RRB NTPC (UG) CBT-I Official Paper (Held On 07 May, 2026 Shift 1) (Previous Year Paper)

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

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MATHEMATICS

Q1. If $4\sin\theta + \operatorname{cosec}\theta = 4$, $0° < \theta < 90°$, then the value of $\sin 3\theta + \cos 3\theta$ is

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

Q2. Two bells are rung at intervals of 1,764 seconds and 2,268 seconds, respectively. They are rung together at the start. After how much time will the two bells ring together again for the first time?

(a) 4 hours 24 minutes 36 seconds
(b) 4 hours 18 minutes 12 seconds
(c) 4 hours 36 minutes 24 seconds
(d) 4 hours 12 minutes 18 seconds

Q3. Three numbers are in the ratio 4 : 13 : 9, and their LCM is 6084. Their HCF is:

(a) 13
(b) 23
(c) 48
(d) 12

Q4. Pipes X, Y, and Z together can fill a tank in 8 hours. If all three work together for 3 hours, and then pipe Z is closed, the remaining tank is filled by X and Y in 10 hours. In how many hours can pipe Z alone fill the empty tank?

(a) 32
(b) 24
(c) 18
(d) 16

Q5. The perimeter of a rhombus is 100 meters and one of its diagonals is 14 meters long. What is the length of the other diagonal?

(a) 48 meters
(b) 50 meters
(c) 40 meters
(d) 42 meters

Q6. Two taps can fill a cistern in 2 hours and 37 hours, respectively. A third tap can empty it in 37 hours. How long (in hours) will it take to fill half of the empty cistern if all the taps are opened together?

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

Q7. A streaming service charges Rs. 150 per month. If you buy an annual plan (12 months) with a 15% discount, what is your total savings (in Rs.) compared to paying monthly for a year?

(a) 180
(b) 300
(c) 240
(d) 270

Q8. The sum of two positive numbers is 27 and their product is 170. The positive difference between them is:

(a) 19
(b) 12
(c) 2
(d) 7

Q9. The value of a machine depreciates by 10% every year. What is the total percentage depreciation after 2 years?

(a) 20%
(b) 21%
(c) 19%
(d) 22%

Q10. If a triangle has sides a, b, c, and fixed sum a + b + c = 18, then the maximum possible area (in cm^2) of the triangle is

(a) $12\sqrt{3}$
(b) $3\sqrt{3}$
(c) $6\sqrt{3}$
(d) $9\sqrt{3}$

Q11. Which of the following numbers is completely divisible by 6?

(a) 7,53,216
(b) 6,42,538
(c) 8,91,452
(d) 5,47,821

Q12. A dealer sells a product at 15% profit. If he had bought it at 10% less and sold it for Rs. 126 less, he would have gained 20%. Find the cost price.

(a) Rs. 1,200
(b) Rs. 2,000
(c) Rs. 1,400
(d) Rs. 1,800

Q13. A shopkeeper offers the following schemes on toys of the same marked price.

(A) Successive discounts of 16% and 29% on any number of toys bought.
(B) Successive discounts of 4%, 34% and 37% on any number of toys bought.
(C) 12% discount on the first 4 toys and 27% discount on each toy thereon.
(D) 4 toys free of cost on buying 10 toys.

A customer wants to buy 10 toys. Which of the above schemes is the least beneficial to her?

(a) D
(b) A
(c) C
(d) B

Q14. The ratio of two numbers is 3 : 5. If 6 is subtracted from each, the resulting numbers are in the ratio 1 : 2. Find the difference between the two original numbers.

(a) 12
(b) 10
(c) 16

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(d) 14

Q15. Which of the ratios given below is the greatest among them?

(a) 4 : 7
(b) 3 : 5
(c) 5 : 8
(d) 7 : 1

Q16. Find the diameter of a sphere of surface area 28962 cm^2. (round off to the closest integer)
(Use $\pi = 22/7$)

(a) 98 cm
(b) 96 cm
(c) 108 cm
(d) 48 cm

Q17. Simplify the following expression using the BODMAS rule: 3/4 + (5/6 × 9/10) - 2/3

(a) 6/5
(b) 5/6
(c) 3/5
(d) 13/5

Q18. A train of length 180 meters is running at a speed of 72 km/h. How much time will it take to cross a bridge 350 meters long?

(a) 27.5 seconds
(b) 23.5 seconds
(c) 26.5 seconds
(d) 24.5 seconds

Q19. A person walks from point P to Q at 5 km/hr and returns from Q to P along the same route jogging at 10 km/hr. If the total time taken is 3 hours, what is the distance between P and Q?

(a) 20 km
(b) 5 km
(c) 10 km
(d) 15 km

Q20. The present age of a man is 4 years more than twice the present age of his son. After 6 years, the sum of their ages will be 58 years. What is the present age of the son?

(a) 14 years
(b) 11 years
(c) 9 years
(d) 10 years

Q21. A and B invest in a business in the ratio 5 : 7. After 4 months, C joins the business with an investment equal to the amount invested by A. At the end of one year, the total profit is Rs. 92,000. Find the sum (in Rs.) of the shares of partners B and C.

(a) Rs. 64,400
(b) Rs. 66,800
(c) Rs. 62,000
(d) Rs. 49,600

Q22. Simplify: {12/33 ÷ 12/2} ÷ (3/7 × 14/9 + 3/11) + 2/8 ÷ 31/25 of 25/8

(a) 5/36
(b) 7/38
(c) 4/31
(d) 5/24

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Q23. A fruit seller sold mangoes at Rs. 600 per box last month. This month, he first increased the price by 10% due to transportation costs and then offered a discount of 15% on the increased price. What is the final price of one box of mangoes?

(a) Rs. 561
(b) Rs. 571
(c) Rs. 541
(d) Rs. 551

Q24. The 7-digit number 46A484B is divisible by 24. What is the minimum value of (A + B)?

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

Q25. Sunil purchased a microwave oven for Rs. 7,000. He spent Rs. 400 on its transportation and Rs. 600 on repairs. He sold the oven for Rs. 9,800. What is his percentage profit on total investment?

(a) 20.5%
(b) 22.5%
(c) 21.5%
(d) 23.5%

Q26. In a class, the average score of 8 boys is 56 and the average score of 4 girls is 80. What is the average score of all 12 students?

(a) 62
(b) 66
(c) 64
(d) 68

Q27. If a two-digit number has a digit sum of 9 and adding 27 reverses its digits, determine the unit digit of the number.

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

Q28. What sum (in Rs.) will earn a simple interest of Rs. 1,320 in 3 years at 20% per year rate of interest?

(a) 792
(b) 1,100
(c) 2,200
(d) 4,400

Q29. If the interest on a sum of Rs. y at 10% per annum compounded annually for 2 years is Rs. 462, then the total amount payable at the end of the two-year period will be _____.

(a) Rs. 2,762
(b) Rs. 2,662
(c) Rs. 2,862
(d) Rs. 2,962

Q30. The arithmetic mean of the first 15 numbers is 82. The mean is reduced by 6 when one of the numbers is removed. Find the number that is excluded?

(a) 142
(b) 100
(c) 166
(d) 164

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GENERAL AWARENESS

Q31. Extended ASCII, an 8-bit evolution of the original 7-bit ASCII standard, supports international text by expanding the character set. How many total codes does it provide?

(a) 1024 codes for video compression
(b) 512 codes for voice recordings
(c) 128 codes limited to English letters
(d) 256 codes including accented characters

Q32. The Mansabdari System, introduced by Akbar in 1571, was mainly a system of _____.

(a) Religious Reformation
(b) Military Administration
(c) Judicial Reforms
(d) Land Revenue Collection

Q33. Which Indian actor was honored with the 'Master Humor Award' at the Macau International Comedy Festival 2025 held in China?

(a) Aamir Khan
(b) Hrithik Roshan
(c) Ram Charan
(d) Akshay Kumar

Q34. How does increasing the Amplitude of a sound wave affect the sound produced?

(a) The frequency decreases
(b) The speed of the sound increases
(c) The loudness increases
(d) The pitch increases

Q35. Who presided over the National Level Conclave of Ministers of States/UTs for Minority Welfare held on 13 September 2025, at Vanijya Bhawan, New Delhi?

(a) Om Prakash Rajbhar
(b) George Kurian
(c) Md. Zama Khan
(d) Kiren Rijiju

Q36. Which institution was founded by Prasanta Chandra Mahalanobis?

(a) Indian Economic Forum
(b) Reserve Bank of India
(c) Planning Commission
(d) Indian Statistical Institute

Q37. Which of the following correctly differentiates system software from application software?

(a) Both perform the same functions
(b) System software manages hardware; application software performs user tasks
(c) System software performs user tasks; application software controls hardware
(d) Application software loads the operating system; system software performs user tasks

Q38. Which of the following belts of the Northern Plains consists of porous rocky soil where stream water seeps underground?

(a) Khadar belt
(b) Delta belt
(c) Terai belt
(d) Bhabar belt

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Q39. Which of the following Union Territories has a Legislative Assembly?

(a) Ladakh
(b) Andaman and Nicobar Islands
(c) National Capital Territory of Delhi
(d) Lakshadweep

Q40. Which of the following optical properties of light enables sunglasses to reduce glare from sunlight reflected off surfaces such as water or roads?

(a) Polarization
(b) Interference
(c) Diffraction
(d) Refraction

Q41. Under which Article of the Indian Constitution may the President of India proclaim President's Rule when Constitutional machinery fails in a state?

(a) Article 356
(b) Article 355
(c) Article 350
(d) Article 249

Q42. Which of the following indicators is NOT a component of the Human Development Index (HDI)?

(a) Gross National Income per capita
(b) Life expectancy
(c) Education index
(d) Poverty line ratio

Q43. Which wildlife sanctuary is set to host its inaugural female cheetah (Dheera) as part of a breeding/translocation initiative in 2025?

(a) Ranthambore National Park
(b) Kuno National Park
(c) Gir Wildlife Sanctuary
(d) Gandhi Sagar Wildlife Sanctuary

Q44. The Vindhyachal Super Thermal Power Station is located in _____.

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

Q45. Which of the following baskets of the Buddhist Tipitaka contains monastic rules?

(a) Jataka Pitaka
(b) Sutta Pitaka
(c) Abhidhamma Pitaka
(d) Vinaya Pitaka

Q46. During the electrolysis of water, hydrogen and oxygen are released in which ratio?

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

Q47. Which factor most directly contributed to the emergence of the Sanyasi–Fakir rebellion in Bengal?

(a) Stable land rights allowed peasants to negotiate with revenue contractors.
(b) Expansion of irrigated farming reduced dependence on religious leaders.
(c) Increased protection from British officials improved rural living conditions.

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(d) Forced taxation and famine pushed dispossessed peasants into rebel groups.

Q48. Which of the following was the first international agreement to establish legally binding emission reduction targets specifically for developed countries?

(a) Rio Declaration
(b) Basel Convention
(c) Kyoto Protocol
(d) Paris Agreement

Q49. With which country did the United Kingdom (UK) sign the Kensington Treaty, the first treaty between the two countries since the Second World War, in July 2025?

(a) Japan
(b) France
(c) United States
(d) Germany

Q50. In which state of India did Pattachitra paintings originate?

(a) Bihar
(b) Punjab
(c) Odisha
(d) Rajasthan

Q51. In which country was the International Conference on 'Reimagining Existence: Emerging Perspectives in World Literature and Language' held in March 2025?

(a) India
(b) China
(c) Russia
(d) Italy

Q52. Consider the following statements regarding the provincial administration in the Mughal period and select the correct option.

Statement I: Each Suba was placed under a Subedar or provincial governor who was directly appointed by the Emperor.

Statement II: Daroga-i-Dak was responsible for maintaining the communication channel.

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

Q53. Which type of natural vegetation covers the largest geographical area in India?

(a) Mountain vegetation
(b) Dry Tropical Thorn vegetation
(c) Tropical Deciduous vegetation
(d) Tidal mangrove vegetation

Q54. In November 2025, PM Modi chaired the 60th All India Conference of Directors General and Inspectors General of Police in which city of Chhattisgarh?

(a) Bilaspur
(b) Bhilai
(c) Korba
(d) Raipur

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Q55. Which statement is True or False about the Windows 11 Operating System (OS)?

(i) The OS loads program code directly onto the hard disk for execution, as the CPU can only execute code from permanent storage.

(ii) For multitasking, the OS allocates small CPU time slices to processes, rapidly switching between them, a technique known as Time-Sharing.

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

Q56. In which year did FEMA replace FERA?

(a) 1998
(b) 1994
(c) 1990
(d) 1999

Q57. Which Amendment restored the primacy of Fundamental Rights over Directive Principles?

(a) 42nd Amendment
(b) 84th Amendment
(c) 44th Amendment
(d) 74th Amendment

Q58. Who among the following led the large-scale armed attack on the Chittagong armoury in April 1930?

(a) Jatin Das
(b) Bhagat Singh
(c) Chandrasekhar Azad
(d) Surya Sen

Q59. By which Amendment Act were the words ‘socialist’, ‘secular’, and ‘integrity’ added to the Preamble of the Indian Constitution?

(a) 62nd Amendment Act
(b) 32nd Amendment Act
(c) 52nd Amendment Act
(d) 42nd Amendment Act

Q60. Which academic institution was responsible for designing the IRIS chip based on the SHAKTI microprocessor, India's push for self-reliance in semiconductor technology, in February 2025?

(a) IIT Madras
(b) IISc Bangalore
(c) IIT Delhi
(d) NIT Trichy

Q61. Which of the following is NOT a characteristic of tertiary services?

(a) Includes tourism, banking, and trade
(b) Involves face-to-face or remote interaction
(c) Directly processes natural resources
(d) Often located in urban areas

Q62. Where does the Indian Prime Minister hoist the national flag on the occasion of Independence Day?

(a) India Gate
(b) Red Fort
(c) Jantar Mantar
(d) Qutb Minar

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Q63. In the Windows 11 File System, a file named mydriver.sys is found in the C:\Windows\System32\drivers folder. Based on its file extension and location, which of the following best describes the purpose and classification of this file?

(a) It is an Application Data File used for temporary user settings and can be safely deleted to free up disk space.
(b) It is a System Configuration File that holds graphical settings and can be edited with a standard text editor.
(c) It is an Operating System Log File that records system events and is only read by the Task Manager.
(d) It is a System Driver File that allows the operating system to communicate with a specific hardware component.

Q64. Which of the following services is a core component of the tourism industry?

(a) Teaching
(b) Banking
(c) Insurance
(d) Hospitality

Q65. When did Ladakh become a union territory of India?

(a) 2019
(b) 2017
(c) 2021
(d) 2020

Q66. Which of the following sites contains prehistoric paintings ranging from the Mesolithic to the historic period?

(a) Nalanda
(b) Bhimbetka
(c) Hampi
(d) Pattadakal

Q67. What was the Dual Government system introduced after the Battle of Buxar?

(a) A system where the French and British shared governance
(b) A system where the British ruled directly
(c) A system where the Nawab collected revenue and the Company maintained the army
(d) A system where the Company collected revenue, and Nawab handled administration

Q68. Which football player was named the Professional Footballers' Association (PFA) Player of the Year in August 2025, becoming the first player to win the award three times?

(a) Lionel Messi
(b) Mohamed Salah
(c) Neymar
(d) Casemiro

Q69. Which Article of the Indian Constitution provides for the Constitution of municipalities?

(a) Article 243Q
(b) Article 243P
(c) Article 243R
(d) Article 243S

Q70. Which of the following is a fat-soluble vitamin that helps in promotion of calcium absorption in the gut for bone health?

(a) Vitamin C
(b) Vitamin D
(c) Vitamin A
(d) Vitamin B

GENERAL INTELLIGENCE AND REASONING

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Q71. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group.

Which is the one 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) LJ−HF
(b) EC−ZA
(c) RP−NL
(d) OM−KI

Q72. In a certain code language, ‘chest shirt coal’ is coded as 'ym aw xu' and ‘coal lake pig’ is coded as ‘aw yh ky’. How is ‘coal’ coded in the given language?

(a) xu
(b) aw
(c) ym
(d) yh

Q73. KH 13 is related to ID 2 in a certain way. In the same way, LO 9 is related to JK −2. To which of the following is LJ 7 related, following the same logic?

(a) KF −4
(b) JF −4
(c) JG −6
(d) KG −6

Q74. Which of the following options should come in place of the ‘?’ in the given series based on the English alphabetical order?

G 5, M 12, S 19, Y 26, ?

(a) J 33
(b) A 33
(c) D 33
(d) E 33

Q75. In a certain code language,

A + B means ‘A is the son of B’,

A – B means ‘A is the brother of B’,

A x B means ‘A is the wife of B’ and

A ÷ B means ‘A is the father of B’.

Based on the above, how is S related to K if ‘S + D ÷ F x H – K’?

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

Q76. R, E, A, D, I, N and G are sitting around a circular table, facing the centre of the table.

Only two people sit between N and R when counted from the left of R. G sits third to the left of A. D sits to the immediate right of A. D sits second to the left of N. I is not an immediate neighbor of G.

Who sits third to the right of E?

(a) R
(b) A
(c) G
(d) D

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Q77. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

MCK 10, PFN 13, SIQ 16, VLT 19, ?

(a) XOV 22
(b) YOW 22
(c) XPW 24
(d) YPV 22

Q78. Each letter in the word LANGUID is arranged in the English alphabetical order. How many letters are there in the English alphabetical order between the letter which is second from the left and the one which is fourth from the right in the new letter cluster thus formed?

(a) 4
(b) 3
(c) 5
(d) 7

Q79. GECD is related to CAYZ in a certain way based on the English alphabetical order. In the same way, AYWX is related to WUST. To which of the following is USQR related, following the same logic?

(a) QNLN
(b) QOLN
(c) QPLR
(d) QOMN

Q80. Refer to the following series and answer the question. (Counting to be done from left to right only.) (all numbers are single digit numbers only.)

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

How many such even digits are there, each of which is immediately preceded by a perfect square and immediately followed by an odd digit? (NOTE: 1 is also a perfect square.)

(a) Two
(b) More than three
(c) One
(d) Three

Q81. What should come in place of ? in the given series based on the English alphabetical order?

SQU TRV USW VTX ?

(a) WXZ
(b) WTX
(c) WUY
(d) WVX

Q82. What should come in place of the '?' in the given series?

13 19 31 55 103 ?

(a) 199
(b) 195
(c) 203
(d) 190

Q83. Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. You have to decide which conclusions logically follow/s from the given statements.

Statements: All cakes are biscuits. All pizzas are biscuits.

Conclusion (I) : Some cakes are pizzas

Conclusion (II) : Some biscuits are pizzas

(a) Neither conclusion (I) nor (II) follows

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

Q84. Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order. A is kept second from the bottom. Only three boxes are kept between A and G. E is kept at one of the positions below A. Only D is kept between G and F. C is kept at one of the positions above G. How many boxes are kept between B and E?

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

Q85. If + means -, - means ×, × means ÷, and ÷ means +, then what will come in place of the question mark (?) in the following equation?

92 - 8 ÷ 311 + 715 × 11 = ?

(a) 965
(b) 975
(c) 982
(d) 998

Q86. Seven people, Mayank, Nidhi, Palak, Rakesh, Surya, Tina and Vivek, are sitting in a row, facing north. Only two people sit to the right of Rakesh. Nidhi sits to the immediate left of Vivek and Vivek sits third to the left of Rakesh. Palak sits third to the right of Tina, but Palak does not sit at any extreme ends. Rakesh is not an immediate neighbour of Mayank. How many people sit between Tina and Vivek?

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

Q87. John ranked 16^(th) from the bottom and 29^(th) from the top in his class. How many students are there in his class?

(a) 44
(b) 41
(c) 43
(d) 42

Q88. What should come in place of the '?' in the given series?

5 14 41 122 ? 1094

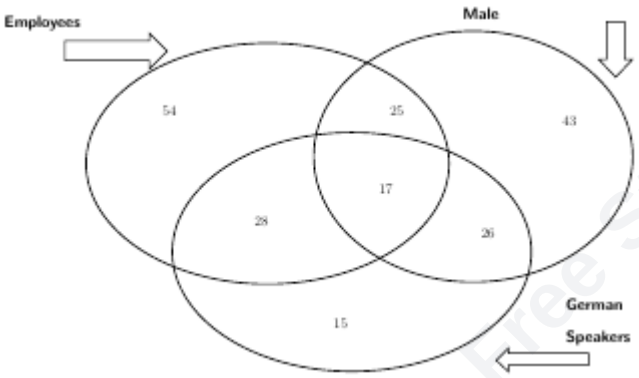
(a) 365
(b) 368
(c) 381
(d) 361

Q89. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which is the one that does not belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)

(a) NK-RO
(b) PM-TR
(c) LI-PN
(d) RO-VT

Q90. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons working in an organization. (NOTE: You have to take the given data to be true even if it seems to be at variance from commonly known facts.)

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How many such employees are there who also speak German?

(a) 41
(b) 43
(c) 45
(d) 28

Q91. If 2 is added to each even digit and 2 is subtracted from each odd digit in the number 5973642, then what will be the sum of all the even digits in the new number thus formed?

(a) 16
(b) 20
(c) 18
(d) 24

Q92. 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 is the one 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) QNT
(b) MJP
(c) URY
(d) JGM

Q93. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

8 - 3 - 24

5 - 8 - 40

(a) 2 - 9 - 15
(b) 14 - 6 - 34
(c) 4 - 8 - 43
(d) 4 - 9 - 36

Q94. Amit starts from Point Y and drives 14 km towards South. He then turns left and drives 35 km, takes a left and drives 68 km. He then takes a left turn and drives 41 km. He takes a left turn, drives 54 km, turns right and drives 53 km to stop 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) 57 km towards east
(b) 56 km towards west
(c) 61 km towards west
(d) 59 km towards east

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Q95. Each vowel in the word TRAJECTORIES is changed to the second letter immediately following it in the English alphabetical order, and each consonant is changed to the second letter immediately preceding it in the English alphabetical order. How many letters will appear exactly twice in the new group of letters thus formed?

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

Q96. AEHB is related to FJMG in a certain way based on the English alphabetical order. In the same way, DHKE is related to IMPJ. To which of the following is GKNH related, following the same logic?

(a) PLMS
(b) PLSM
(c) LPSM
(d) LPMS

Q97. In a certain code language, 'NORM' is coded as '7341' and 'ROME' is coded as '3748'. What is the code for 'E' in the given code language?

(a) 3
(b) 8
(c) 7
(d) 4

Q98. What will come in place of the question mark (?) in the following equation if '+' and '÷' are interchanged and '−' and '×' are interchanged?

603 + 9 × 18 − 6 ÷ 56 = ?

(a) 15
(b) 16
(c) 20
(d) 11

Q99. P is the daughter of Q. Q is the wife of S. T is the mother of X. T is the sister of S. How is T related to P?

(a) Mother
(b) Husband's sister
(c) Sister
(d) Father's sister

Q100. Uvx ranked 14^(th) from the top and 79^(th) from the bottom in his class. How many students are there in his class?

(a) 93
(b) 92
(c) 91
(d) 90

ANSWER KEY

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

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81	c	82	a	83	d	84	a	85	c	86	a	87	a	88	a	89	a	90	c
91	c	92	c	93	d	94	d	95	b	96	c	97	b	98	a	99	d	100	b

SOLUTIONS

Q1. Answer: (a) 1

Shortcut Trick

The equation $4\sin\theta + 1/\sin\theta = 4$ is in the form $x + 1/x = 2$ where $x = 2\sin\theta$.

This standard form implies $x = 1$, which means $2\sin\theta = 1$ or $\sin\theta = 1/2$.

For the range $0° < \theta < 90°$, the value of θ is $30°$.

Substitute $\theta = 30°$ in the required expression: $\sin(3 \times 30°) + \cos(3 \times 30°)$.

$\sin 90° + \cos 90° = 1 + 0 = 1$.

Therefore The correct answer is 1.

Alternate Method

Given: $4\sin\theta + \operatorname{cosec}\theta = 4$, where $0° < \theta < 90°$

Formula Used: $\operatorname{cosec}\theta = 1/\sin\theta$ and $(a - b)^2 = a^2 - 2ab + b^2$

Calculations:

$\Rightarrow 4\sin\theta + 1/\sin\theta = 4$

$\Rightarrow (4\sin^2\theta + 1) / \sin\theta = 4$

$\Rightarrow 4\sin^2\theta + 1 = 4\sin\theta$

$\Rightarrow 4\sin^2\theta - 4\sin\theta + 1 = 0$

$\Rightarrow (2\sin\theta - 1)^2 = 0$

$\Rightarrow 2\sin\theta - 1 = 0$

$\Rightarrow \sin\theta = 1/2$

$\Rightarrow$ Since $\sin 30° = 1/2$ and $0° < \theta < 90°$, then $\theta = 30°$.

$\Rightarrow$ Required value = $\sin 3\theta + \cos 3\theta$

$\Rightarrow \sin(3 \times 30°) + \cos(3 \times 30°)$

$\Rightarrow \sin 90° + \cos 90°$

$\Rightarrow 1 + 0 = 1$

Therefore The correct answer is 1.

Additional Information

Reciprocal Identities

The trigonometric functions $\sin\theta$ and $\operatorname{cosec}\theta$ are reciprocals, meaning $\sin\theta \times \operatorname{cosec}\theta = 1$.

Standard Trigonometric Values

Key values include $\sin 30° = 1/2$, $\sin 90° = 1$, and $\cos 90° = 0$.

Complementary Angles

For any angle A, $\sin A = \cos(90° - A)$ and $\cos A = \sin(90° - A)$.

Q2. Answer: (a) 4 hours 24 minutes 36 seconds

Shortcut Trick

To find when the bells ring together again, calculate the Least Common Multiple (LCM) of the two time intervals.

Find the common factor: $1764 = 252 \times 7$ and $2268 = 252 \times 9$.

LCM = $252 \times 7 \times 9 = 252 \times 63 = 15876$ seconds.

Convert 15876 seconds: $15876 \div 3600 = 4$ hours, remainder 1476; $1476 \div 60 = 24$ minutes, remainder 36 seconds.

Therefore The correct answer is 4 hr 24 min 36 sec.

Alternate Method

Given:

Interval of Bell 1 = 1,764 seconds

Interval of Bell 2 = 2,268 seconds

Formula Used:

Time to ring together again = LCM (Interval 1, Interval 2)

Calculations:

=> Prime Factorization of 1764 = $2^2 \times 3^2 \times 7^2$

=> Prime Factorization of 2268 = $2^2 \times 3\text{^}4 \times 7^1$

=> LCM = $2^2 \times 3\text{^}4 \times 7^2$

=> LCM = $4 \times 81 \times 49 = 15876$ seconds

=> To convert seconds to hours: $15876 \div 3600 = 4$ hours (14400 seconds)

=> Remaining seconds = $15876 - 14400 = 1476$ seconds

=> To convert remaining seconds to minutes: $1476 \div 60 = 24$ minutes (14400 seconds)

=> Remaining seconds = $1476 - 1440 = 36$ seconds

=> Total Time = 4 hr 24 min 36 sec

Therefore The correct answer is 4 hr 24 min 36 sec.

Additional Information

LCM in Periodic Events

For problems involving bells, traffic lights, or runners on a circular track starting together, the next meeting time is always the LCM of their individual time periods.

Time Conversion Rules

1 hour = 60 minutes = 3600 seconds. To convert seconds to larger units, divide by 3600 for hours and divide the remainder by 60 for minutes.

HCF and LCM Relation

The product of two numbers is equal to the product of their HCF and LCM: Number1 × Number2 = HCF × LCM.

Q3. Answer: (a) 13

Shortcut Trick

If the ratio parts are pairwise coprime (meaning no two parts share a common factor), the LCM is simply the HCF × Product of Ratio Parts.

Ratio parts 4, 13, and 9 are pairwise coprime.

=> 6084 = HCF × (4 × 13 × 9)

=> 6084 = HCF × 468

=> HCF = 6084 ÷ 468 = 13

Therefore The correct answer is 13.

Alternate Method

Given: Ratio of numbers = 4 : 13 : 9 and Least Common Multiple (LCM) = 6084.

Let the Highest Common Factor (HCF) be x.

Therefore, the three numbers are 4x, 13x, and 9x.

To find the LCM of these numbers, we look at the common and non-common factors:

=> LCM(4x, 13x, 9x) = x × LCM(4, 13, 9)

Since 4, 13, and 9 have no common factors between them (pairwise coprime):

=> LCM = x × (4 × 13 × 9) = 468x

According to the question:

=> 468x = 6084

=> x = 6084 ÷ 468

=> x = 13

Therefore The correct answer is 13.

Additional Information

HCF and LCM Relation

For two numbers a and b, HCF(a, b) × LCM(a, b) = a × b. This formula is only strictly valid for exactly two numbers.

Co-prime Numbers

Two numbers are co-prime if their HCF is 1. The LCM of a set of co-prime numbers is the product of those numbers.

LCM of Fractions

LCM of fractions = (LCM of Numerators) ÷ (HCF of Denominators). Similarly, HCF = (HCF of Numerators) ÷ (LCM of Denominators).

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Q4. Answer: (d) 16

Shortcut Trick

Work done by Pipes X, Y, and Z in 3 hr = 3/8 part.

Remaining work = 1 − 3/8 = 5/8 part.

X and Y fill 5/8 part in 10 hr => full tank in 10 × 8/5 = 16 hr.

Efficiency of pipe Z = 1/8 − 1/16 = 1/16.

Time taken by pipe Z alone = 16 hr.

Therefore The correct answer is 16 hr.

Alternate Method

Given:

Time taken by (X+Y+Z) = 8 hr

Work done by (X+Y+Z) in 3 hr = 3/8

Remaining work = 1 − 3/8 = 5/8

Time taken by (X+Y) to fill 5/8 part = 10 hr

=> Time for (X+Y) to fill full tank = 10 × 8/5 = 16 hr

Calculations:

Person	Days (hr)	Total Work	Efficiency
X+Y+Z	8	16	16 ÷ 8 = 2
X+Y	16	16 ÷ 16 = 1	

=> Efficiency of pipe Z = Efficiency of (X+Y+Z) − Efficiency of (X+Y)

=> Efficiency of pipe Z = 2 − 1 = 1

=> Time taken by pipe Z alone = Total Work ÷ Efficiency of Z

=> Time = 16 ÷ 1 = 16 hr

Therefore The correct answer is 16 hr.

Additional Information

Work, Time, and Efficiency Relationship

The total work is the product of efficiency and time (Work = Efficiency × Time). Efficiency is the amount of work done in a unit of time.

Combined Rate Rule

When multiple pipes work together, their combined efficiency is the sum of their individual efficiencies: E_(total) = E1 + E2 + E3.

Inlet vs. Outlet Pipes

Inlet pipes (filling) have positive efficiency, while outlet pipes (emptying/leakage) have negative efficiency in calculation.

Q5. Answer: (a) 48 meters

Shortcut Trick

Perimeter of 100 m => Side = 100 ÷ 4 = 25 m.

Given one diagonal is 14 m => half-diagonal = 14 ÷ 2 = 7 m.

Using the Pythagorean triplet (7, 24, 25), the other half-diagonal is 24 m.

Length of the other diagonal = 24 × 2 = 48 m.

Therefore The correct answer is 48 m.

Alternate Method

Given: Perimeter of the rhombus = 100 m, Diagonal 1 (d1) = 14 m.

Formula Used: Side (s) = Perimeter ÷ 4; $(d1/2)^2 + (d2/2)^2 = s^2$

=> Side of the rhombus (s) = 100 ÷ 4 = 25 m

=> Half of first diagonal = 14 ÷ 2 = 7 m

=> Let the other diagonal be d2.

=> $(d2/2)^2 = 25^2 - 7^2$

=> $(d2/2)^2 = 625 - 49$

=> $(d2/2)^2 = 576$

=> $d2/2 = \sqrt{576}$

=> d2/2 = 24 m

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=> d2 = 24 × 2 = 48 m

Therefore The correct answer is 48 m.

Additional Information

Area of a Rhombus

The area of a rhombus can be calculated using its diagonals: Area = 1/2 × d1 × d2.

Side-Diagonal Relationship

The relationship between the side (s) and diagonals is $4s^2 = d1^2 + d2^2$, which is derived from the Pythagoras theorem.

Diagonals Property

In a rhombus, all sides are equal, and the diagonals bisect each other at right angles (90°).

Q6. Answer: (d) 1

Shortcut Trick

Since Tap 2 (fills in 37 hr) and Tap 3 (empties in 37 hr) have the same rate, they cancel each other out completely.

The net filling depends only on Tap 1, which fills the full cistern in 2 hr.

To fill half of the cistern, the time taken is simply half of the total time for Tap 1.

Required Time = 2 hr ÷ 2 = 1 hr.

Therefore The correct answer is 1 hr.

Alternate Method

Given:

Time to fill by Tap A = 2 hr

Time to fill by Tap B = 37 hr

Time to empty by Tap C = 37 hr

Efficiency Table:

Tap	Time (hr)	Total Work (LCM)	Efficiency
Tap A (Fill)	2	74	37
Tap B (Fill)	37	2	
Tap C (Empty)	37	−2	

Calculations:

=> Net Efficiency (A + B + C) = 37 + 2 − 2 = 37 units/hr

=> Total capacity of cistern = 74 units

=> Work required to fill half the cistern = 74 ÷ 2 = 37 units

=> Time taken = Work ÷ Efficiency = 37 ÷ 37 = 1 hr

Therefore The correct answer is 1 hr.

Additional Information

Inlet and Outlet Pipes

Pipes that fill the tank are called Inlets (positive efficiency), while those that empty it are Outlets (negative efficiency).

LCM Method

Assuming Total Work as the Least Common Multiple (LCM) of all given time periods simplifies efficiency calculations significantly.

Combined Rate Formula

If Tap 1 fills in 'x' and Tap 2 empties in 'x', the net rate is zero, meaning they don't change the tank level when working together.

Q7. Answer: (d) 270

Shortcut Trick

Total cost for 12 months = 150 × 12 = Rs. 1800.

Savings = Discount % of Total Cost.

Savings = 15% of 1800 = 15 × 18 = Rs. 270.

Therefore The correct answer is Rs. 270.

Alternate Method

Given:

Monthly charge = Rs. 150

Duration = 12 months

Discount rate = 15%
Calculation:
=> Total cost without discount = 150 × 12
=> Total cost = Rs. 1800
=> Total savings = 15% of 1800
=> Savings = (15 ÷ 100) × 1800
=> Savings = 15 × 18 = Rs. 270
Therefore The correct answer is Rs. 270.
Additional Information
Percentage Discount Formula
Discount Amount = (Discount % ÷ 100) × Marked Price. It represents the reduction in the original price.
Net Payable Amount
The Final Price (Selling Price) = Original Price − Discount Amount, or Final Price = Original Price × (100 − Discount%) ÷ 100.
Successive Discounts
When two discounts a% and b% are applied sequentially, the equivalent single discount is given by (a + b − ab/100)%.

Q8. Answer: (d) 7

Shortcut Trick
Identify factors of the product 170 that add up to the sum 27.
170 = 17 × 10
Checking the sum: 17 + 10 = 27 (Satisfied)
Required positive difference: 17 − 10 = 7
Therefore The correct answer is 7.
Alternate Method
Let the two positive numbers be x and y.
Given: x + y = 27 and xy = 170
Formula Used: $(x - y)^2 = (x + y)^2 - 4xy$
=> $(x - y)^2 = (27)^2 - 4 \times 170$
=> $(x - y)^2 = 729 - 680$
=> $(x - y)^2 = 49$
=> $x - y = \sqrt{49}$
=> x − y = 7
Therefore The correct answer is 7.
Additional Information
Algebraic Identity Relation
The relation between sum, difference, and product of two numbers is given by: $(a + b)^2 - (a - b)^2 = 4ab$.
Quadratic Equation Formation
If the sum (S) and product (P) of two numbers are known, the numbers are the roots of the quadratic equation: $t^2 - St + P = 0$.
Sum of Squares
The sum of the squares of the numbers can be calculated as: $x^2 + y^2 = (x + y)^2 - 2xy$. In this case, $27^2 - 2(170) = 729 - 340 = 389$.

Q9. Answer: (c) 19%

Shortcut Trick
Apply the successive percentage change formula: Net Change = x + y + (xy ÷ 100)
For depreciation, take x = −10 and y = −10.
Net change = −10 − 10 + [(−10 × −10) ÷ 100]
Net change = −20 + 1 = −19%
The negative sign indicates a total depreciation of 19%.
Therefore The correct answer is 19%.
Alternate Method
Given:
Initial rate of depreciation = 10% per year

Time period = 2 years

Formula Used:

Value after n years = $P \times (1 - r \div 100)^n$, where P is the initial value and r is the rate.

=> Let the initial value of the machine be 100 units.

=> Value after 1st year = 100 − (10% of 100) = 100 − 10 = 90 units.

=> Value after 2nd year = 90 − (10% of 90) = 90 − 9 = 81 units.

=> Total depreciation = Initial Value − Final Value = 100 − 81 = 19 units.

=> Total percentage depreciation = (Total Depreciation ÷ Initial Value) × 100

=> Total percentage depreciation = (19 ÷ 100) × 100 = 19%.

Therefore The correct answer is 19%.

Additional Information

Successive Percentage Change

When a value changes by a% and then by b% successively, the net percentage change is given by [a + b + (ab ÷ 100)]%.

Compound Depreciation

It is similar to compound interest but with a negative rate. The value after n years is $V = P(1 - r/100)^n$.

Appreciation

If the value of an asset increases over time, it is called appreciation, calculated as $V = P(1 + r/100)^n$.

Q10. Answer: (d) 9√3

Shortcut Trick

For a fixed perimeter, the area of a triangle is maximized when it is an equilateral triangle.

Side of the equilateral triangle = Perimeter ÷ 3 = 18 ÷ 3 = 6 cm.

Maximum Area = (√3 ÷ 4) × side²

Maximum Area = (√3 ÷ 4) × 6² = (√3 ÷ 4) × 36 = 9√3 cm².

Therefore The correct answer is 9√3 cm².

Alternate Method

Given: Perimeter (a + b + c) = 18 cm

Formula Used: Heron's Formula Area = √[s(s − a)(s − b)(s − c)], where s = (a + b + c) ÷ 2

=> Semi-perimeter (s) = 18 ÷ 2 = 9 cm

=> For maximum area, a = b = c = 18 ÷ 3 = 6 cm

=> Area = √[9 × (9 − 6) × (9 − 6) × (9 − 6)]

=> Area = √[9 × 3 × 3 × 3]

=> Area = √[243] = √[81 × 3] = 9√3 cm²

Therefore The correct answer is 9√3 cm².

Additional Information

Equilateral Triangle Properties

All sides and angles (60°) are equal. Height h = (√3 ÷ 2) × side and Area = (√3 ÷ 4) × side².

In-radius and Circum-radius

For an equilateral triangle with side 'a', in-radius (r) = a ÷ (2√3) and circum-radius (R) = a ÷ √3.

Maximum Area of Polygons

Among all polygons with 'n' sides and a fixed perimeter, the regular polygon (like a square for n=4) always has the maximum area.

Q11. Answer: (a) 7,53,216

Shortcut Trick

A number is divisible by 6 if it is both even (divisible by 2) and the sum of its digits is divisible by 3.

Checking 7,53,216: It is even (ends in 6). Sum of digits = 7 + 5 + 3 + 2 + 1 + 6 = 24 (divisible by 3).

Checking other options: 5,47,821 is odd; 6,42,538 (sum=28) and 8,91,452 (sum=29) are not divisible by 3.

Therefore The correct answer is 7,53,216.

Alternate Method

Given Numbers: 7,53,216, 6,42,538, 8,91,452, 5,47,821

A number is divisible by 6 if it satisfies two divisibility rules simultaneously:

Step-by-step verification for 7,53,216:

=> Condition 1 (Divisibility by 2): The last digit is 6, which is even. => Passed.

=> Condition 2 (Divisibility by 3): Sum of digits = 7 + 5 + 3 + 2 + 1 + 6 = 24.

=> 24 ÷ 3 = 8 (No remainder). => Passed.

=> Since both conditions are satisfied, the number is divisible by 6.

Therefore The correct answer is 7,53,216.

Additional Information

Divisibility by 4 and 8

A number is divisible by 4 if its last two digits are divisible by 4. It is divisible by 8 if its last three digits are divisible by 8.

Divisibility by 9

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

Divisibility by 11

A number is divisible by 11 if the difference between the sum of digits at odd positions and even positions is either 0 or a multiple of 11.

Q12. Answer: (d) Rs. 1,800

Shortcut Trick

Assume initial Cost Price = 100 units

Initial SP = 115 units and New CP = 90 units (10% less)

New SP = 90 × 120% = 108 units (20% gain)

Difference in SP = 115 − 108 = 7 units

7 units = Rs. 126 => 1 unit = Rs. 18 => 100 units = Rs. 1,800

Therefore The correct answer is Rs. 1,800.

Alternate Method

Given:

Initial Profit = 15%, Reduction in CP = 10%, Reduction in SP = Rs. 126, New Profit = 20%

Let the Cost Price (CP) of the product be Rs. x

=> Initial Selling Price (SP1) = x + 15% of x = 1.15x

=> New Cost Price (CP2) = x − 10% of x = 0.90x

=> New Selling Price (SP2) = 0.90x + 20% of 0.90x

=> SP2 = 0.90x × (120/100) = 1.08x

=> According to the question: SP1 − SP2 = 126

=> 1.15x − 1.08x = 126

=> 0.07x = 126

=> x = 126 ÷ 0.07

=> x = 12600 ÷ 7 = 1800

Therefore The correct answer is Rs. 1,800.

Additional Information

Profit and Loss Formulas

Profit % = (Profit ÷ CP) × 100 and SP = CP × (100 + Profit%) ÷ 100.

Net Percentage Change

When a value changes by a% and then b%, the net change is given by (a + b + ab/100)%.

Relationship between CP and MP

CP ÷ MP = (100 − Discount%) ÷ (100 + Profit%). This is used for problems involving markup and discount.

Q13. Answer: (c) C

Shortcut Trick

Compare the effective discount percentage for each scheme on 10 toys:

(A) 16 + 29 − (16 × 29)/100 = 45 − 4.64 = 40.36%

(B) Effective of (4, 34, 37) is approx. 60.1% (high discount)

(C) Average discount = [(4 × 12%) + (6 × 27%)] ÷ 10 = (48 + 162) ÷ 10 = 21%

(D) Discount = [Free ÷ Total] × 100 = (4 ÷ 14) × 100 ≈ 28.57%

The least beneficial scheme is the one with the lowest discount percentage.

Therefore The correct answer is C.
Alternate Method
Given: Total toys to buy = 10. Let Marked Price (MP) of 1 toy = Rs. 100. Total MP = Rs. 1000.
Formula Used: Effective Discount = (Total Discount ÷ Total MP) × 100
Calculations:
Scheme (A): Successive 16% and 29%
=> Net Discount = 16 + 29 − (16 × 29)/100 = 45 − 4.64 = 40.36%
Scheme (B): Successive 4%, 34% and 37%
=> First two: 4 + 34 − (4 × 34)/100 = 36.64%
=> Final: 36.64 + 37 − (36.64 × 37)/100 = 73.64 − 13.55 = 60.09%
Scheme (C): 12% on 4 toys and 27% on 6 toys
=> Discount on 4 toys = 4 × 12 = Rs. 48
=> Discount on 6 toys = 6 × 27 = Rs. 162
=> Total Discount = 48 + 162 = Rs. 210
=> Effective Discount % = (210 ÷ 1000) × 100 = 21%
Scheme (D): 4 toys free on buying 10 toys
=> Effective Discount % = [Free ÷ (Paid + Free)] × 100
=> Discount % = [4 ÷ (10 + 4)] × 100 = 400 ÷ 14 ≈ 28.57%
Comparing all, Scheme C offers the minimum discount (21%), making it the least beneficial for the customer.
Therefore The correct answer is C.
Additional Information
Successive Discount Formula
For two successive discounts a% and b%, the equivalent single discount is [a + b − (ab/100)]%.
Buy X Get Y Free
In such schemes, the effective discount percentage is calculated as [Y ÷ (X + Y)] × 100.
Customer's Benefit
A scheme is most beneficial when the discount is maximum and least beneficial when the discount is minimum.

Q14. Answer: (a) 12

Shortcut Trick
Initial Ratio = 3 : 5 (Difference = 2 units)
Final Ratio = 1 : 2 (Difference = 1 unit)
Equating the difference by multiplying the final ratio by 2: 1 × 2 : 2 × 2 = 2 : 4
Comparison: 3 → 2 and 5 → 4 (Decrease of 1 unit = 6)
Original Difference = 5 − 3 = 2 units => 2 × 6 = 12
Therefore The correct answer is 12.
Alternate Method
Given:
Initial Ratio of numbers = 3 : 5
Value subtracted from each = 6
Resulting Ratio = 1 : 2
Formula Used:
If ratio is a : b, numbers are ax and bx. Difference = (b − a)x
Calculations:
Let the two numbers be 3x and 5x.
=> (3x − 6) / (5x − 6) = 1 / 2
=> 2 × (3x − 6) = 1 × (5x − 6)
=> 6x − 12 = 5x − 6
=> 6x − 5x = 12 − 6
=> x = 6
=> Original Difference = 5x − 3x = 2x
=> 2 × 6 = 12

Therefore The correct answer is 12.

Additional Information

Ratio Difference Property

When the same quantity is added to or subtracted from both terms of a ratio, the absolute difference between the terms remains a constant multiple of the common variable x.

Cross-Multiplication Method

For any ratio problem involving changes, the Cross-product method (Product of extremes = Product of means) is the most reliable way to set up the linear equation.

Proportionality

A proportion is an equality of two ratios. If a/b = c/d, then a × d = b × c.

Q15. Answer: (d) 7 : 1

Given:

Ratios: 4 : 7, 3 : 5, 5 : 8, and 7 : 1

Formula used:

Ratio a : b = a ÷ b

Calculation:

To determine the greatest ratio, convert each into its decimal equivalent:

4 : 7 => 4 ÷ 7 ≈ 0.571

3 : 5 => 3 ÷ 5 = 0.6

5 : 8 => 5 ÷ 8 = 0.625

7 : 1 => 7 ÷ 1 = 7.0

Comparing these decimal values:

=> 7.0 > 0.625 > 0.6 > 0.571

The largest value is 7.0, which corresponds to the ratio 7 : 1.

Therefore The correct answer is option (4).

Q16. Answer: (b) 96 cm

Shortcut Trick

Surface Area of a sphere in terms of diameter (d) is $\pi \times d^2$.

$28962 \approx (22/7) \times d^2$

$d^2 \approx (28962 \times 7) \div 22 \approx 9215.18$

Since $96^2 = 9216$, the diameter $d \approx 96$ cm.

Therefore The correct answer is 96 cm.

Alternate Method

Given:

Surface Area (SA) of the sphere = 28962 cm^2

Value of $\pi = 22/7$

Formula Used:

Surface Area of sphere = $4 \times \pi \times r^2$

Diameter (d) = 2 × r

Calculations:

=> Surface Area = $4 \times (22/7) \times r^2$

=> $28962 = (88/7) \times r^2$

=> $r^2 = (28962 \times 7) \div 88$

=> $r^2 = 202734 \div 88$

=> $r^2 = 2303.795$

=> $r = \sqrt{2303.795} \approx 47.997$

=> Diameter (d) = 2 × r

=> d = 2 × 47.997 = 95.994

=> Rounding to the closest integer, d ≈ 96 cm.

Therefore The correct answer is 96 cm.

Additional Information

Volume of a Sphere

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

Hemisphere Surface Area

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

Circle vs Sphere

A circle is a 2D shape with area πr^2, while a sphere is its 3D counterpart with surface area $4\pi r^2$.

Q17. Answer: (b) 5/6

Given:

$3/4 + (5/6 \times 9/10) - 2/3$

Formula used:

The BODMAS rule is used to solve the expression:

B = Bracket

O = Of

D = Division

M = Multiplication

A = Addition

S = Subtraction

Calculations:

First, solve the Multiplication inside the bracket:

=> $5/6 \times 9/10$

=> $45/60$

=> $3/4$

Now, the expression becomes:

=> $3/4 + 3/4 - 2/3$

Next, perform the Addition:

=> $(3 + 3) / 4 - 2/3$

=> $6/4 - 2/3$

=> $3/2 - 2/3$

Finally, perform the Subtraction by finding the LCM of 2 and 3, which is 6:

=> $(3 \times 3 - 2 \times 2) / 6$

=> $(9 - 4) / 6$

=> $5/6$

Therefore The correct answer is option (2).

Q18. Answer: (c) 26.5 seconds

Shortcut Trick

Total distance = Train length + Bridge length = 180 + 350 = 530 m.

Speed in m/s = 72 × 5/18 = 20 m/s.

Required Time taken = 530 ÷ 20 = 26.5 sec.

Therefore The correct answer is 26.5 sec.

Alternate Method

Given:

Train length = 180 m

Bridge length = 350 m

Speed = 72 km/h

Formula Used:

Time = Total Distance ÷ Speed

Calculations:

=> Total distance to cross = 180 + 350 = 530 m

=> Speed in m/s = 72 × (5 ÷ 18) = 20 m/s

=> Time taken = 530 ÷ 20

=> Time taken = 26.5 sec

Therefore The correct answer is 26.5 sec.

Additional Information

Unit Conversion

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

Relative Speed

When two objects move in the same direction, relative speed is the difference. In opposite directions, it is the sum.

Distance Concept

When crossing stationary objects like a platform or tunnel, total distance is the sum of the train length and the object length.

Q19. Answer: (c) 10 km

Shortcut Trick

Average Speed for equal distances = (2 × s1 × s2) ÷ (s1 + s2)

=> Average Speed = (2 × 5 × 10) ÷ (5 + 10) = 100 ÷ 15 = 20/3 km/hr.

Total Distance covered (round trip) = Average Speed × Total Time = (20/3) × 3 = 20 km.

Distance between Point P and Point Q = Total Distance ÷ 2 = 20 ÷ 2 = 10 km.

Therefore The correct answer is 10 km.

Alternate Method

Given:

Speed from P to Q (s1) = 5 km/hr

Speed from Q to P (s2) = 10 km/hr

Total Time (T) = 3 hr

Formula Used:

Time = Distance ÷ Speed

Calculations:

Let the Distance between P and Q be 'd' km.

=> Time taken from P to Q (t1) = d ÷ 5

=> Time taken from Q to P (t2) = d ÷ 10

=> Total Time = t1 + t2 = 3

=> d/5 + d/10 = 3

=> (2d + d) ÷ 10 = 3

=> 3d ÷ 10 = 3

=> 3d = 30

=> d = 10 km

Therefore The correct answer is 10 km.

Additional Information

Average Speed (Equal Distances)

When a person covers two equal distances at speeds x and y, the average speed for the whole journey is given by 2xy ÷ (x + y).

Ratio of Speed and Time

If the distance is constant, the ratio of speeds is inversely proportional to the ratio of time taken (Speed1 : Speed2 = Time2 : Time1).

Average Speed (Equal Time Intervals)

When a person travels for two equal time intervals at speeds x and y, the average speed is the arithmetic mean (x + y) ÷ 2.

Q20. Answer: (a) 14 years

Shortcut Trick

The present sum of ages is 58 − (2 × 6) = 46 years.

If the son is s, then the man is 2s + 4.

Sum: s + 2s + 4 = 46 => 3s = 42 => s = 14.

Therefore The correct answer is 14 years.

Alternate Method

Given:

Present age relationship: Man = 2 × Son + 4

Future sum (after 6 years): 58 years

Calculations:

=> Let the present age of the son be x years.

=> The present age of the man = 2x + 4 years.

=> After 6 years, son's age = x + 6.

=> After 6 years, man's age = (2x + 4) + 6 = 2x + 10.

=> Sum of their ages after 6 years = (x + 6) + (2x + 10) = 58.

=> 3x + 16 = 58.

=> 3x = 58 − 16.

=> 3x = 42.

=> x = 42 ÷ 3 = 14.

Therefore The correct answer is 14 years.

Additional Information

Age Sum Calculation

When calculating the sum of ages after n years for k people, the sum increases by n × k. For two people, the sum increases by 2n.

Linear Equations in Ages

Age problems are typically solved by assigning a variable to the youngest person's present age to simplify the algebraic expression.

Age Ratio Rule

The difference between the ages of two individuals remains constant at any point in time, regardless of how many years pass.

Q21. Answer: (c) Rs. 62,000

Shortcut Trick

Investment ratio of A : B : C = 5 : 7 : 5

Time period ratio of A : B : C = 12 : 12 : 8 = 3 : 3 : 2

Profit sharing ratio = (5 × 3) : (7 × 3) : (5 × 2) = 15 : 21 : 10

Total ratio units = 15 + 21 + 10 = 46 units

Sum of B and C shares = 21 + 10 = 31 units

Value = (31 ÷ 46) × 92,000 = 31 × 2,000 = Rs. 62,000

Therefore The correct answer is Rs. 62,000.

Alternate Method

Given: Investment ratio A : B = 5 : 7. After 4 months, C joins with investment = A. Total profit = Rs. 92,000.

=> Let the initial investments of A and B be 5x and 7x.

=> Investment of C = Investment of A = 5x.

=> Time duration: A = 12 months, B = 12 months, C = (12 − 4) = 8 months.

=> Profit Ratio = (Capital_A × Time_A) : (Capital_B × Time_B) : (Capital_C × Time_C)

=> Profit Ratio = (5x × 12) : (7x × 12) : (5x × 8)

=> Profit Ratio = 60 : 84 : 40 = 15 : 21 : 10

=> Total profit units = 15 + 21 + 10 = 46 units.

=> Given, 46 units = Rs. 92,000.

=> 1 unit = 92,000 ÷ 46 = Rs. 2,000.

=> Sum of shares of B and C = (21 + 10) units = 31 units.

=> Sum = 31 × 2,000 = Rs. 62,000.

Therefore The correct answer is Rs. 62,000.

Additional Information

Partnership Ratio Formula

The profit sharing ratio in a business is always calculated as P1 : P2 = (C1 × T1) : (C2 × T2), where C is capital and T is time.

Compound Partnership

When partners invest their capitals for different time periods, it is called a compound partnership.

Active vs Sleeping Partner

An active partner manages the business and may receive a salary or extra share, while a sleeping partner only invests money.

Q22. Answer: (c) 4/31

Given:

{ (12/33) ÷ (12/2) } ÷ ((3/7) × (14/9) + (3/11)) + (2/8) ÷ (31/25) of (25/8)

Formula used:

The expression is solved using the BODMAS rule, which stands for Brackets, Of, Division, Multiplication, Addition, and Subtraction.

Calculations:

Solving the first Bracket and the Of operation:

=> { (12/33) × (2/12) } ÷ ((3/7 × 14/9) + 3/11) + (1/4) ÷ (31/25 × 25/8)

=> (2/33) ÷ (2/3 + 3/11) + (1/4) ÷ (31/8)

Solving the second Bracket and performing Division:

=> (2/33) ÷ ((22 + 9)/33) + (1/4) × (8/31)

=> (2/33) ÷ (31/33) + 2/31

Continuing with the Division operation:

=> (2/33) × (33/31) + 2/31

=> 2/31 + 2/31

Performing the final Addition:

=> 4/31

Therefore The correct answer is option (3).

Q23. Answer: (a) Rs. 561

Shortcut Trick

Apply the successive percentage change formula: a + b + (ab/100).

Here, increase a = +10% and discount b = −15%.

Net Change = 10 − 15 + (10 × (−15))/100 = −5 − 1.5 = −6.5%.

Final Price = 600 × (100 − 6.5)% = 600 × 93.5% = 6 × 93.5 = 561.

Therefore The correct answer is Rs. 561.

Alternate Method

Given: Initial Price = Rs. 600, Price Increase = 10%, Discount = 15%.

Calculations:

=> Increased Price = 600 + (10% of 600)

=> Increased Price = 600 + (10/100) × 600 = 600 + 60 = Rs. 660

=> Discount Amount = 15% of Rs. 660

=> Discount Amount = (15/100) × 660 = 0.15 × 660 = Rs. 99

=> Final Selling Price = Increased Price − Discount

=> Final Selling Price = 660 − 99 = Rs. 561

Therefore The correct answer is Rs. 561.

Additional Information

Successive Percentage Change

When a value is changed by x% and then by y%, the net percentage change is given by [x + y + (xy/100)]%.

Multiplying Factor Method

Final Value = Initial Value × (1 + r1/100) × (1 + r2/100). For a 10% increase, factor is 1.10; for a 15% discount, factor is 0.85.

Profit and Loss Relation

If the final price is greater than the initial cost, there is a profit; if less, there is a loss. Here, 561 < 600, so the net result is a 6.5% loss.

Q24. Answer: (b) 1

Shortcut Trick

For a number to be divisible by 24, it must be divisible by both 3 and 8.

Divisibility by 8: Last three digits 84B ÷ 8 => B can be 0 or 8.

Divisibility by 3: Sum of digits (4 + 6 + A + 4 + 8 + 4 + B) = 26 + A + B must be a multiple of 3.

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To find the minimum (A + B), we test B = 0: 26 + A + 0 = 27 (nearest multiple) => A = 1.
Then, A + B = 1 + 0 = 1.
Therefore The correct answer is 1.
Alternate Method
Given: The 7-digit number 46A484B is divisible by 24.
Formula Used: Divisibility rules for 3 and 8 (since 24 = 3 × 8).
Calculations:
=> For divisibility by 8, the last three digits 84B must be divisible by 8.
=> 840 ÷ 8 = 105 (Remainder 0), so B = 0 is possible.
=> 848 ÷ 8 = 106 (Remainder 0), so B = 8 is possible.
=> For divisibility by 3, sum of digits = 4 + 6 + A + 4 + 8 + 4 + B = 26 + A + B.
=> If B = 0, Sum = 26 + A. The smallest A making this divisible by 3 is A = 1 (as 26 + 1 = 27).
=> In this case, A + B = 1 + 0 = 1.
=> If B = 8, Sum = 26 + A + 8 = 34 + A. The smallest A making this divisible by 3 is A = 2 (as 34 + 2 = 36).
=> In this case, A + B = 2 + 8 = 10.
=> Comparing both cases, the minimum value of (A + B) is 1.
Therefore The correct answer is 1.
Additional Information
Divisibility Rule of 8
A number is divisible by 8 if its last three digits form a number that is divisible by 8 or if the last three digits are 000.
Divisibility Rule of 3
A number is divisible by 3 if the sum of all its digits is a multiple of 3.
Composite Divisibility
To check divisibility by a composite number like 24, check divisibility by its co-prime factors (e.g., 3 and 8, where HCF is 1).

Q25. Answer: (b) 22.5%

Shortcut Trick
Total Investment (CP) = 7000 + 400 + 600 = Rs. 8000
Selling Price (SP) = Rs. 9800
Profit = 9800 − 8000 = Rs. 1800
Profit % = (1800 ÷ 8000) × 100 = 22.5%
Therefore The correct answer is 22.5%.
Alternate Method
Given:
Purchase Price of microwave oven = Rs. 7,000
Transportation cost = Rs. 400
Repair cost = Rs. 600
Selling Price (SP) = Rs. 9,800
Formula Used:
Total CP = Purchase Price + Overhead Expenses
Profit % = [(SP − Total CP) ÷ Total CP] × 100
Calculations:
=> Total Investment (Total CP) = 7000 + 400 + 600
=> Total CP = Rs. 8,000
=> Profit = SP − Total CP
=> Profit = 9800 − 8000 = Rs. 1,800
=> Profit % = (1800 ÷ 8000) × 100
=> Profit % = 180 ÷ 8 = 22.5%
Therefore The correct answer is 22.5%.
Additional Information
Overhead Charges
Expenses like transportation, repairs, and labor are always added to the purchase price to calculate the effective Cost Price.

Profit and Loss Percentage

Profit % = (Profit ÷ CP) × 100 and Loss % = (Loss ÷ CP) × 100. Both are always calculated on the Cost Price unless specified otherwise.

Selling Price Calculation

SP = CP × (100 + Profit%) ÷ 100 or SP = CP × (100 − Loss%) ÷ 100.

Q26. Answer: (c) 64

Shortcut Trick

Ratio of number of boys to girls = 8 : 4 = 2 : 1.

Using Weighted Average method: Combined Average = (Ratio1 × Avg1 + Ratio2 × Avg2) ÷ (Total Ratio)

Combined Average = (2 × 56 + 1 × 80) ÷ (2 + 1)

Combined Average = (112 + 80) ÷ 3 = 192 ÷ 3 = 64.

Therefore The correct answer is 64.

Alternate Method

Given:

Number of boys (n1) = 8, Average score (a1) = 56

Number of girls (n2) = 4, Average score (a2) = 80

Formula Used:

Combined Average = (Total sum of scores) ÷ (Total number of students)

Calculations:

=> Total score of boys = 8 × 56 = 448

=> Total score of girls = 4 × 80 = 320

=> Total score of all students = 448 + 320 = 768

=> Total number of students = 8 + 4 = 12

=> Average score of all students = 768 ÷ 12 = 64

Therefore The correct answer is 64.

Additional Information

Weighted Average Formula

It is used when groups of different sizes are combined: Avg = (n1×a1 + n2×a2 + ...) ÷ (n1 + n2 + ...).

Deviation Method

Pick an assumed mean (A), calculate deviations (d), then find the true average using: Average = A + (Σf_id_i ÷ Σf_i).

Combined Mean Property

The combined average always lies between the lowest and the highest individual group averages.

Q27. Answer: (c) 6

Shortcut Trick

For any two-digit number, the difference between its digits is equal to the change in value upon reversing digits divided by 9.

Difference between digits = 27 ÷ 9 = 3

Given digit sum = 9

Unit digit = (Sum + Difference) ÷ 2 = (9 + 3) ÷ 2 = 6

Therefore The correct answer is 6.

Alternate Method

Given:

Sum of digits of a two-digit number = 9

Number + 27 = Reversed Number

Method: Algebraic representation where tens digit is x and unit digit is y.

Let the tens digit be x and the unit digit be y.

=> x + y = 9 ... (i)

=> The original number is 10x + y.

=> According to the problem: (10x + y) + 27 = 10y + x

=> 10x − x + y − 10y = −27

=> 9x − 9y = −27

=> x − y = −3 or y − x = 3 ... (ii)

=> Adding equation (i) and (ii): (x + y) + (y − x) = 9 + 3

=> 2y = 12

=> y = 6

=> x = 9 − 6 = 3

The number is 36 and its unit digit is 6.

Therefore The correct answer is 6.

Additional Information

Number Representation

A two-digit number with tens digit x and unit digit y is expressed as 10x + y. Its reversed form is 10y + x.

Difference Property

The difference between any two-digit number and its reverse is always a multiple of 9, specifically 9 × |x − y|.

Divisibility by 9

A number is divisible by 9 if and only if the sum of its digits is divisible by 9.

Q28. Answer: (c) 2,200

Shortcut Trick

Total Interest Percentage = Rate × Time = 20% × 3 = 60%

Given: 60% of Principal = Rs. 1,320

Principal (100%) = (1,320 ÷ 60) × 100

=> 22 × 100 = Rs. 2,200

Therefore The correct answer is Rs. 2,200.

Alternate Method

Given: Simple Interest (SI) = Rs. 1,320, Rate (R) = 20% per year, Time (T) = 3 years.

Formula Used: SI = (P × R × T) ÷ 100

=> 1,320 = (P × 20 × 3) ÷ 100

=> 1,320 = (P × 60) ÷ 100

=> 1,320 = 0.6 × P

=> P = 1,320 ÷ 0.6

=> P = (1,320 × 10) ÷ 6

=> P = 220 × 10

=> P = Rs. 2,200

Therefore The correct answer is Rs. 2,200.

Additional Information

Total Amount in Simple Interest

The total amount (A) is the sum of Principal and Interest. Formula: A = P + SI or A = P(1 + RT/100).

Constant Nature of SI

Unlike Compound Interest, Simple Interest remains constant for every year as it is always calculated on the original Principal amount.

Relationship between P, R, T and SI

If SI, R, and T are known, Principal can be found using P = (SI × 100) ÷ (R × T).

Q29. Answer: (b) Rs. 2,662

Shortcut Trick

The effective interest rate for 2 years at 10% per annum compounded annually is 10 + 10 + (10 × 10 ÷ 100) = 21%.

Given that the interest of 21% is equal to Rs. 462.

Value of 1% = 462 ÷ 21 = Rs. 22.

The total amount payable is Principal (100%) + Interest (21%) = 121%.

Total amount = 121 × 22 = Rs. 2,662.

Therefore The correct answer is Rs. 2,662.

Alternate Method

Given:

Principal (P) = Rs. y
Rate of Interest (R) = 10% per annum
Time (T) = 2 years
Compound Interest (CI) = Rs. 462
Formula Used:
CI = P × [(1 + R/100)^T − 1]
Amount (A) = Principal (P) + Compound Interest (CI)
Calculations:
=> 462 = y × [(1 + 10/100)² − 1]
=> 462 = y × [(1.1)² − 1]
=> 462 = y × [1.21 − 1]
=> 462 = 0.21 × y
=> y = 462 ÷ 0.21 = 2200
=> Total amount payable = y + 462 = 2200 + 462 = Rs. 2,662
Therefore The correct answer is Rs. 2,662.
Additional Information
Effective Interest Rate Formula
For a rate of R% for 2 years, the effective compound interest rate is calculated as R + R + (R × R ÷ 100).
Compound Interest Amount Formula
The total amount A is given by A = P × (1 + R/100)^n, where n is the number of years.
Difference between CI and SI
The difference between Compound Interest and Simple Interest for 2 years is P × (R ÷ 100)².

Q30. Answer: (c) 166

Shortcut Trick
Excluded Number = Old Average + (Remaining Count × Decrease in Average)
Remaining numbers = 15 − 1 = 14
Decrease in average = 6
Excluded Number = 82 + (14 × 6) = 82 + 84 = 166
Therefore The correct answer is 166.
Alternate Method
Given:
Total numbers (n1) = 15
Initial arithmetic mean (M1) = 82
Mean reduction = 6
Formula Used:
Sum of numbers = Average × Total count
Calculations:
=> Total sum of 15 numbers = 15 × 82 = 1230
=> Remaining numbers after exclusion = 15 − 1 = 14
=> New mean = 82 − 6 = 76
=> Total sum of 14 numbers = 14 × 76 = 1064
=> Excluded number = Sum of 15 numbers − Sum of 14 numbers
=> Excluded number = 1230 − 1064 = 166
Therefore The correct answer is 166.
Additional Information
Arithmetic Mean
The average of a set of data calculated by dividing the sum of all values by the total number of values.
Effect of Excluding an Item
If the excluded number is greater than the average, the mean of the remaining items decreases. If it is smaller, the mean increases.
Net Deviation Rule

The sum of deviations of all observations from their arithmetic mean is always zero. This property is used to find missing or excluded values quickly.

Q31. Answer: (d) 256 codes including accented characters

The correct answer is 256 codes including accented characters.

Key Points

• Extended ASCII is an 8-bit character encoding scheme that doubles the capacity of the original 7-bit Standard ASCII.

• The number of unique codes in a binary system is calculated as 2^n, where n is the number of bits. For an 8-bit system, this results in 2^8 = 256 unique character representations.

• The original ASCII set occupies the first 128 positions (0 to 127), which include English letters, digits, and control characters.

• The additional 128 positions (128 to 255) provided by the Extended ASCII set are used to map accented characters (such as á, é, ñ), mathematical symbols, and box-drawing glyphs.

• This expansion was critical for supporting Western European languages and other international symbols that could not be represented within the original 7-bit constraint.

Additional Information

• Evolution of Encoding Standards:

• Standard ASCII: Developed in 1963, it only utilized 7 bits, allowing for 128 codes, which was sufficient for basic English but lacked international support.

• ISO 8859-1: Also known as Latin-1, this is one of the most common implementations of Extended ASCII, catering specifically to Western European alphabets.

• Unicode: To solve the limitations of the 256-code ceiling, Unicode (such as UTF-8) was introduced, which can represent over 1.1 million characters across all global languages.

• Data Representation:

• In 7-bit ASCII, the eighth bit of a byte was often used as a parity bit for error detection during data transmission.

• In Extended ASCII, the eighth bit is repurposed as a data bit to expand the addressable character space to 256.

Q32. Answer: (b) Military Administration

The correct answer is Military Administration.

Key Points

• The Mansabdari System was the core administrative and military framework introduced by the Mughal Emperor Akbar in 1571 to streamline the empire's bureaucracy and military strength.

• The term Mansab is derived from the Arabic language, signifying a rank, status, or position held by an individual within the imperial hierarchy.

• It served as a mechanism for Military Administration because every officer of the state was assigned a military rank, requiring them to supply a specific contingent of troops to the Emperor when needed.

• The system was structured around two numerical designations: Zat, which indicated the personal rank and salary of the Mansabdar, and Sawar, which specified the number of cavalrymen or horsemen the official was mandated to maintain.

• Under this system, the Mughal nobility was organized into a single service, where promotions and appointments were strictly based on merit and loyalty, ensuring centralized control over the vast Mughal Army.

• Mansabdars were categorized into different grades, typically ranging from a rank of 10 to 10,000, with the highest ranks usually reserved for members of the royal family or Princes.

Additional Information

• Comparison with other Administrative Systems:

• Land Revenue Collection: While the Mansabdari system was often remunerated through Jagirs (land assignments), the specific mechanism for revenue assessment was the Zabt or Dahshala system, managed by Raja Todar Mal.

• Religious Reformation: Akbar is noted for his religious syncretism, specifically the Din-i-Ilahi (Divine Faith) founded in 1582, which was an ethical code rather than an administrative or military system.

• Judicial Reforms: Judicial functions were distinct from the military-centric Mansabdari system and were overseen by officials like the Qazi-ul-Quzat and the Mir Adl, who administered justice based on imperial decrees and religious laws.

Q33. Answer: (a) Aamir Khan

The correct answer is Aamir Khan.

Key Points

• Aamir Khan, a veteran Indian actor and filmmaker, was honored with the prestigious ‘Master Humor Award’ during the Macau International Comedy Festival 2025 held in China.

• The award recognizes his exceptional contribution to the comedy-drama genre and his unique ability to blend social commentary

with humor, reaching a massive global audience.

• Aamir Khan enjoys a legendary status in China, often referred to as a 'cultural ambassador' between India and China, primarily due to the historic success of his films like Dangal and 3 Idiots.

• The Macau International Comedy Festival (MICF) is a prominent cultural event co-founded by Mahua FunAge and Enlight Media, supported by the Macao SAR Government, to promote excellence in cinematic humor across Asia.

Additional Information

• Impact in China:

• Aamir Khan's film Dangal (2016) remains one of the highest-grossing non-English films in China, earning approximately 1.2 billion Chinese Yuan and sparking nationwide discussions on gender equality.

• He is affectionately known as 'Mi Shu' (Uncle Aamir) by his Chinese fans, highlighting his deep cross-cultural connection.

• Festival Highlights:

• The festival aims to establish Macau as a World Centre of Tourism and Leisure by integrating performing arts and film industries.

• The Master Humor Award is specifically designed to celebrate masters of the craft who have utilized satire and wit to address complex human emotions and societal norms.

• Events at the festival include film screenings, comedy forums, and interactive workshops featuring international filmmakers and humorists.

Q34. Answer: (c) The loudness increases

The correct answer is The loudness increases.

Key Points

• Amplitude represents the maximum displacement of the particles of a medium from their mean equilibrium position when a sound wave passes through it.

• The loudness of a sound is a physical sensation that depends directly on the amplitude of the vibrating object; specifically, loudness is proportional to the square of the amplitude (Loudness prop. to Amplitude^2).

• When the amplitude of the vibration is increased, the energy carried by the sound wave increases, which the human ear perceives as an increase in volume or loudness.

• If the amplitude is doubled, the loudness becomes four times (2^2) greater, whereas if the amplitude is tripled, the loudness increases by nine times (3^2).

• Loudness is typically measured in units called decibels (dB), and it serves to distinguish between a faint sound and a loud sound produced by the same source.

Additional Information

• Pitch and Frequency:

• Pitch is the characteristic of sound that allows us to distinguish between a shrill sound and a grave (deep) sound.

• It depends entirely on the frequency of the sound wave (the number of vibrations per second), not the amplitude.

• Higher frequency results in a higher pitch, while lower frequency results in a lower pitch.

• Speed of Sound:

• The velocity of sound is determined by the properties of the medium, such as elasticity, density, temperature, and humidity.

• Altering the amplitude or frequency of the wave does not change the speed at which the sound travels through a uniform medium.

• Timbre (Quality):

• This is the property that enables us to differentiate between sounds of the same loudness and pitch produced by different instruments, determined by the wave shape.

Q35. Answer: (d) Kiren Rijiju

The correct answer is Kiren Rijiju.

Key Points

• Kiren Rijiju, the Union Minister of Minority Affairs, presided over the National Level Conclave of Ministers of States/UTs for Minority Welfare held at Vanijya Bhawan, New Delhi.

• The conclave, conducted on 13 September 2025, served as a vital platform for coordination between the Central Government and various States and Union Territories to ensure the effective delivery of welfare schemes.

• During the event, the focus was placed on the Pradhan Mantri Jan Vikas Karyakram (PMJVK), which aims at creating socio-economic infrastructure and basic amenities in minority-concentrated areas.

• Discussions also revolved around the Pradhan Mantri Virasat Ka Samvardhan (PM VIKAS) scheme, which integrates components of skill development, entrepreneurship, and leadership for the upliftment of marginalized communities.

• The Minister emphasized the use of digital technology and Direct Benefit Transfer (DBT) to ensure transparency in Minority

Scholarship programs.

Additional Information

• George Kurian:

• He serves as the Minister of State in the Ministry of Minority Affairs and participated in the conclave to assist in the policy deliberations.

• Om Prakash Rajbhar:

• He is the Cabinet Minister for Minority Welfare, Muslim Waqf, and Haj in the Government of Uttar Pradesh.

• Md. Zama Khan:

• He holds the portfolio of Minister for Minority Welfare in the State Government of Bihar.

Therefore, the correct option is 4.

Q36. Answer: (d) Indian Statistical Institute

The correct answer is Indian Statistical Institute.

Key Points

• The Indian Statistical Institute (ISI) was founded by the legendary scientist and statistician Prasanta Chandra Mahalanobis on December 17, 1931.

• The institute was established in Kolkata (then Calcutta) and originated from a small Statistical Laboratory set up by Mahalanobis in the Presidency College.

• The primary objective of the ISI was to facilitate research, provide training, and apply statistical methods to solve complex socio-economic problems in India.

• Recognizing its immense contribution to the nation, the Parliament of India passed the Indian Statistical Institute Act in 1959, designating it as an Institute of National Importance.

• Under the leadership of Mahalanobis, the institute also launched Sankhya: The Indian Journal of Statistics in 1933, which became a prestigious platform for statistical research globally.

Additional Information

• Prasanta Chandra Mahalanobis:

• He is widely regarded as the Father of Indian Statistics.

• His birthday, June 29, is celebrated annually as National Statistics Day in India to commemorate his contributions to economic planning and statistical development.

• He was a key architect of the Second Five-Year Plan (1956−1961), which focused on heavy industrialization based on the Mahalanobis Model.

• Reserve Bank of India (RBI):

• Established on April 1, 1935, following the recommendations of the Hilton Young Commission.

• It serves as the Central Bank of India and was nationalized on January 1, 1949.

• Planning Commission:

• Formed in March 1950 by an executive resolution of the Government of India.

• It was responsible for formulating India's Five-Year Plans before being replaced by NITI Aayog on January 1, 2015.

Q37. Answer: (b) System software manages hardware; application software performs user tasks

The correct answer is System software manages hardware; application software performs user tasks.

Key Points

• System software serves as the foundational layer of a computer system, designed to provide a platform for other software and manage the underlying hardware components like the CPU, memory, and storage devices.

• The primary role of system software is to create an environment where application software can run efficiently by handling low-level tasks such as memory management, process scheduling, and disk management.

• Application software is a set of programs developed to perform specific tasks for the user, ranging from word processing and spreadsheet calculations to graphic design and web browsing.

• While system software starts running automatically when the computer boots up and operates in the background, application software is usually triggered by the user based on their immediate requirements.

• The distinction lies in the functionality: system software ensures the machine is operational and stable, whereas application software extends the computer's capabilities to solve user-specific problems.

Additional Information

• System Software Categories:

• Operating Systems (OS): Examples include Windows, Linux, and macOS, which act as the main interface between hardware and the user.

• Device Drivers: Specialized programs that allow the OS to communicate with hardware peripherals like printers, scanners, and video cards.

• Utility Software: Tools like antivirus programs, disk defragmenters, and backup software used for system maintenance.

• Application Software Categories:

• General Purpose: Software like Microsoft Word or Google Chrome that serves a wide variety of users.

• Customized Software: Tailor-made applications created for specific business needs, such as banking software or inventory management systems.

• Web-based Apps: Applications like Gmail or Netflix that run through a browser and perform remote data processing.

Q38. Answer: (d) Bhabar belt

The correct answer is Bhabar belt.

Key Points

• The Bhabar belt is a narrow region situated immediately at the foothills of the Shiwalik Range, marking the northernmost boundary of the Indo-Gangetic Plain.

• This belt stretches from the Indus River in the west to the Teesta River in the east, maintaining a width of approximately 8 to 16 kilometers.

• It is primarily composed of pebbles, gravel, and heavy boulders deposited by Himalayan rivers as they descend from the mountains and lose their velocity.

• The accumulation of these coarse materials results in extremely high porosity and permeability of the soil, causing surface streams to seep underground and disappear from the surface.

• Due to the lack of surface water and the presence of un-sorted rocky debris, this belt is generally unsuitable for agriculture, though large trees with deep roots can survive.

• Therefore, the Bhabar belt is the correct option.

Additional Information

• Terai belt

• Located south of the Bhabar, this is a zone where the underground streams re-emerge to the surface.

• It creates a wet, marshy, and swampy region characterized by thick forests and rich biodiversity.

• Khadar belt

• Comprises the younger alluvium of the floodplains that is renewed by fresh silt deposits during every monsoon season.

• It is highly fertile and intensive agriculture is practiced here for crops like paddy and wheat.

• Delta belt

• The lowest part of the plains where rivers slow down significantly and split into numerous distributaries.

• The Ganga-Brahmaputra Delta is the most prominent example, famous for its mangrove vegetation and silt deposition.

Q39. Answer: (c) National Capital Territory of Delhi

The correct answer is National Capital Territory of Delhi.

Key Points

• The National Capital Territory of Delhi was provided with a Legislative Assembly and a Council of Ministers through the 69th Constitutional Amendment Act, 1991.

• This amendment inserted Article 239AA into the Constitution of India, which designated the Union Territory of Delhi as the National Capital Territory (NCT) and provided that its administrator would be known as the Lieutenant Governor.

• The Legislative Assembly of Delhi has the power to make laws for the whole or any part of the NCT with respect to any of the matters enumerated in the State List or Concurrent List, except for Public Order, Police, and Land.

• The strength of the Legislative Assembly is fixed at 70 members, who are directly elected by the people from territorial constituencies.

Additional Information

• Apart from Delhi, Puducherry and Jammu and Kashmir are the other Union Territories that have provisions for a Legislative Assembly.

• Puducherry: It was the first Union Territory to have a legislature, created in 1963 under the Government of Union Territories Act, 1963.

• Ladakh: Created as a separate Union Territory in 2019 under the Jammu and Kashmir Reorganisation Act, 2019, but it is a Union Territory without a legislature.

• Andaman and Nicobar Islands: It is a Union Territory administered by the President of India through a Lieutenant Governor and does not possess its own Legislative Assembly.

• Lakshadweep: It is the smallest Union Territory of India and is administered directly by an Administrator appointed by the

President, without a local legislature.

Q40. Answer: (a) Polarization

The correct answer is Polarization.

Key Points

• Polarization is the process by which the vibrations of a transverse wave, such as light, are restricted to a single plane of direction. Natural sunlight is unpolarized, meaning its waves vibrate in multiple planes perpendicular to its path of travel.

• When light strikes a non-metallic horizontal surface like water or a wet road, it undergoes reflection. This reflected light becomes horizontally polarized, meaning the light waves predominantly vibrate in a horizontal orientation parallel to the surface.

• The intense, concentrated light resulting from this horizontal reflection is what we identify as glare. It is often blinding and reduces visual contrast, making it difficult to see objects clearly.

• Polarized sunglasses are designed with a special chemical film containing molecules aligned in vertical rows. This structure creates a vertical transmission axis that allows only vertically vibrating light to pass through while absorbing or blocking the horizontal component.

• By filtering out the horizontal light waves, these lenses effectively eliminate the glare from surfaces, allowing the wearer to see into the water or view the road with much higher definition and safety.

Additional Information

• Interference:

• This phenomenon occurs when two or more light waves overlap to form a resultant wave of greater, lower, or the same amplitude.

• In optics, thin-film interference is utilized in anti-reflective (AR) coatings for eyeglasses to reduce surface reflections, but it does not selectively filter polarized glare.

• Diffraction:

• This refers to the bending of light as it passes around the edge of an object or through a narrow aperture.

• It is a fundamental principle in spectroscopy and the study of the wave nature of light, but it is unrelated to the functionality of glare-reducing sunglasses.

• Refraction:

• This is the change in direction and speed of light as it passes from one medium to another, such as from air into glass.

• While refraction is the core principle used to create corrective lenses (to fix nearsightedness or farsightedness), it does not account for the removal of reflected glare.

• Brewster's Law:

• This law states that maximum polarization occurs when the tangent of the angle of incidence is equal to the refractive index of the reflecting medium.

Q41. Answer: (a) Article 356

The correct answer is Article 356.

Key Points

• Article 356 of the Indian Constitution provides for the imposition of President’s Rule in a state if the President, on receipt of a report from the Governor or otherwise, is satisfied that the State Government cannot be carried on in accordance with the provisions of the Constitution.

• When President’s Rule is imposed, the President dismisses the state council of ministers headed by the Chief Minister and the State Governor, on behalf of the President, carries on the state administration with the help of the Chief Secretary.

• The proclamation of President’s Rule must be approved by both Houses of Parliament (Lok Sabha and Rajya Sabha) within two months from the date of its issue through a simple majority.

• If approved, the proclamation continues for six months and can be extended for a maximum period of three years with the approval of the Parliament every six months.

• The President can also invoke Article 356 if a state fails to comply with or give effect to any direction from the Union under Article 365.

Additional Information

• Article 355

• It imposes a duty on the Union to protect every State against external aggression and internal disturbance.

• It also ensures that the government of every State is carried on in accordance with the provisions of the Constitution.

• Article 350

• It specifies the language to be used in representations for redress of grievances to any officer or authority of the Union or a State.

• Associated articles include Article 350A (instruction in mother-tongue at primary stage) and Article 350B (Special Officer for

Linguistic Minorities).

• Article 249

• It empowers the Parliament to legislate with respect to a matter in the State List in the national interest.

• This requires the Rajya Sabha to pass a resolution supported by not less than two-thirds of the members present and voting.

Q42. Answer: (d) Poverty line ratio

The correct answer is Poverty line ratio.

Key Points

• The Human Development Index (HDI) is a summary composite measure of average achievement in three basic dimensions of human development: a long and healthy life, knowledge, and a decent standard of living.

• Life expectancy at birth is the core indicator used to assess the health dimension. It reflects the overall mortality level and quality of healthcare services available to a population.

• The Education index assesses the knowledge dimension through two primary indicators: Mean years of schooling (average number of years of education received by people ages 25 and older) and Expected years of schooling (years of schooling a child of school-entrance age can expect to receive).

• Gross National Income (GNI) per capita, adjusted for Purchasing Power Parity (PPP) in constant international dollars, is the indicator used to measure the economic standard of living.

• The Poverty line ratio, which indicates the percentage of the population living below a specific income threshold, is not a constituent indicator of the HDI. It is instead used in other metrics like the Multidimensional Poverty Index (MPI) or national poverty assessments.

Additional Information

• Origin and Purpose:

• The HDI was developed in 1990 by economists Mahbub ul Haq and Amartya Sen to shift the focus of development economics from national income accounting to people-centered policies.

• It is published annually by the United Nations Development Programme (UNDP) as part of the Human Development Report.

• The HDI value ranges from 0 to 1, where values closer to 1 signify higher levels of human development.

• Calculation Method:

• The HDI is the geometric mean of the normalized indices for each of the three dimensions (Health, Education, and Income).

• Other related indices released by the UNDP include the Gender Inequality Index (GII) and the Inequality-adjusted Human Development Index (IHDI).

Q43. Answer: (d) Gandhi Sagar Wildlife Sanctuary

The correct answer is Gandhi Sagar Wildlife Sanctuary.

Key Points

• Gandhi Sagar Wildlife Sanctuary, located in the Mandsaur and Neemuch districts of Madhya Pradesh, has been officially designated as the second home for cheetahs in India.

• This translocation is a critical expansion of Project Cheetah, which was launched to reintroduce the species after it was declared extinct in India in 1952.

• A female cheetah named Dheera is part of the cohort scheduled for the inaugural release into the sanctuary by early 2025, signifying the successful scaling of the breeding and translocation initiative.

• The sanctuary spans approximately 368 square kilometers and features a landscape of dry deciduous forests and vast grasslands, which mimics the natural habitat required for the cheetahs agility and hunting patterns.

• To ensure a safe environment, a 64-square-kilometer predator-proof enclosure has been constructed, and thousands of prey animals like Chital (spotted deer) have been relocated from other parks to the sanctuary.

Additional Information

• Kuno National Park:

• Located in Madhya Pradesh, it was the first site to receive cheetahs from Namibia and South Africa in 2022.

• Gir Wildlife Sanctuary:

• Situated in Gujarat, this sanctuary is famous for being the exclusive and final natural habitat of the Asiatic Lion.

• Ranthambore National Park:

• Located in Rajasthan, it is one of India's most prominent Tiger Reserves, known for its significant population of Bengal tigers and its historical fort.

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Q44. Answer: (b) Madhya Pradesh

The correct answer is Madhya Pradesh.

Key Points

• The Vindhyachal Super Thermal Power Station is located in the Singrauli district of the Indian state of Madhya Pradesh.

• It is currently the largest thermal power plant in India, with a total installed capacity of 4,760 MW.

• The facility is owned and operated by NTPC Limited (formerly National Thermal Power Corporation), a leading Maharatna public sector enterprise.

• The power station utilizes coal-fired units and was commissioned in multiple stages, starting with its first unit in 1987.

• The coal required for power generation is sourced primarily from the Nigahi mines of Northern Coalfields Limited, while water is drawn from the Rihand Reservoir.

• The electricity generated is supplied to various states in the Western Region of India, including Madhya Pradesh, Gujarat, Maharashtra, Goa, and Chhattisgarh.

Additional Information

• Chhattisgarh

• This state houses major power facilities such as the Sipat Super Thermal Power Station in Bilaspur and the Korba Super Thermal Power Station.

• Rajasthan

• Key thermal power plants in this state include the Suratgarh Super Thermal Power Station and the Chhabra Thermal Power Plant.

• Gujarat

• Notable power plants in Gujarat include the Mundra Thermal Power Station (operated by Adani Power) and the Wanakbori Thermal Power Station.

• Singrauli District

• Known as the Energy Capital of India, this region is a massive hub for coal mining and thermal power production, serving as the base for multiple NTPC projects.

Q45. Answer: (d) Vinaya Pitaka

The correct answer is Vinaya Pitaka.

Key Points

• The Vinaya Pitaka is the first of the three divisions of the Tipitaka, which serves as the canonical law of Theravada Buddhism. It primarily focuses on the rules of discipline and conduct for the Sangha (monastic community).

• It contains the Patimokkha, a set of 227 rules for monks (Bhikkhus) and 311 rules for nuns (Bhikkhunis), governing everything from moral behavior to daily etiquette.

• The text is divided into three main sections: the Suttavibhanga (detailed commentary on the rules), the Khandhaka (rules for community life and organization), and the Parivara (a summary and analysis of the rules).

• The Suttavibhanga explains the historical origin of each rule, providing a narrative context for why the Buddha deemed a particular regulation necessary.

• The Khandhaka further branches into the Mahavagga and Cullavagga, which detail procedures for admission into the order, the observation of the Uposatha days, and the management of monastic dwellings.

Additional Information

• Sutta Pitaka

• It is the collection of the Buddha's sermons and theoretical teachings.

• It is divided into five Nikayas: Digha, Majjhima, Samyutta, Anguttara, and Khuddaka.

• It covers a wide range of topics including ethics, meditation, and metaphysics through dialogues and discourses.

• Abhidhamma Pitaka

• This basket contains a systematic and philosophical analysis of the Dhamma.

• It reorganizes the teachings of the Sutta Pitaka into a strictly academic and psychological framework, focusing on the nature of consciousness and matter.

• Jataka Stories

• These are stories concerning the previous births of Gautama Buddha in both human and animal forms.

• The Jatakas are technically part of the Khuddaka Nikaya within the Sutta Pitaka rather than being a separate basket themselves.

• They are used to illustrate the Paramitas (perfections) required for Enlightenment.

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Q46. Answer: (c) 2:1

The correct answer is 2:1.

Key Points

• Electrolysis is the process of using electricity to decompose a compound into its constituent elements. In the case of water (H2O), it is split into Hydrogen and Oxygen gases.

• The balanced chemical equation for the electrolysis of water is 2H2O(l) → 2H2(g) + O2(g).

• According to the stoichiometry of this reaction, two molecules of water decompose to produce two molecules of Hydrogen gas and one molecule of Oxygen gas.

• Based on Avogadro Law, the volume of a gas is directly proportional to the number of moles of the gas at a constant temperature and pressure. Therefore, the molar ratio of 2:1 translates directly to a volume ratio of 2:1.

• During the electrolytic decomposition, the amount of hydrogen gas collected is exactly double the amount of oxygen gas by volume.

Additional Information

• Electrode Reactions:

• At the Cathode (negative electrode), reduction takes place: 4H^+ + 4e^− → 2H2(g). This is where Hydrogen gas is released.

• At the Anode (positive electrode), oxidation takes place: 2H2O → O2(g) + 4H^+ + 4e^−. This is where Oxygen gas is released.

• Mass Ratio: It is important to distinguish between volume and mass. The mass ratio of Hydrogen to Oxygen in water is 1:8, because oxygen is significantly denser and heavier than hydrogen.

• Electrolyte: Pure water is a poor conductor of electricity. To facilitate electrolysis, a few drops of dilute Sulphuric acid (H2SO4) or a salt are added to provide free ions for conductivity.

• Hofmann Voltameter: This is the specialized apparatus used to perform this experiment, allowing for the visual verification of the 2:1 displacement ratio in the gas collection tubes.

Q47. Answer: (d) Forced taxation and famine pushed dispossessed peasants into rebel groups.

The correct answer is Forced taxation and famine pushed dispossessed peasants into rebel groups..

Key Points

• The Sanyasi-Fakir Rebellion (circa 1763−1800) was one of the earliest organized resistances against the British East India Company in Bengal and Bihar, emerging shortly after the Battle of Buxar.

• The Great Bengal Famine of 1770 was a primary catalyst; it decimated nearly one-third of the local population and destroyed the rural economy, yet the British relentlessly continued forced tax collection.

• Impoverished and dispossessed peasants, who lost their lands due to the Ijaradari system and high revenue demands, found common cause with the displaced religious mendicants.

• The rebellion was fueled by the British decision to restrict the pilgrimage movements of Sanyasis (Hindu monks of the Giri order) and Fakirs (Sufi followers of Madari sect), viewing them as 'lawless vagabonds'.

• Prominent leaders like Majnu Shah, Bhabani Pathak, and Devi Chaudhurani coordinated attacks on Company factories, treasuries, and the homes of wealthy zamindars who collaborated with the British.

Additional Information

• Literary Significance:

• The rebellion gained immortal fame through Bankim Chandra Chattopadhyay's 1882 novel Anandamath, which features the patriotic song Vande Mataram.

• Another work by the same author, Devi Chaudhurani, also reflects the socio-political climate of this era.

• British Policy Impact:

• The East India Company labeled the rebels as 'thugs' or 'bandits' to delegitimize their struggle, but the rebels were largely seen as folk heroes by the local peasantry.

• The high land revenue rates under the Dual Government system in Bengal (1765−1772) created a vacuum where traditional rural safety nets vanished, pushing the masses toward insurgency.

• Geographical Spread:

• The rebellion was centered in northern Bengal districts such as Rangpur, Dinajpur, and Mymensingh, often using dense forests as tactical retreats for guerrilla warfare.

Q48. Answer: (c) Kyoto Protocol

The correct answer is Kyoto Protocol.

Key Points

• The Kyoto Protocol was adopted on 11 December 1997 in Kyoto, Japan, and entered into force on 16 February 2005.

• It was the first international agreement to establish legally binding obligations for developed countries to reduce their

Greenhouse Gas (GHG) emissions.

• The treaty is based on the principle of Common But Differentiated Responsibilities (CBDR), acknowledging that industrialized nations are primarily responsible for the historical levels of atmospheric GHGs.

• Under the first commitment period (2008−2012), 37 industrialized countries and the European Community committed to reduce emissions by an average of 5% against 1990 levels.

• The protocol introduced innovative flexible mechanisms to meet targets, including International Emissions Trading, the Clean Development Mechanism (CDM), and Joint Implementation (JI).

Additional Information

• Rio Declaration (1992):

• Adopted at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit.

• It consists of 27 principles intended to guide sustainable development but does not set binding emission targets.

• Basel Convention:

• An international treaty that focuses on the control of transboundary movements of hazardous wastes and their disposal.

• It aims to minimize the generation of toxic waste and ensure its environmentally sound management.

• Paris Agreement (2015):

• A legally binding international treaty on climate change adopted at COP21.

• Unlike the Kyoto Protocol, it requires all countries (both developed and developing) to submit Nationally Determined Contributions (NDCs) to limit global warming to well below 2 degrees Celsius.

Q49. Answer: (d) Germany

The correct answer is Germany.

Key Points

• The Kensington Treaty, signed in July 2025, represents a historic milestone in the bilateral relations between the United Kingdom and Germany, serving as the first comprehensive treaty between the two nations since the Second World War.

• This landmark agreement was the result of a diplomatic "reset" initiated by the Labour government under Prime Minister Keir Starmer and the German Federal Government led by Chancellor Olaf Scholz to strengthen ties in a post-Brexit landscape.

• The treaty focuses on deep cooperation across multiple sectors, most notably Security and Defense, Trade, Climate Action, and Energy Security, aiming to create a formal framework for long-term strategic partnership.

• A central pillar of the Kensington Treaty is the enhancement of the European pillar of NATO, ensuring that the two largest economies in Europe coordinate closely on transatlantic security and defense procurement.

• The agreement also facilitates easier movement for professional services and researchers, addressing economic barriers that emerged after the UK's departure from the European Union.

• By signing this treaty, both nations have signaled a shift from informal cooperation to a legally binding commitment to protect democratic values and international law in a volatile global geopolitical environment.

Additional Information

• Geopolitical Context of UK Relations:

• Japan: While the UK has strengthened ties with Japan through the Hiroshima Accord and the Reciprocal Access Agreement (RAA), these are primarily focused on the Indo-Pacific security architecture rather than a post-WWII foundational friendship treaty.

• France: The UK's relationship with France is largely governed by the Lancaster House Treaties of 2010. While significant, they predate the 2025 diplomatic reset seen with Berlin.

• United States: The UK maintains a Special Relationship with the United States, recently bolstered by the Atlantic Declaration (2023), which focuses on economic and technological cooperation rather than a traditional bilateral friendship treaty.

Q50. Answer: (c) Odisha

The correct answer is Odisha.

Key Points

• Pattachitra is one of the oldest and most popular traditional art forms of Odisha, with its name originating from the Sanskrit words Patta (meaning cloth/canvas) and Chitra (meaning picture).

• The art form is intrinsically linked to the Jagannath cult and the temple traditions of Puri. It is traditionally used to create Anasara Patti, which are paintings of the deities used for worship during the 15-day ritual seclusion (Anasara) of Lord Jagannath, Balabhadra, and Subhadra.

• The traditional center for this art is Raghurajpur in Puri district, which has been designated as a Heritage Crafts Village where artists known as Chitrakars have preserved the technique for generations.

• The preparation of the canvas is a meticulous process involving cotton cloth treated with a mixture of chalk and tamarind seed gum, followed by polishing with stones to create a smooth, leather-like surface.

• The paintings are characterized by bold lines, ornate floral borders, and the exclusive use of natural pigments derived from

conch shells (white), lamp soot (black), and various minerals (red, yellow, blue).

Additional Information

• Bihar

• Home to the world-renowned Madhubani painting (or Mithila art), which is traditionally practiced by women using natural dyes and fingers, twigs, or matchsticks.

• Other notable art forms include Manjusha art (scroll paintings) and Tikuli art.

• Rajasthan

• Famous for Phad painting, a style of religious scroll painting on cloth dedicated to folk deities like Pabuji and Devnarayan.

• It is also the center for Pichwai art, which depicts scenes from the life of Lord Krishna (Shrinathji) on large cloth hangings.

• Punjab

• While best known for Phulkari (floral embroidery), the region also fostered the Sikh School of Art, characterized by manuscript illustrations and frescoes found in Gurdwaras.

Q51. Answer: (a) India

The correct answer is India.

Key Points

• The International Conference on 'Reimagining Existence: Emerging Perspectives in World Literature and Language' was successfully conducted on March 10 and 11, 2025.

• The prestigious event was organized and hosted by the Department of English, School of Liberal Arts (SLA) at XIM University, which is located in Bhubaneswar, Odisha, India.

• The conference utilized a hybrid mode, allowing for both in-person participation at the IC II Seminar Hall and virtual attendance from global scholars and delegates.

• The primary objective of the conference was to explore the evolving aspects of human identity, culture, and consciousness through the lens of global literary and linguistic traditions.

• It provided a vital platform for academicians, writers, translators, and researchers to address modern global challenges such as climate change, migration, and technological transformation.

Additional Information

• XIM University:

• It is a premier private university based in Bhubaneswar, India, formerly known as Xavier University.

• The inaugural address of the conference was delivered by Fr. Antony R. Uvari, the Vice Chancellor of the university.

• Notable Speakers:

• The keynote address was delivered by Prof. David Anshen from the University of Texas Rio Grande Valley, USA.

• A plenary speech was given by Prof. Pramod K. Nayar, the UNESCO Chair in Vulnerability Studies from the University of Hyderabad.

• Academic Output:

• The scholarly articles and research papers presented during the two-day event were later curated into a collection published by Bloomsbury Publishing.

Q52. Answer: (d) Both statements I and II are correct.

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

Key Points

• In 1580, the Mughal Emperor Akbar organized the empire into administrative units known as Subas. Each province was headed by a Subedar (also known as Sipah Salar), who was the executive head and commander of the provincial forces. He was directly appointed by the Emperor and was responsible for maintaining law, order, and general administration. Hence, statement I is correct.

• The Daroga-i-Dak was the superintendent of the Postal and Intelligence Department. His primary responsibility was to maintain the communication channel between the central government and the provinces. He managed the dispatch of imperial orders and the receipt of news reports from local officials like the Waqia-navis. Hence, statement II is correct.

Additional Information

• Provincial Officials:

• Diwan: He was the head of the revenue department at the provincial level and acted as a check on the Subedar. He was appointed by the Imperial Diwan.

• Bakshi: This official looked after the military administration, including the payment of salaries and the recruitment of provincial troops.

• Sadr: Responsible for religious grants, judicial matters, and charitable endowments within the Suba.

• Waqia-navis: They were the official news reporters who kept the Emperor informed about every important occurrence in the province via the Daroga-i-Dak.

• Kotwal: Functioned as the city administrator and police chief, responsible for law enforcement and internal security in urban areas.

Q53. Answer: (c) Tropical Deciduous vegetation

The correct answer is Tropical Deciduous vegetation.

Key Points

• Tropical Deciduous Forests are the most widespread and dominant forest type in India, covering approximately 65 percent of the total forest area of the country.

• Popularly known as Monsoon Forests, they flourish in regions that receive an annual rainfall ranging between 70 cm and 200 cm.

• Based on the availability of water, these forests are further categorized into Moist Deciduous (rainfall between 100-200 cm) and Dry Deciduous (rainfall between 70-100 cm).

• A defining characteristic of this vegetation is that the trees shed their leaves for about six to eight weeks during the dry summer to prevent loss of moisture through transpiration.

• They are geographically distributed across the foothills of the Himalayas, eastern slopes of the Western Ghats, Odisha, Chhattisgarh, Jharkhand, and the Peninsular plateau.

• Economically, these forests are highly valuable as they provide timber from species such as Teak, Sal, Sandalwood, Shisham, Arjun, Kusum, and Mulberry.

Additional Information

• Mountain Vegetation:

• Found in high-altitude regions like the Himalayas where the temperature decreases with height.

• It transitions from wet temperate forests to coniferous forests (Pine, Deodar) and finally to Alpine vegetation at higher elevations.

• Dry Tropical Thorn Vegetation:

• Found in semi-arid regions receiving less than 70 cm of rainfall, such as Rajasthan, Gujarat, and Haryana.

• Trees are typically stunted with deep roots and thick stems, including Acacias, Euphorbias, and Cacti.

• Tidal Mangrove Vegetation:

• Located along coastal areas and river deltas influenced by tides and saline water.

• The Sundarbans in West Bengal is the largest mangrove habitat, dominated by Sundari trees.

Q54. Answer: (d) Raipur

The correct answer is Raipur.

Key Points

• The 60th All India Conference of Directors General and Inspectors General of Police is scheduled to be held in Raipur, the capital city of Chhattisgarh, in November 2025.

• This high-level annual summit is organized by the Intelligence Bureau (IB) and serves as a premier platform for top police leadership to deliberate on internal security challenges and policing strategies.

• Prime Minister Narendra Modi will chair the core sessions of the conference, continuing the tradition of the head of government spending substantial time interacting with the country's top police brass.

• Union Home Minister Amit Shah and National Security Advisor Ajit Doval are also key participants, guiding discussions on policy implementation and inter-state police coordination.

• The venue Raipur was selected following the successful conclusion of the 59th conference, highlighting the strategic importance of Chhattisgarh in India's internal security map.

Additional Information

• Objectives of the Conference:

• The primary focus includes the effective implementation of new criminal laws—Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), and Bharatiya Sakshya Adhiniyam (BSA).

• Specific sessions are dedicated to tackling Cyber Crime, Drug Trafficking, Left-Wing Extremism (LWE), and the security implications of Artificial Intelligence (AI) in policing.

• The conference promotes Cooperative Federalism by bringing together Directors General of Police (DGPs) from all States and Union Territories alongside heads of Central Armed Police Forces (CAPFs).

• Historical Context:

• Since 2014, the conference has been moved out of Delhi to different states to provide exposure to regional security dynamics; previous venues include Jaipur (2024), Bhubaneswar (2024), and Lucknow.

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• The 59th All India DGP/IGP Conference was hosted in Bhubaneswar, Odisha, where the formal announcement for the Raipur edition was consolidated.

Q55. Answer: (a) (i) False, (ii) True

The correct answer is (i) False, (ii) True.

Key Points

• The Central Processing Unit (CPU) does not execute program code directly from a Hard Disk or any permanent storage device because these devices are significantly slower than the processor; instead, the Operating System (OS) must first load the code into the Random Access Memory (RAM) for execution. Hence, statement (i) is incorrect.

• Windows 11 utilizes a Preemptive Multitasking model where the OS Scheduler assigns a specific duration of processor time, known as a Time Slice or Quantum, to various active processes, switching between them so rapidly that it creates the effect of simultaneous execution. Hence, statement (ii) is correct.

Additional Information

• Random Access Memory (RAM):

• It is the Primary Memory of the computer system characterized by high-speed data access and Volatile storage, meaning it loses data when power is removed.

• The Memory Management unit of the Windows 11 OS ensures that only the necessary fragments of a program (pages) are loaded into RAM to optimize performance.

• Time-Sharing Systems:

• This technique allows multiple users or programs to share the resources of a single CPU by alternating execution in small intervals, improving Throughput and responsiveness.

• It prevents a single application from monopolizing the Processor, ensuring a smooth User Interface (UI) experience in modern environments like Windows 11.

• Windows 11 OS Architecture:

• It is built upon the Windows NT kernel, which is designed to handle complex Process Scheduling, security protocols, and Virtual Memory management.

• The system uses Context Switching to save the state of a process before moving to the next time slice, allowing the previous task to resume exactly where it left off.

Q56. Answer: (d) 1999

The correct answer is 1999.

Key Points

• The Foreign Exchange Management Act (FEMA) was introduced by the Government of India in 1999 to replace the archaic Foreign Exchange Regulation Act (FERA) of 1973.

• This legislative transition was a direct result of the economic liberalization policies initiated in 1991, which necessitated a shift from a control-oriented regime to a management-oriented framework.

• While the FEMA bill was passed by the Indian Parliament in December 1999, it officially came into force on June 1, 2000, marking the complete repeal of FERA.

• The primary objective of the 1999 Act is to facilitate external trade and payments and to promote the orderly development and maintenance of the foreign exchange market in India.

• Under FEMA, the legal philosophy changed significantly; violations that were previously treated as criminal offenses under FERA were reclassified as civil offenses.

• The act applies to the whole of India and also extends to all branches, offices, and agencies outside India that are owned or controlled by a person resident in India.

Additional Information

• Foreign Exchange Regulation Act (FERA), 1973:

• Enacted during a period of acute foreign exchange shortage, it was designed to conserve foreign exchange reserves through strict regulations.

• It was characterized by its draconian provisions, where the burden of proof lay on the accused, and the Enforcement Directorate (ED) had extensive powers of arrest and search.

• Key Features of FEMA, 1999:

• Current Account Transactions: These are generally permitted unless specifically restricted by the Central Government.

• Capital Account Transactions: The Reserve Bank of India (RBI) is empowered to specify the classes of capital account transactions and the limit up to which foreign exchange shall be admissible.

• Adjudicating Authority: It provides for the appointment of Adjudicating Officers for holding inquiries and an Appellate Tribunal for hearing appeals against the orders of these officers.

Q57. Answer: (c) 44th Amendment

The correct answer is 44th Amendment.

Key Points

• The 44th Amendment Act, 1978, was enacted by the Janata Party government primarily to nullify the various distortions introduced into the Constitution of India by the 42nd Amendment Act, 1976, during the Emergency.

• Prior to this, the 42nd Amendment had significantly expanded the scope of Article 31C to state that no law giving effect to any or all Directive Principles of State Policy (DPSP) could be declared void on the ground of being inconsistent with the Fundamental Rights (specifically Articles 14, 19, and 31).

• The 44th Amendment sought to restore the balance between Part III (Fundamental Rights) and Part IV (Directive Principles) by stripping away the absolute immunity granted to all DPSPs over Fundamental Rights, thereby reinstating the primacy of individual liberties.

• A crucial step in this restoration was the removal of the Right to Property as a Fundamental Right (originally Article 19(1)(f) and Article 31) and its reclassification as a Legal Right under Article 300A, which reduced the friction between state-led socio-economic reforms and individual rights.

• The amendment also ensured that the enforcement of the rights guaranteed by Articles 20 and 21 (Protection in respect of conviction for offences and Protection of life and personal liberty) cannot be suspended even during a National Emergency.

Additional Information

• 42nd Amendment Act, 1976:

• Often referred to as the Mini-Constitution, it was enacted by the Indira Gandhi government.

• It added the words Socialist, Secular, and Integrity to the Preamble.

• It introduced Fundamental Duties under Part IV-A (Article 51A).

• 74th Amendment Act, 1992:

• This amendment granted constitutional status and protection to the Urban Local Bodies (ULBs) or Municipalities.

• It added Part IX-A and the 12th Schedule to the Constitution of India.

• 84th Amendment Act, 2001:

• It extended the freeze on the number of seats in the Lok Sabha and State Legislative Assemblies until the year 2026.

• This was based on the population figures of the 1991 Census and later adjusted to the 2001 Census for delimitation purposes without changing the total number of seats.

Q58. Answer: (d) Surya Sen

The correct answer is Surya Sen.

Key Points

• Surya Sen, popularly known as Masterda due to his profession as a school teacher, was the primary architect and leader of the Chittagong Armoury Raid executed on April 18, 1930.

• He founded and led the Indian Republican Army (IRA), Chittagong Branch, which was modeled after the Irish Republican Army to challenge British colonial rule through armed resistance.

• The meticulously planned operation targeted two major armories in Chittagong (now in Bangladesh): the Police Armoury and the Auxiliary Force Armoury, with the aim of seizing weapons and ammunition.

• Under his leadership, approximately 65 revolutionaries successfully severed communication lines by destroying telegraph and telephone wires and disrupted railway links to isolate the city from British reinforcements.

• After the raid, Surya Sen hoisted the Indian National Flag outside the captured police armoury and was proclaimed the head of the Provisional Revolutionary Government.

• Following the Battle of Jalalabad Hills on April 22, 1930, he went underground for nearly three years before being captured in February 1933 and was eventually hanged on January 12, 1934.

Additional Information

• Jatin Das

• A prominent member of the Hindustan Socialist Republican Association (HSRA).

• He is best remembered for his 63-day hunger strike in Lahore Jail in 1929, protesting against the ill-treatment of political prisoners, which led to his martyrdom.

• Bhagat Singh

• A key figure in the HSRA who was involved in the Lahore Conspiracy Case and the 1929 Central Legislative Assembly bombing.

• He was executed on March 23, 1931, alongside Rajguru and Sukhdev.

• Chandrasekhar Azad

• The reorganized leader of the HSRA who participated in the Kakori Train Robbery.

• He vowed never to be caught alive by the British and died during a shootout at Alfred Park, Allahabad, in February 1931.

Q59. Answer: (d) 42nd Amendment Act

The correct answer is 42nd Amendment Act.

Key Points

• The Preamble of the Indian Constitution has been amended only once since its enactment on January 26, 1950, which was achieved through the 42nd Amendment Act, 1976.

• This landmark legislation was passed during the National Emergency (1975−1977) under the government of Prime Minister Indira Gandhi, following the recommendations of the Swaran Singh Committee.

• The amendment inserted three significant words into the Preamble: 'Socialist', 'Secular', and 'Integrity'.

• The addition of 'Socialist' and 'Secular' transformed the description of India from a 'Sovereign Democratic Republic' to a 'Sovereign Socialist Secular Democratic Republic'.

• Furthermore, the phrase 'Unity of the Nation' was replaced with 'Unity and Integrity of the Nation' to emphasize the territorial and psychological unity of the country.

Additional Information

• The 42nd Amendment Act is widely referred to as the 'Mini-Constitution' because it brought about massive changes across various parts of the document.

• It introduced Fundamental Duties for citizens under a new Part IV-A (Article 51A).

• It transferred five subjects—Education, Forests, Weights and Measures, Protection of Wild Animals and Birds, and Administration of Justice—from the State List to the Concurrent List.

• 62nd Amendment Act: Enacted in 1989, this act extended the reservation of seats for Scheduled Castes (SC) and Scheduled Tribes (ST) in the Lok Sabha and State Legislative Assemblies for another 10 years (until 2000).

• 52nd Amendment Act: Passed in 1985, it is famously known as the Anti-Defection Law. It added the 10th Schedule to the Constitution to disqualify members of Parliament or State Legislatures on grounds of defection.

• 32nd Amendment Act: Enacted in 1973, it provided for the insertion of Article 371-D and Article 371-E to ensure equitable opportunities in Andhra Pradesh for public employment and education, specifically addressing the Telangana region's grievances.

Q60. Answer: (a) IIT Madras

The correct answer is IIT Madras.

Key Points

• The IRIS chip is a cutting-edge semiconductor design developed by the SHAKTI team at IIT Madras, representing a major milestone in India's mission for technological sovereignty in February 2025.

• It is built upon the SHAKTI microprocessor framework, which is the first indigenous industrial-grade processor family in India, designed using the open-source RISC-V Instruction Set Architecture (ISA).

• The development of the IRIS chip directly supports the Atmanirbhar Bharat (Self-Reliant India) initiative by providing a home-grown alternative to foreign proprietary semiconductor technologies like ARM and Intel.

• The IRIS variant is specifically optimized for Edge Computing and Internet of Things (IoT) devices, emphasizing high energy efficiency, integrated security features, and a small silicon footprint for compact hardware.

• This project was managed by the RISE Group (Reconfigurable Intelligent Systems Engineering) within the Department of Computer Science and Engineering at IIT Madras, funded largely by the Ministry of Electronics and Information Technology (MeitY).

Additional Information

• SHAKTI Microprocessor Project:

• Launched in 2014, the project aims to develop six different classes of processors, including the E-class for low-power microcontrollers and the C-class for core-level compute tasks.

• The project is led by Professor V. Kamakoti, the current Director of IIT Madras, who has been instrumental in advocating for indigenous hardware in India's strategic sectors.

• The IRIS chip signifies the evolution of this project into commercial-ready silicon that can be mass-produced for the domestic electronics market.

• India Semiconductor Mission (ISM):

• This is a specialized business division within the Digital India Corporation tasked with building a sustainable semiconductor and display ecosystem in the country.

• The IRIS development aligns with the Design Linked Incentive (DLI) scheme, which offers financial incentives and design infrastructure support to domestic startups and academic institutions.

• RISC-V Architecture:

• Unlike proprietary architectures, RISC-V is a royalty-free, open-standard ISA that allows Indian engineers to customize hardware for specific security protocols without needing external licenses or being subject to export controls.

Q61. Answer: (c) Directly processes natural resources

The correct answer is Directly processes natural resources.

Key Points

• The Tertiary Sector, often called the Service Sector, involves activities that provide support and intangible value, such as tourism, banking, trade, and transportation. Hence, statement 1 is correct.

• A primary feature of tertiary services is that they rely on human interaction, which may take place face-to-face (like medical consultations) or through remote digital communication and telecommunications. Hence, statement 2 is correct.

• The act of directly processing natural resources is the fundamental characteristic of the Primary Sector, which includes agriculture, mining, forestry, and fishing; the tertiary sector does not engage in raw material extraction. Hence, statement 3 is incorrect.

• Service-based industries are often located in urban areas because these regions provide the necessary infrastructure, a dense consumer market, and a specialized labor force required for commercial activities. Hence, statement 4 is correct.

Additional Information

• Economic sectors are categorized based on the nature of activity:

• Primary Sector: Focused on the extraction and harvesting of natural resources. It includes quarrying, farming, and animal husbandry.

• Secondary Sector: Involved in manufacturing and construction, where raw materials are transformed into finished products (e.g., steel production or textile mills).

• Quaternary Sector: A knowledge-oriented subset of the service sector involving information technology, research and development (R&D), and financial planning.

• Quinary Sector: Comprises the highest level of decision-making, including government officials, top executives, and scientific consultants who formulate policies and strategies.

Q62. Answer: (b) Red Fort

The correct answer is Red Fort.

Key Points

• The Red Fort, or Lal Qila, is a historic fortification in Old Delhi that serves as the designated venue for the national Independence Day ceremony held every August 15.

• The Prime Minister of India hoists the National Flag (Tiranga) from the ramparts of the fort, specifically at the Lahori Gate, to commemorate India's freedom from British rule.

• This tradition was initiated by the first Prime Minister, Jawaharlal Nehru, on August 15, 1947, symbolizing the birth of a sovereign nation and the end of the British Raj.

• The ceremony includes a 21-gun salute, the singing of the national anthem, Jana Gana Mana, and an address to the nation by the Prime Minister detailing the country's progress and future vision.

• The fort was commissioned by Mughal Emperor Shah Jahan in 1638 and is recognized as a UNESCO World Heritage Site for its architectural and historical significance.

Additional Information

• India Gate:

• A prominent war memorial located on Kartavya Path (formerly Rajpath) in New Delhi, designed by Sir Edwin Lutyens.

• It commemorates the soldiers of the British Indian Army who died during World War I and the Third Anglo-Afghan War.

• Jantar Mantar:

• An astronomical observatory built by Maharaja Jai Singh II of Jaipur in 1724, consisting of 13 architectural astronomy instruments.

• The primary purpose of the structures was to compile astronomical tables and predict the times and movements of the sun, moon, and planets.

• Qutb Minar:

• A 73-metre high victory tower and UNESCO World Heritage Site located in the Mehrauli area of Delhi.

• Its construction was started by Qutb-ud-din Aibak in 1192 and completed by his successor Iltutmish and later Firoz Shah Tughlaq.

• Protocol Distinction:

• On Independence Day (August 15), the flag is hoisted (pulled from bottom to top) by the Prime Minister at the Red Fort.

• On Republic Day (January 26), the flag is unfurled (unfolded while tied at the top) by the President of India at Kartavya Path.

Q63. Answer: (d) It is a System Driver File that allows the operating system to communicate with a specific hardware component.

The correct answer is It is a System Driver File that allows the operating system to communicate with a specific hardware component..

Key Points

• The .sys extension is the standard file format for Windows System Files, which are primarily used as device drivers or hardware configuration files that interact directly with the Windows Kernel.

• The specific directory C:\Windows\System32\drivers is the critical repository where Windows 11 stores Kernel-mode driver files required for the operating system to manage hardware peripherals and core system resources.

• A System Driver File acts as a software interface or 'translator,' enabling the Operating System (OS) to send high-level commands to hardware devices (such as network cards, disk drives, or chipsets) and receive feedback or data in return.

• Files located in the drivers folder are typically loaded during the boot sequence; they operate at a high privilege level (Ring 0) to ensure efficient and direct communication with the physical hardware layer of the computer.

Additional Information

• Application Data Files:

• These files usually reside in C:\Users[Username]\AppData or ProgramData folders. They store user-specific settings or temporary data and typically use extensions like .xml, .json, or .dat rather than .sys.

• System Configuration Files:

• Most modern Windows 11 configurations are managed via the Windows Registry or Group Policy. Legacy configuration files like .ini or .cfg are text-based, whereas .sys files are binary files that cannot be read or edited using a standard text editor.

• Operating System Log Files:

• System events are recorded in Log Files (extensions like .log or .evtx), typically found in C:\Windows\Logs. These records are viewed through the Event Viewer utility rather than the Task Manager.

• Impact of Deletion:

• Deleting or corrupting a System Driver File like mydriver.sys can lead to severe system instability, hardware failure, or the Blue Screen of Death (BSOD) because the OS loses the ability to control a specific hardware component.

Q64. Answer: (d) Hospitality

The correct answer is Hospitality.

Key Points

• Hospitality is recognized as the core foundational pillar of the tourism industry, as it encompasses the essential services required by travelers, including accommodation, food and beverage, and guest relations.

• The relationship between tourism and hospitality is symbiotic; while Tourism refers to the activity of people traveling to places outside their usual environment, Hospitality provides the infrastructure and service quality that makes the stay possible and comfortable.

• The hospitality sector includes lodging operations such as hotels, resorts, and homestays, which are vital for any tourist destination to sustain overnight visitors and generate economic value.

• Key components of hospitality in tourism also involve culinary services and event management, ensuring that the basic physiological and social needs of a tourist are met during their journey.

Additional Information

• Banking

• This service belongs to the Financial Sector.

• In the context of travel, it facilitates currency exchange, international transactions, and ATM accessibility, but it remains a supporting function rather than a core tourism component.

• Insurance

• Insurance is a part of the Financial and Risk Management sector.

• While Travel Insurance is highly recommended to cover medical emergencies or trip cancellations, it is a risk-mitigation tool and not an inherent part of the tourism experience itself.

• Teaching

• Teaching is the primary activity of the Education Sector.

• It focuses on pedagogical methods and knowledge dissemination, which does not directly involve the hosting or servicing of travelers within the tourism value chain.

Q65. Answer: (a) 2019

The correct answer is 2019.

Key Points

• Ladakh officially became a Union Territory of India on October 31, 2019, following the enactment of the Jammu and Kashmir Reorganisation Act, 2019.

• The proposal to reorganize the state was introduced in the Rajya Sabha on August 5, 2019, and received the Presidential assent on August 9, 2019.

• This administrative change led to the bifurcation of the erstwhile state of Jammu and Kashmir into two separate Union Territories: Jammu and Kashmir and Ladakh.

• The effective date, October 31, was chosen to coincide with the birth anniversary of Sardar Vallabhbhai Patel, who played a pivotal role in the political integration of India.

• Ladakh is established as a Union Territory without a legislature, meaning it is governed directly by the Central Government through an appointed Lieutenant Governor.

Additional Information

• Administrative Structure of Ladakh:

• The Union Territory comprises two primary districts: Leh and Kargil.

• Radha Krishna Mathur was sworn in as the first Lieutenant Governor of the Union Territory of Ladakh in 2019.

• While it lacks a state-level assembly, it retains its Autonomous Hill Development Councils for both Leh and Kargil to manage local governance.

• Constitutional Context:

• The transition occurred alongside the effective abrogation of Article 370, which previously granted special autonomous status to the region.

• The Union Territory of Jammu and Kashmir, unlike Ladakh, was created with a provision for its own Legislative Assembly, similar to the model of Puducherry.

• National Unity Day (Rashtriya Ekta Diwas) is celebrated annually on October 31, the same day the new administrative status of the region was formalized.

Q66. Answer: (b) Bhimbetka

The correct answer is Bhimbetka.

Key Points

• Located in the Raisen district of Madhya Pradesh, the Bhimbetka rock shelters are situated within the Vindhya Mountain Range and represent the earliest traces of human life on the Indian subcontinent.

• The site features over 700 rock shelters, containing paintings that provide a continuous cultural record from the Upper Paleolithic and Mesolithic periods through the Chalcolithic and into the historic period.

• Mesolithic paintings at Bhimbetka are characterized by depictions of hunting, dancing, and various animals such as bison, tigers, and elephants, often painted in red and white pigments.

• The historic period paintings at the site demonstrate a transition in social life, featuring warriors on horseback, processions, and religious symbols, indicating more organized societal structures.

• Discovered by archaeologist Dr. V.S. Wakankar in 1957, Bhimbetka was designated as a UNESCO World Heritage Site in 2003 for its exceptional prehistoric art.

Additional Information

• Nalanda:

• Situated in Bihar, it was a world-famous ancient Buddhist university and monastic center that reached its peak during the Gupta Empire and Pala Empire.

• It is purely a historic period site, serving as a hub for higher learning and Buddhist philosophy.

• Hampi:

• Located in Karnataka on the banks of the Tungabhadra River, it was the grand capital of the Vijayanagara Empire during the 14th to 16th centuries.

• It is known for its Dravidian style temple architecture and was a major medieval historic trade center.

• Pattadakal:

• A UNESCO World Heritage Site in Karnataka, it represents the high point of Chalukya architecture during the 7th and 8th centuries.

• The site features a unique blend of Nagara and Dravidian temple styles, categorized as the Vesara style, and belongs strictly to the historic period.

Q67. Answer: (d) A system where the Company collected revenue, and Nawab handled administration

The correct answer is A system where the Company collected revenue, and Nawab handled administration.

Key Points

• The Dual Government system was a unique administrative arrangement introduced in Bengal by Robert Clive in 1765 following the British victory in the Battle of Buxar.

• Under this system, the administration of Bengal was divided into two distinct parts: Diwani and Nizamat.

• The East India Company acquired the Diwani rights (the right to collect revenue and manage civil justice) from the Mughal Emperor Shah Alam II through the Treaty of Allahabad.

• The Nawab of Bengal was restricted to Nizamat functions, which included general administration, maintenance of law and order, and criminal justice.

• This arrangement created a scenario where the British exercised actual power and controlled the financial resources without any responsibility, while the Nawab bore the full responsibility of administration without the funds or power to execute it.

• The Company exercised its Diwani powers through appointed Deputy Diwans, specifically Mohammad Reza Khan for Bengal and Raja Shitab Roy for Bihar.

Additional Information

• Battle of Buxar (1764):

• This decisive battle was fought between the British East India Company and the combined forces of Mir Qasim (Nawab of Bengal), Shuja-ud-Daula (Nawab of Awadh), and Shah Alam II (Mughal Emperor).

• The British victory established them as a dominant political power in Northern India.

• Abolition of Dual Government:

• The system was eventually abolished in 1772 by Warren Hastings, who brought Bengal under the direct control of the Company.

• The abolition was necessitated by the rampant corruption, administrative breakdown, and the devastating impact of the Great Bengal Famine of 1770.

• Robert Clive:

• Served as the first Governor of Bengal and is credited with laying the foundation of British rule in India.

• He returned to India in 1765 specifically to reform the administration and consolidate the gains made after Buxar.

Q68. Answer: (b) Mohamed Salah

The correct answer is Mohamed Salah.

Key Points

• Mohamed Salah, the prolific forward for Liverpool FC, was officially named the Professional Footballers' Association (PFA) Player of the Year in August 2025.

• With this achievement, he became the first player in history to win the prestigious award three times, establishing a new record in English football.

• Salah's previous victories in the PFA Players' Player of the Year category occurred during the 2017–18 and 2021–22 seasons.

• The PFA Player of the Year is an annual award given to the player who is adjudged to have been the best of the year in English football, based on a vote by the members of the players' union, the Professional Footballers' Association.

• Winning the award in 2025 highlights his consistent performance and dominance in the Premier League, where he has maintained elite scoring and playmaking levels for nearly a decade.

Additional Information

• Award History and Multi-time Winners:

• Before Mohamed Salah secured his third trophy, the record for most wins was two, shared by several legends including Mark Hughes, Alan Shearer, Thierry Henry, Cristiano Ronaldo, Gareth Bale, and Kevin De Bruyne.

• The award has been presented since the 1973–74 season and is considered one of the most coveted individual honors because it is voted for by the players' own peers.

• Mohamed Salah's Legacy:

• Known as the 'Egyptian King', Salah has broken numerous records at Liverpool, including becoming the club's all-time leading scorer in the Premier League era.

• His 2024–25 campaign, which led to the August 2025 recognition, was characterized by high goal contributions and leadership on the pitch.

Q69. Answer: (a) Article 243Q

The correct answer is Article 243Q.

Key Points

• Article 243Q of the Indian Constitution mandates the establishment of three types of Municipalities in every State based on the size and nature of the urban area.

• This provision was introduced by the 74th Constitutional Amendment Act, 1992, which added Part IXA to the Constitution, providing a formal structure to Urban Local Bodies (ULBs).

• A Nagar Panchayat is constituted for a transitional area, which is a location shifting from a rural to an urban character.

• A Municipal Council is established for a smaller urban area, ensuring local governance and infrastructure management.

• A Municipal Corporation is created for a larger urban area, typically characterized by high population density and significant revenue generation.

• The Governor of the state has the authority to define and notify these areas based on factors such as population, density, and the percentage of employment in non-agricultural activities.

Additional Information

• Article 243P:

• Contains the Definitions for terms used in Part IXA, including Metropolitan area, Municipal area, and Panchayat.

• A Metropolitan area is defined as an area having a population of ten lakhs or more.

• Article 243R:

• Deals with the Composition of Municipalities, requiring all seats to be filled by direct election from territorial constituencies.

• It allows for the representation of the Lok Sabha and Legislative Assembly members within the municipal body.

• Article 243S:

• Provides for the Constitution and Composition of Wards Committees in municipalities having a population of three lakhs or more.

• The 74th Amendment also introduced the Twelfth Schedule, which lists 18 functional items such as urban planning, fire services, and public health that fall under municipal jurisdiction.

Q70. Answer: (b) Vitamin D

The correct answer is Vitamin D.

Key Points

• Vitamin D is a fat-soluble vitamin that functions primarily as a steroid hormone, playing a critical role in maintaining calcium homeostasis and bone health.

• The primary function of Vitamin D is to enhance the intestinal absorption of calcium and phosphorus by stimulating the expression of calbindin and TRPV6 transport proteins in the small intestine.

• Without adequate Vitamin D, the body can only absorb about 10% to 15% of dietary calcium, but with sufficient levels, the absorption efficiency increases to 30% to 40%.

• It is synthesized in the skin upon exposure to ultraviolet B (UVB) radiation, converting 7-dehydrocholesterol into Vitamin D3 (cholecalciferol).

• The active form of the vitamin, 1,25-dihydroxyvitamin D or calcitriol, is produced in the kidneys and acts on the bone cells (osteoblasts and osteoclasts) to regulate bone remodeling.

• Deficiency in this vitamin can lead to skeletal deformities like Rickets in children and Osteomalacia or Osteoporosis in adults, where bones become brittle and weak.

Additional Information

• Vitamin C

• It is a water-soluble vitamin, also known as ascorbic acid, found in citrus fruits and leafy greens.

• Its primary role is the synthesis of collagen and acting as a potent antioxidant; its deficiency leads to Scurvy.

• Vitamin A

• A fat-soluble vitamin that is vital for vision, as it is a component of rhodopsin in the retina.

• It supports immune function and skin health; major sources include retinol from animal liver and beta-carotene from carrots.

• Vitamin B

• A complex of water-soluble vitamins (B1, B2, B12, etc.) that act as coenzymes in various metabolic pathways.

• They are essential for energy production, red blood cell formation, and maintaining neurological health.

Q71. Answer: (b) EC−ZA

The logic followed here is:

Option 1) LJ−HF

Option 2) EC−ZA

Option 3) RP−NL

Option 4) OM−KI

The letter-cluster that DOES NOT belong to the group is: EC−ZA.

Hence, the correct answer is "Option (2)"

Q72. Answer: (b) aw

The logic followed here is the comparison method of coding-decoding. By identifying common words in the given phrases, we can determine their corresponding codes.

Thus, the code for coal is aw.

Hence, the correct answer is "Option 2".

Q73. Answer: (b) JF −4

The logic followed here is:

For, KH 13 is related to ID 2

For,LO 9 is related to JK −2

Similarly, for LJ 7

So, LJ 7 will be related to JF -4.

Hence, the correct answer is 'Option 2'.

Q74. Answer: (d) E 33

The logic follows here,

Hence, the correct answer is “Option 4”.

Q75. Answer: (c) Brother's wife's brother

Family Chart:

According to the information given in the question :

A is				
Symbol	•	−	×	÷
Meaning	Son	Brother	Wife	Father
of B				

Given: S + D ÷ F × H − K

Family Tree Doagram will be :

Therefore, S is the brother of F, who is the wife of H, and H is the brother of K. This means S is the Brother's wife's brother of K.

Hence, the correct answer is 'Option 3'.

Q76. Answer: (d) D

Given:R, E, A, D, I, N and G are sitting around a circular table, facing the centre of the table.

1) G sits third to the left of A

2) D sits to the immediate right of A

3) D sits second to the left of N

4) Only two people sit between N and R when counted from the left of R.

5) I is not an immediate neighbor of G.

The final Arrangement is,

According to final arrangement D sits third to the right of E

Hence, "Option 4" is the correct answer.

Q77. Answer: (b) YOW 22

The logic follows here,

So, 'YOW 22' will replace the question mark in the given series.

Hence, the correct answer is "Option 2"

Q78. Answer: (a) 4

The logic followed here is:

Given : L A N G U I D

Arranged in the English alphabetical order: A D G I L N U

Left A D G I L N U Right

Letters between D and I are E, F, G, and H.

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Thus, there are 4 letters.

Hence, the correct answer is "Option 1".

Q79. Answer: (d) QOMN

The logic follows here.

For 'GECD' related to 'CAYZ':

G(7)	E(5)	C(3)	D(4)
−4 ↓	−4 ↓	−4 ↓	−4 ↓
C(3)	A(1)	Y(25)	Z(26)

For 'AYWX' related to 'WUST':

A(1)	Y(25)	W(23)	X(24)
−4 ↓	−4 ↓	−4 ↓	−4 ↓
W(23)	U(21)	S(19)	T(20)

Similarly, 'USQR':

U(21)	S(19)	Q(17)	R(18)
−4 ↓	−4 ↓	−4 ↓	−4 ↓
Q(17)	O(15)	M(13)	N(14)

Thus, USQR is related to QOMN.

Hence, the correct answer is 'Option 4'.

Q80. Answer: (b) More than three

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

According to the question:

Required condition: Perfect square - Even Digit - Odd digit

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

Thus, there are more than 3 numbers that are immediately preceded by a perfect square and immediately followed by an odd digit: 9 2 3, 1 4 5, 1 2 9, 9 8 3.

Hence, "Option 2" is the correct answer.

Q81. Answer: (c) WUY

The logic follows here,

Hence, the correct answer is “Option 3”.

Q82. Answer: (a) 199

The logic followed here is:

• 13 + 6 = 19

• 19 + (6 × 2) = 19 + 12 = 31

• 31 + (12 × 2) = 31 + 24 = 55

• 55 + (24 × 2) = 55 + 48 = 103

• 103 + (48 × 2) = 103 + 96 = 199

Hence, the correct answer is 'Option 1'.

Q83. Answer: (d) Only conclusion (II) follows

The least possible Venn diagram for the given statements is:

Conclusions:

(I) Some cakes are pizzas—False. (There is no direct relation between cakes and pizza, as all cakes are biscuits and all pizzas are biscuits. So, maybe it is possible but not definite)

(II) Some biscuits are pizzas — True (Asall pizzas are biscuits that means some biscuits are also a part of pizza and some pizza is a part of biscuit).

Only conclusion (II) follows.

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The correct answer is option 4.

Q84. Answer: (a) 1

Given:

1) A is kept second from the bottom.

2) Only three boxes are kept between A and G.

3) E is kept at one of the positions below A.

Position	Box
7 (Top)	
6	G
5	
4	
3	
2	A
1 (Bottom)	E

4) Only D is kept between G and F. (This means F must be at position 4 and D must be at position 5).

5) C is kept at one of the positions above G. (Since G is at position 6, C must be at position 7).

6) B is the only box left, so it will be kept at position 3.

The final arrangement is

7	C
6	G
5	D
4	F
3	B
2	A
1	E

Thus, only 1 box is kept between B and E.

Hence, the correct answer is 'Option 1'.

Q85. Answer: (c) 982

The logic followed is:

Decoding the information,

Symbol	•	÷	•	×
Meaning	•	•	×	÷

Given : 92 - 8 ÷ 311 + 715 × 11 = ?

After replacing the signs from left to right and using the BODMAS rule,

92 × 8 + 311 - 715 ÷ 11 = ?

= 92 × 8 + 311 - 65

= 736 + 311 - 65

= 1047 - 65

= 982

Hence, the correct answer is "Option 3".

Q86. Answer: (a) None

Given: Seven people, Mayank, Nidhi, Palak, Rakesh, Surya, Tina, and Vivek, are sitting in a row, facing north.

1) Only two people sit to the right of Rakesh.

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2) Nidhi sits to the immediate left of Vivek and Vivek sits third to the left of Rakesh.

3) Palak sits third to the right of Tina, but Palak does not sit at any extreme ends.

4) Rakesh is not an immediate neighbour of Mayank.

The final arrangement is,

Thus, no one sitting between Tina and Vivek

Hence, the correct answer is 'Option 1.'

Q87. Answer: (a) 44

The logic followed here is:

Position of John from the bottom = 16^(th)

Position of John from the top = 29^(th)

Total number of students in the class = (Position from the top + Position from the bottom) − 1

= 29 + 16 − 1

= 45 − 1

= 44

Hence, the correct answer is 'Option 1'.

Q88. Answer: (a) 365

The logic followed here is:

• 14 − 5 = 9 = 3^2

• 41 − 14 = 27 = 3^3

• 122 − 41 = 81 = 3^4

• 365 − 122 = 243 = 3^5

• 1094 − 365 = 729 = 3^6

Hence, the correct answer is 'option 1'

Q89. Answer: (a) NK-RO

The logic followed here is:

Logic: In each pair, the difference between the alphabetical positions of the letters in the first cluster is 3, while the difference in the second cluster is 2.

Option 1) NK-RO,

This pair does not follow the rule.

Option 2) PM-TR,

Option 3) LI-PN,

Option 4) RO-VT,

Hence, the correct answer is 'Option 1'.

Q90. Answer: (c) 45

According to the given Venn diagram:

The shaded area represents

• Number of person who are Employees and German Speakers (but not male) = 28

• Number of persons who are Employees, German Speakers, and also Male = 17

Total employees who speak German = 28 + 17 = 45

Hence, the correct answer is "Option 3".

Q91. Answer: (c) 18

Given: 2 is added to each odd digit and 2 is subtracted from each even digit in the number 6127385.

Given	5	9	7	3	6	4	2
Operation	-2	-2	-2	-2	+2	+2	+2
New number	3	7	5	1	8	6	4

The new number formed is 3751864.

Sum of all the even digits in the new number thus formed: 8 + 6 + 4 = 14

Hence, the correct answer is "Option 3".

Q92. Answer: (c) URY

The logic followed here,

Logic: (First letter − 3) = Second letter; (Second letter + 6) = Third letter.

Option 1) QNT:

Option 2) MJP:

Option 4) JGM:

Option 3) URY:

This letter-cluster does not follow the same rule as the others.

Therefore, the letter-cluster that is different from the others is URY.

Hence, the correct answer is 'Option 3'.

Q93. Answer: (d) 4 - 9 - 36

The logic followed here is:

Logic: First Number × Second Number = Third Number

In (8 - 3 - 24)

=> 8 × 3 = 24

In (5 - 8 - 40)

=> 5 × 8 = 40

Similarly,

4 - 9 - 36

=> 4 × 9 = 36

Here, in (4, 9, 36) similar logic is followed.

Hence, the correct answer is 'Option 4'.

Q94. Answer: (d) 59 km towards east

Given:

• Amit starts from Point Y and drives 14 km towards South.

• He then turns left and drives 35 km, takes a left and drives 68 km.

• He then takes a left turn and drives 41 km.

• He takes a left turn, drives 54 km, turns right and drives 53 km to stop at Point Z

• The final Diagram,

The shortest distance and the direction in which he should drive in order to reach Point Y again is = 53 km + 6 km = 59 km and in the east direction.

Hence, the correct answer is "Option 4".

Q95. Answer: (b) Four

The logic followed here is based on the positions of letters in the English alphabetical order.

Logic:

• Vowels (A, E, I, O, U) are replaced by the letter that is 2 positions ahead (+2).

• Consonants are replaced by the letter that is 2 positions behind (−2).

Applying the logic to the word TRAJECTORIES:

Original Letter	**T**	**R**	**A**	**J**	**E**	**C**	**T**	**O**	**R**	**I**	**E**	**S**
Operation	-2	-2	+2	-2	+2	-2	-2	+2	-2	+2	+2	-2
New Letter	R	P	C	H	G	A	R	Q	P	K	G	Q

The new group of letters formed is: R, P, C, H, G, A, R, Q, P, K, G, Q

The letters that appear exactly twice are R, P, G, and Q are 4.

Hence, the correct answer is "Option 2".

Q96. Answer: (c) LPSM

The logic followed in this pattern is a consistent alphabetical shift of +5 for each letter in the sequence.

For 'AEHB' related to 'FJMG':

A(1)	E(5)	H(8)	B(2)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
F(6)	J(10)	M(13)	G(7)

For 'DHKE' related to 'IMPJ':

D(4)	H(8)	K(11)	E(5)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
I(9)	M(13)	P(16)	J(10)

Applying the same logic to 'GKNH':

G(7)	K(11)	N(14)	H(8)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
L(12)	P(16)	S(19)	M(13)

Thus, GKNH is related to LPSM.

Hence, the correct answer is 'Option 3'.

Q97. Answer: (b) 8

The logic followed here is,

Therefore, the code for E is 8.

Hence, correct answer is option 2

Q98. Answer: (a) 15

Given: 603 + 9 × 18 − 6 ÷ 56 = ?

After '+' and '÷' are interchanged and '−' and '×' are interchanged and using the BODMAS rule,

603 ÷ 9 − 18 × 6 + 56 = ?

= 603 ÷ 9 − 18 × 6 + 56

= 67 − 18 × 6 + 56

= 67 + 56 − 108

= 123 − 108

= 15

Hence, the correct answer is "Option 1".

Q99. Answer: (d) Father's sister

Given: Family Chart:

The family tree diagram is,

S is father of P and T is sister of S. T is the Father's sister of P.

Hence, the correct answer is 'Option 4'.

Q100. Answer: (b) 92

The logic followed here is:

Total number of students = (Rank from the top + Rank from the bottom) − 1

Given:

Rank of Uvx from the top = 14^(th)

Rank of Uvx from the bottom = 79^(th)

Total number of students = (Rank from the top + Rank from the bottom) − 1

= (14 + 79) − 1

= 93 − 1

= 92

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Hence, the total number of students in the class is 92.

Hence, the correct answer is 'Option 2'.

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