
Hence, the correct answer is "Option 4".

Q86. Answer: (d) JA-DG

The logic followed here is:
Option 1) NE-HL
Option 2) PG-JN
Option 3) LC-FJ
Option 4) JA-DG
Here, 'JA-DG' is odd among the given options.
Hence, the correct answer is "Option 4".

Q87. Answer: (a) Three

Given: Seven boxes D, E, F, G, H, I and X are kept one over the other but not necessarily in the same order.
1) Only F is kept above I.
2) Only X is kept between I and E.
3) Only H is kept below G.

D
F

I
X
E
G
H

So, there are 'Three' boxes are kept between D and F.
Hence, the correct answer is "Option 1".

Q88. Answer: (b) CEGH

The logic followed here is:
For, VXZA is related to WYAB
For, YACD is related to ZBDE
Similarly, for BDFG
So, BDFG will be related to CEGH.
Hence, the correct answer is "Option 2".

Q89. Answer: (c) jb

Given:
"the glass broke" → code: "al tk jb"
"answer the question" → code: "mo jb tu"
Common code in both phrases is jb, so the = jb.
Hence, the correct answer is 'Option 3'.

Q90. Answer: (a) IFYS

The logic followed here is:
For, URKE is related to ZWPJ
For, OLEY is related to TQJD
Similarly, for DATN
So, DATN will be related to IFYS.
Hence, the correct answer is "Option 1".

Q91. Answer: (b) 34

The logic followed here is:
thus, "34" will replace the question mark in the given series.
Hence, the correct option is "Option 2".

Q92. Answer: (b) 48

Given numbers: 95423671
If 1 is subtracted from each odd digit of the number, we get
New number formed: 8 4 4 2 2 6 6 0
Odd digits: 9, 5, 3, 7, 1
Digits repeated more than once: 4, 2, 6
Their product = 4 × 2 × 6 = 48.
Hence, the correct answer is 'Option 2'.

Q93. Answer: (a) MPO

The logic followed here is:
Option 1) MPO
Option 2) YBZ
Option 3) ORP
Option 4) EHF
Here, 'MPO' is odd among the given options.

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Hence, the correct answer is "Option 1".

Q94. Answer: (a) MPO

The logic followed here is:
Option 1) MPO
Option 2) YBZ
Option 3) ORP
Option 4) EHF
Here, 'MPO' is odd among the given options.
Hence, the correct answer is "Option 1".

Q95. Answer: (c) 124th

The logic followed here is:
Total students = 151
Mr. Into is 12th from the right.
So, his position from the left:
Position of Into from left = 151 − 12 + 1 = 140
Mr. Toni is 16th to the left of Mr. Into:
Position of Toni = 140 − 16 = 124
Hence, the correct answer is 'Option 3'.

Q96. Answer: (c) LDX

The logic followed here is:
Here, 'LDX' will come in place of question mark.
Hence, the correct answer is "Option 3".

Q97. Answer: (a) 9, 80

The logic followed here is:
Logic: Second number = (First number)² − 1
15, 224
=> $15^2 = 225 \rightarrow 225 - 1 = 224$
8, 63
=> $8^2 = 64 \rightarrow 64 - 1 = 63$
Now, checking the options:
Option 1) 9, 80
=> $9^2 - 1 = 81 - 1 = 80$
Option 2) 11, 123
=> $11^2 - 1 = 121 - 1 = 120 \neq 123$
Option 3) 6, 37
=> $6^2 - 1 = 36 - 1 = 35 \neq 37$
Option 4) 13, 170
=> $13^2 - 1 = 169 - 1 = 168 \neq 170$
Hence, the correct option is "Option 1"

Q98. Answer: (a) BR-XE

The logic followed here is:
Option 1) BR-XE
Option 2) CS-YA
Option 3) VL-RT
Option 4) HX-DF
Here, 'BR-XE' is odd among the given options.
Hence, the correct answer is "Option 1".

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Q99. Answer: (a) VX 79

The logic followed here is:

Here, 'VX 79' will come in place of question mark.

Hence, the correct answer is "Option 1".

Q100. Answer: (a) Only conclusion (II) follows.

• Given Statements:

Some lipsticks are tabs.

No tab is a kite.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) Some lipsticks are kites:

However, the remaining part of Lipsticks (the part that is not Tabs) could or could not be Kites.

• Since the possibility of "Some lipsticks are kites" cannot be confirmed as Definitely True from the statements, this conclusion does not follow.

• (II) Some tabs are lipsticks:

The conversion of a "Some A are B" statement is always "Some B are A".

Therefore, if Some lipsticks are tabs, it is definitely true that Some tabs are lipsticks.

Conclusion (II) follows.

Thus, Only conclusion (II) follows.

Hence, the correct answer is "Option 1".

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