RRB NTPC (UG) CBT-I Official Paper (Held On 07 May, 2026 Shift 2) (Previous Year Paper)

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

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MATHEMATICS

Q1. The curved surface area of a solid cylinder is numerically equal to the total surface area of another cylinder whose radius is half of the first cylinder. If the height and radius of the first cylinder are 7 cm and 4 cm, respectively. find the curved surface area of the second cylinder.

(a) 40π cm²
(b) 48π cm²
(c) 52π cm²
(d) 65π cm²

Q2. A shopkeeper marks an item at Rs. 4,000. During a festival, he first offers a discount of 25% on the marked price. After a week, he increases the discounted price by 20% to earn more profit. What is the final selling price of the item after these successive changes?

(a) Rs. 3,400
(b) Rs. 3,600
(c) Rs. 3,500
(d) Rs. 3,700

Q3. The sum of two numbers is 72. If the larger number is increased by 8 and the smaller number is decreased by 6, then the resulting numbers are in the ratio 3 : 2, respectively. Find the smaller of the original two numbers.

(a) 35.6
(b) 32.5
(c) 35
(d) 34.2

Q4. If 9^x - 9^(x-1) = 72, then the value of (2x-1)/(2x+3) is:

(a) 3/4
(b) 3/7
(c) 3/8
(d) 3/5

Q5. A retailer buys 60 pens and sells them at the purchase price of 72 pens. Determine his profit percentage.

(a) 20%
(b) 12%
(c) 15%
(d) 16%

Q6. Two trains, X and Y, are running on parallel tracks. Train X is 200 m long and travels at 72 km/hr. Train Y is 300 m long. If the trains are traveling in opposite directions, they pass each other completely in 15 seconds. If the trains were traveling in the same direction, how long would it take for the faster train to overtake the slower one?

(a) 72 seconds
(b) 67.5 seconds

(c) 78 seconds
(d) 75 seconds

Q7. If 5 and 10 are given, what is the third proportional to these numbers?
(a) 20
(b) 25
(c) 30
(d) 15

Q8. Trains from Delhi, Lucknow, and Jaipur depart every 12 minutes, 18 minutes, and 27 minutes, respectively. If all depart together at 6:00 am, when will they depart together again?
(a) 7:36 am
(b) 7:48 am
(c) 7:40 am
(d) 7:24 am

Q9. A television is marked at Rs. 50,000. A retailer gives a 15% discount on the first 70% of the price and a 5% discount on the rest. What is the total percentage discount offered?
(a) 12%
(b) 10%
(c) 11%
(d) 13%

Q10. Calculate the total amount when Rs. 4000 is invested at 10% compound interest per annum, compounded annually for 2 years.
(a) Rs. 4400
(b) Rs. 4080
(c) Rs. 4800
(d) Rs. 4840

Q11. Find the single discount equivalent to three successive discounts of 10% on a commodity.
(a) 25.8%
(b) 27.1%
(c) 28.2%
(d) 26.9%

Q12. A tank is being filled by two taps, M and N. M fills the tank completely in 18 hours and N fills it in 9 hours. A leakage at the bottom of the tank can empty the completely filled tank in 27 hours. How long will it take to fill the empty tank completely if both taps are opened while the leakage continues?
(a) 73/7 hours
(b) 7 5/7 hours
(c) 6 4/7 hours
(d) 6 5/7 hours

Q13. Which of the following digits should replace X so that the three-digit number 2X2 is divisible by 4?
(a) 1
(b) 2
(c) 0
(d) 4

Q14. Two taps can fill a cistern in 4 hours and 11 hours, respectively. A third tap can empty it in 11 hours. How long (in hours) will it take to fill one-fourth of the empty cistern if all the taps are opened together?
(a) 4
(b) 3
(c) 2
(d) 1

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Q15. A student scores 75, 80 and 90 in three tests with weights 2,3 and 5 respectively. What is the weighted average score?

(a) 84
(b) 85
(c) 83
(d) 82

Q16. A shopkeeper offers the following schemes on toys of the same marked price.

(A) Successive discounts of 44% and 12% on any number of toys bought.

(B) Successive discounts of 18%, 43% and 23% on any number of toys bought.

(C) 8% discount on the first 4 toys and 38% discount on each toy thereon.

(D) On buying ten items, the customer is billed for only seven items.

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

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

Q17. The average of k numbers is x. If 48 is subtracted from each of any two of the numbers, then we get (x-12) as the new average.

Find the value of k.

(a) 5
(b) 10
(c) 8
(d) 3

Q18. A train runs at 72 km/h for 3 hours and then at 60 km/h for 1.5 hours.

What is the average speed of the train?

(a) 67 km/h
(b) 66 km/h
(c) 65 km/h
(d) 68 km/h

Q19. Evaluate $24^3 + (-7)^3 + (-17)^3$

(a) 8396
(b) 8450
(c) 8568
(d) 8345

Q20. A transaction code 92419 is not divisible by 13. To make it divisible by 13, the least digit should be appended at the end of the number. What is that digit?

(a) 6
(b) 2
(c) 5
(d) 4

Q21. The diagonals of a rhombus-shaped field are 224 m and 420 m long.

What is the perimeter (in m) of the field?

(a) 952
(b) 922
(c) 904
(d) 944

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Q22. The speeds of two cars are in the ratio 5 : 7. The faster car covers 140 km in 2 hours.
How much distance will the slower car cover in the same time?
(a) 70 km
(b) 90 km
(c) 140 km
(d) 100 km

Q23. If sin 6A = cos 12A,
find the value of tan 9A + cot 9A.
(a) 0
(b) -2
(c) 1
(d) 2

Q24. ABCD is a quadrilateral in which AB || DC, and E and F are the mid points of the diagonals AC and BD, respectively. If AB = 74 cm, BC = 91 cm, DC = 26 cm, and AD = 39 cm,
then what is the length (in cm) of EF?
(a) 24
(b) 22
(c) 21
(d) 25

Q25. The largest four-digit number which when divided by 7, 6 and 10 leaves the remainder 5 in each case, is:
(a) 9793
(b) 9875
(c) 9909
(d) 9964

Q26. Four numbers a, b, c and d satisfy the relation
(a + 2) : (b − 2) = (c + 4) : (d − 4).
If a = 6, b = 8 and c = 12,
find the value of d.
(a) 20
(b) 18
(c) 14
(d) 16

Q27. If 40% of a number exceeds 25% of it by 36, then the number is:
(a) 260
(b) 280
(c) 240
(d) 220

Q28. If the principal is Rs. 1000, the rate is 5% per annum, and the time is 2 years,
what is the simple interest?
(a) Rs. 50
(b) Rs. 100
(c) Rs. 200
(d) Rs. 500

Q29. The ages of two siblings add up to 44 years. If one sibling is 4 years younger than twice the other's age,
what is the difference between their ages?
(a) 8 years
(b) 12 years

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(c) 14 years
(d) 10 years

Q30. Simplify 10.5 - [6.5 - {3.3 - (3.2 - 2.2 - 1.8)}]
(a) 10.5
(b) 0
(c) 1
(d) 4.5

GENERAL AWARENESS

Q31. Article 141 of the Indian Constitution declares that the law laid down by the Supreme Court is binding on ____.
(a) State governments
(b) All courts within the territory of India
(c) Only High Courts
(d) All tribunals except civil courts

Q32. Who among the following was awarded the Abel Prize 2025?
(a) Avi Wigderson
(b) Masaki Kashiwara
(c) Karen Uhlenbeck
(d) Luis Caffarelli

Q33. The 2025 study detecting airborne microplastics in the mangroves of Sundarbans was done by scientists from which institute?
(a) IISER Kolkata
(b) IIT Kharagpur
(c) NIO Goa
(d) WII Dehradun

Q34. Where was the 69^(th) session of the United Nations Commission on the Status of Women held in March 2025?
(a) Oslo, Norway
(b) Rio de Janeiro, Brazil
(c) Berlin, Germany
(d) New York, USA

Q35. Which extremist leader authored the famous work, Gita Rahasya?
(a) Bipin Chandra Pal
(b) Bal Gangadhar Tilak
(c) Aurobindo Ghose
(d) Lala Lajpat Rai

Q36. Who among the following was associated with the Farazi Movement in Bengal during the 19th century?
(a) U Kiang Nongbah
(b) Dadu Mian
(c) Maznoom Shah
(d) Birsa Munda

Q37. Which global event first initiated coordinated international action on environmental protection and development?
(a) Doha Climate Meeting, 2012
(b) Johannesburg Summit, 2002
(c) Rio Conference, 1992
(d) Stockholm Conference, 1972

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Q38. Which of the following water bodies separates the Andaman Islands from the Nicobar Islands?

(a) Palk Strait
(b) Ten Degree Channel
(c) Duncan Passage
(d) Nine Degree Channel

Q39. According to the Sustainable Development Goals National Indicator Framework (SDG NIF) Progress Report of 2025, social protection coverage rose from 22% in 2016 to what percentage in 2025?

(a) 55%
(b) 40%
(c) 64.3%
(d) 78%

Q40. What is the full form of UNDP?

(a) Union of Nations Development Programme
(b) United Nations Deployment Programme
(c) Union of Nations Deployment Programme
(d) United Nations Development Programme

Q41. Which of the following musical genres was considered formal and divine in ancient India?

(a) Gandharva
(b) Gana
(c) Dhrupad
(d) Prabandh

Q42. In October 2025, the Ministry of Minority Affairs announced support to universities to set up Centres of Excellence to promote heritage and classical languages. This initiative was taken under which scheme?

(a) National Minorities Development Finance Corporation (NMDFC)
(b) Pradhan Mantri Jan Vikas Karyakram (PMJVK)
(c) Maulana Azad National Fellowship (MANF)
(d) Pradhan Mantri Virasat Ka Samvardhan (PM VIKAS)

Q43. Which approach is crucial for empowering rural women, leading to community development?

(a) Limiting educational opportunities to urban centres
(b) Promoting gender-specific vocational training and education
(c) Restricting women's roles to traditional household duties
(d) Focussing solely on men's employment programmes

Q44. The presence of elaborate gopurams is a defining feature of which temple architectural style?

(a) Dravidian style
(b) Nagara style
(c) Vesara style
(d) Pala style

Q45. Selected for the International Space Station mission in 2025, John McFall, the first disabled astronaut, is associated with which of the following countries?

(a) United States of America
(b) Australia
(c) Canada
(d) United Kingdom

Q46. Razia, the daughter of Iltutmish, ruled Delhi Sultanate between which years before being overthrown by Turkish nobles?

(a) 1236–1240
(b) 1246–1250

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(c) 1240–1246
(d) 1230–1236

Q47. Which contribution is correctly associated with Lala Lajpat Rai during the freedom struggle?
(a) Leading the anti-Simon Commission protests, where he suffered fatal injuries
(b) Commanding the Congress Volunteers during the Salt March in Gujarat
(c) Leading the Bardoli satyagraha against enhanced revenue-demand policies
(d) Drafting the Nehru Report outlining complete independence for India

Q48. The Government of India set up the Price Stabilisation Fund (PSF) to regulate the prices of agri-horticultural commodities in which financial year?
(a) 2016-17
(b) 2019-20
(c) 2014-15
(d) 2012-13

Q49. The S.I. derived unit for Force is the Newton (N). Which combination of S.I. base units is equivalent to the Newton?
(a) kg?m/s
(b) kg?m/s²
(c) kg?m²/s²
(d) kg?m?s

Q50. The roads and streets of the Harappan Lower Town were laid out in which pattern?
(a) Grid pattern intersecting at right angles
(b) Circular pattern with curved streets
(c) Irregular pattern without fixed alignment
(d) Radial pattern spreading from a centre

Q51. Hindu, Sikh, Buddhist, Jain, Parsi, and Christian citizens of which of the following nations are eligible to receive Indian citizenship under the CAA, 2019, if they entered India on or before December 31, 2014?
(a) Afghanistan, Sri Lanka, and Bangladesh
(b) Bhutan, Bangladesh, and Maldives
(c) Afghanistan, Bangladesh, and Pakistan
(d) Pakistan, Myanmar, and Nepal

Q52. Which of the following trees is characteristic of the tropical deciduous forests of India?
(a) Mangrove
(b) Deodar
(c) Fir
(d) Teak

Q53. Which soil type, known for retaining moisture, is ideal for cotton cultivation?
(a) Black soil
(b) Laterite soil
(c) Sandy soil
(d) Red soil

Q54. Which launch vehicle will be used for Chandrayaan-5?
(a) GSLV Mk III
(b) GSLV Mk II
(c) H3-24L
(d) PSLV-C45

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Q55. In modern Windows versions (Windows 10/11), which Task Manager tab allows users to monitor real-time graphics card utilization for individual applications?

(a) Performance
(b) Startup
(c) App History
(d) Processes

Q56. Which of the following temples is NOT a prime example of the Dravidian style of temple architecture?

(a) Brihadeeswara Temple
(b) Shore Temple
(c) Gangaikondacholapuram Temple
(d) Siddhesvara Mahadeva Temple

Q57. In human beings, the complete digestion of proteins results in the formation of which substances?

(a) Fatty acids
(b) Glucose
(c) Glycerol
(d) Amino acids

Q58. The members of the Railway Convention Committee are nominated by which of the following authorities of India?

(a) The Chairman of the Rajya Sabha
(b) The Speaker of the Lok Sabha
(c) The Prime Minister of India
(d) The President of India

Q59. Which among the following kings from the early medieval period assumed the title "Gangaikonda"?

(a) Vijayalaya
(b) Rajaraja I
(c) Rajendra I
(d) Pulakesin II

Q60. As per the Indian Constitution, the Directive Principles of State Policy are _____.

(a) Purely administrative rules
(b) Justiciable only during emergencies
(c) Non-justiciable but fundamental in governance
(d) Justiciable and legally enforceable

Q61. The CPU mainly performs which of the following functions?

(a) Processing and control
(b) Input and calculation
(c) Storage and output
(d) Display and storage

Q62. Which of the following is a non-renewable resource?

(a) Petroleum
(b) Solar Energy
(c) Biomass
(d) Wind Energy

Q63. In October 2025, India's Society of Association Executives (SAE) officially launched in which of the following cities?

(a) Bengaluru
(b) Ahmedabad
(c) Patna
(d) New Delhi

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Q64. Which of the following states accounts for about three-fourths of India's total jute production?

(a) West Bengal
(b) Bihar
(c) Assam
(d) Odisha

Q65. Which article implicitly prohibits 'dual citizenship' in India?

(a) Article 9
(b) Article 5
(c) Article 7
(d) Article 3

Q66. In a cross between true-breeding red-flowered and true breeding white-flowered plants, the Filial 1 (F1) progeny was pink. This is a case of which type of inheritance?

(a) Incomplete Dominance
(b) Complete Dominance
(c) Co-dominance
(d) Sex-linkage

Q67. Which of the following is NOT a function of the President?

(a) Granting pardons and remissions
(b) Promulgating ordinances
(c) Presiding over Rajya Sabha sessions
(d) Summoning and proroguing Parliament

Q68. When a book is pushed across a table surface, which type of friction mainly opposes its motion?

(a) Sliding friction
(b) Magnetic friction
(c) Fluid friction
(d) Rolling friction

Q69. Which of the following is an example of application software used for creating documents?

(a) MS Word
(b) BIOS
(c) Windows
(d) Linux

Q70. What does CD stand for in computer terminology?

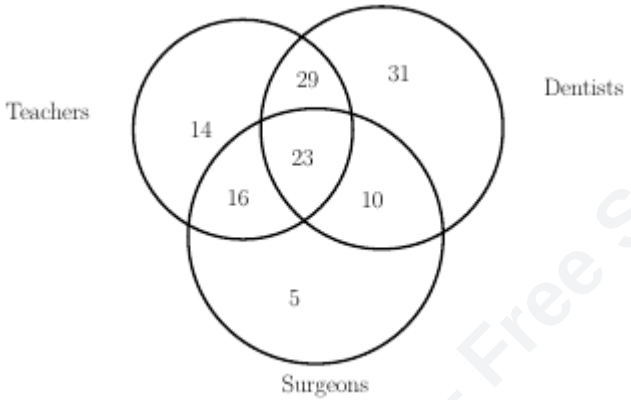
(a) Control Datamine
(b) Current Directories
(c) Color Display
(d) Compact Disc

GENERAL INTELLIGENCE AND REASONING

Q71. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. (NOTE: You have to take the given data to be true even if it seems to be at variance from commonly known facts.)

How many such Teachers are there who are also Dentists but not Surgeons?

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(a) 16
(b) 29
(c) 14
(d) 5

Q72. Select the pair which follows the same pattern as that followed by the two sets of pairs given below. Both pairs follow the same pattern.

DIP : GLS

BST : EVW

(a) EHL : IFP
(b) CIG : FKJ
(c) TEL : VHP
(d) HKD : KNG

Q73. What should come in place of '?' in the given series?

67 70 ? 85 97 112

(a) 80
(b) 76
(c) 78
(d) 82

Q74. 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) EH-JB
(b) OR-TM
(c) LO-QJ
(d) HK-MF

Q75. Each of the digits in the number 52178436 is arranged in ascending order from left to right.

What will be the sum of the digits that are third from the left and third from the right in the number thus formed?

(a) 10
(b) 8
(c) 11
(d) 9

Q76. Seven people, N, V, C, Y, E, F and G, are sitting in a row, facing north.

Only two people sit to the left of V. F sits fourth from the right end. Only two people sit between N and V. E is the immediate neighbour of G and V. Y does not sit to the right of C.

How many people sit between Y and E?

(a) Two

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(b) Four
(c) Five
(d) Three

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

GDH 66 FCG 61 EBF 56 DAE 51 ?

(a) CYC 45
(b) CKT 45
(c) CAC 46
(d) CZD 46

Q78. Seven boxes, M, N, O, P, Q, R and S, are kept one over the other, but not necessarily in the same order.

No box is kept above O. Only three boxes are kept between O and S. Only one box is kept between Q and M. M is kept immediately above S. Only four boxes are kept between Q and P. R is kept at some place above N.

Which box is kept second below R?

(a) S
(b) O
(c) Q
(d) N

Q79. 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 to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

(2, 7, 14)

(3, 16, 48)

(a) (8, 6, 56)
(b) (5, 3, 15)
(c) (6, 7, 48)
(d) (4, 6, 20)

Q80. Based on the alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that does not belong to that group?

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

(a) CEH
(b) PRT
(c) SUW
(d) HJL

Q81. A, B, D, J, O, T and Z are sitting around a circular table facing the center. Only two people sit between O and D when counted from the left of D. J sits third to the left of B. A sits to the immediate right of B. A sits second to the left of O. Z is an immediate neighbor of J. How many people sit between O and Z when counted from the right of O?

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

Q82. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements: All vehicles are machines. Some machines are tools.

Conclusions:

(I) Some vehicles are tools. (II) All tools are machines.

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

Q83. Each of the digits in the number 1358274 is arranged in the ascending order from left to right. The position(s) of how many digits will remain unchanged as compared to that in the original number?
(a) Zero
(b) Three
(c) Two
(d) One

Q84. Mr. Yorly starts from Point A and drives 16 km towards South. He then takes a right turn, drives 14 km, turns right and drives 44 km. He then takes a right turn and drives 2 km, turns right drives 15 km. He then takes a left turn drives 21 km. He takes a final right turn, drives 13 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again?
(All turns are 90 degrees turns only unless specified.)
(a) 10 km to the East
(b) 16 km to the North
(c) 11 km to the South
(d) 9 km to the West

Q85. In a row of 54 students facing the north, Gagan is 13^(th) from the right end. If Nitin is 17^(th) to the left of Gagan, what is Nitin's position from the left end of the line?
(a) 27th
(b) 25th
(c) 23rd
(d) 30th

Q86. In a certain code language,
J ÷ Q means ‘J is the brother of Q’,
J x Q means ‘J is the mother of Q’,
J – Q means ‘J is the husband of Q’ and
J + Q means ‘J is the father of Q’.
Based on the above, how is A related to F if ‘A + B ÷ C – D x E ÷ F’?
(a) Wife's father
(b) Mother's brother
(c) Mother's father
(d) Father's father

Q87. JDHK is related to OIMP in a certain way based on the English alphabetical order. In the same way, MGKN is related to RLPS. To which of the following is PJNQ related, following the same logic?
(a) OUVS
(b) OUSV
(c) UOVS
(d) UOSV

Q88. Each vowel in the word CURRENT is changed to the letter immediately following it in the English alphabetical order, and each consonant is changed to the letter immediately preceding it in the English alphabetical order. Which of the following letters will be third from the right in the new group of letters thus formed?
(a) G
(b) H
(c) F
(d) E

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Q89. In a certain code language, ‘DONE’ is coded as ‘5432’ and ‘CODE’ is coded as ‘2835’. What is the code for ‘C’ in the given code language?

(a) 5
(b) 2
(c) 3
(d) 8

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

(Left) 4 6 2 9 1 4 9 7 1 7 6 5 3 6 4 1 4 3 8 4 2 2 3 9 9 7 6 (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) None
(c) One
(d) Three

Q91. What should come in place of ‘?’ in the given series?

5 ? 10 19 35 60

(a) 6
(b) 8
(c) 9
(d) 7

Q92. QX 18 is related to SS 4 in a certain way. In the same way, EL 10 is related to GG -4. To which of the following is IJ 5 related, following the same logic?

(a) KL -11
(b) TR -5
(c) HF -8
(d) KE -9

Q93. Each of the digits in the number 36857219 is arranged in the ascending order from left to right. What will be the sum of the digits which are second from the left and third from the right in the new number thus formed?

(a) 8
(b) 11
(c) 9
(d) 10

Q94. What should come in place of '?' in the given series based on the English alphabetical order?

MFJ JCG GZD DWA ?

(a) ASY
(b) AKR
(c) ATX
(d) ATZ

Q95. Which of the following options should come in place of the ‘?’ in the given series based on the English alphabetical order?

R 45, A 40, J 35, S 30, ?

(a) T 25
(b) B 25
(c) X 25
(d) V 25

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Q96. Refer to the following letter series and answer the question that follows. Counting to be done from left to right only.

(Left) K D D U R V U D E C Q D V A D R D G D E D Z D J (Right)

How many such D's are there, each of which is immediately preceded by a vowel and also immediately followed by a consonant?

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

Q97. 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 ÷ H x K'?

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

Q98. In a row of 22 students facing North, Sunil is 17th from the left end. If Deepak is 3rd to the right of Sunil, what is Deepak's position from the right end of the row?

(a) 3rd
(b) 2nd
(c) 1st
(d) 4th

Q99. Based on the English alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that does not belong to that group?

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

(a) QPM
(b) BAX
(c) TTP
(d) SRO

Q100. In a certain code language, 'BRAK' is coded as '4938' and 'ARCK' is coded as '2849'. What is the code for 'C' in the given code language?

(a) 9
(b) 4
(c) 2
(d) 8

ANSWER KEY

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

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71	b	72	d	73	b	74	a	75	d	76	a	77	d	78	a	79	b	80	a
81	c	82	d	83	c	84	d	85	b	86	d	87	d	88	c	89	d	90	a
91	a	92	d	93	c	94	c	95	b	96	a	97	c	98	a	99	c	100	c

SOLUTIONS

Q1. Answer: (b) 48π cm²

Shortcut Trick

Numerical value of CSA1 = 2 × π × 4 × 7 = 56π.

Given radius of second cylinder (r2) = 2 cm and its TSA2 = 56π.

Relation: TSA = CSA + 2 × Base Area.

56π = CSA2 + 2 × (π × 2²) => 56π = CSA2 + 8π.

CSA2 = 48π cm².

Therefore The correct answer is 48π cm².

Alternate Method

Given:

First Cylinder: Radius (r1) = 4 cm, Height (h1) = 7 cm.

Second Cylinder: Radius (r2) = 4 ÷ 2 = 2 cm.

Formula Used:

Curved Surface Area (CSA) of cylinder = 2πrh

Total Surface Area (TSA) of cylinder = 2πr(r + h)

=> CSA of first cylinder = 2 × π × 4 × 7 = 56π cm².

=> TSA of second cylinder = 2 × π × r2 × (r2 + h2) = 56π.

=> 2 × π × 2 × (2 + h2) = 56π.

=> 4π × (2 + h2) = 56π.

=> 2 + h2 = 56 ÷ 4 = 14.

=> h2 = 14 − 2 = 12 cm.

=> CSA of second cylinder = 2 × π × r2 × h2.

=> CSA2 = 2 × π × 2 × 12 = 48π cm².

Therefore The correct answer is 48π cm².

Additional Information

Volume of a Cylinder

The volume represents the space occupied and is calculated as Base Area × Height: V = πr²h.

Total Surface Area (TSA)

TSA includes both the curved part and the two circular bases: TSA = 2πrh + 2πr² = 2πr(h + r).

Area of the Circular Base

Since the base of a cylinder is a circle, its area is given by πr².

Q2. Answer: (b) Rs. 3,600

Shortcut Trick

The net percentage change can be calculated using the formula: a + b + (a × b)/100.

Here, a = −25 (discount) and b = +20 (increase).

Net change = −25 + 20 + (−25 × 20)/100 = −5 − 5 = −10%.

Final Selling Price = 4000 × (100 − 10)% = 4000 × 0.9 = Rs. 3,600.

Therefore The correct answer is Rs. 3,600.

Alternate Method

Given:

Marked Price (MP) = Rs. 4,000

First Discount = 25%

Price Increase = 20%

Calculations:

=> Price after first discount = MP − 25% of MP

=> Price after discount = 4000 − (25/100 × 4000) = 4000 − 1000 = Rs. 3,000

=> Price after increase = Price after discount + 20% of Price after discount

=> Final Selling Price = 3000 + (20/100 × 3000) = 3000 + 600 = Rs. 3,600

Therefore The correct answer is Rs. 3,600.

Additional Information

Successive Percentage Change

When a value is changed by x% and then by y%, the effective change is (x + y + xy/100)%. Use positive for increase and negative for discount/decrease.

Selling Price Formula

Selling Price (SP) = Marked Price (MP) × (100 − Discount%)/100. If there is a further markup, multiply by (100 + Increase%)/100.

Ratio Method for Successive Changes

Convert percentages to fractions: 25% discount = 4 to 3 ratio; 20% increase = 5 to 6 ratio. Multiply ratios: (4×5) to (3×6) = 20:18 = 10:9.

Q3. Answer: (a) 35.6

Shortcut Trick

New sum of resulting numbers = 72 + 8 − 6 = 74.

Total ratio parts = 3 + 2 = 5 parts.

Value of 1 part = 74 ÷ 5 = 14.8.

New smaller number = 2 parts × 14.8 = 29.6.

Original smaller number = 29.6 + 6 = 35.6.

Therefore The correct answer is 35.6.

Alternate Method

Given: Sum of two numbers = 72. Let the larger number be x and the smaller number be y.

Formula Used: Linear equation in two variables and Ratio proportion properties.

=> x + y = 72 → (Equation 1)

=> According to the condition: (x + 8) ÷ (y − 6) = 3 ÷ 2

=> 2 × (x + 8) = 3 × (y − 6)

=> 2x + 16 = 3y − 18

=> 2x − 3y = −34 → (Equation 2)

=> Substitute x = 72 − y in Equation 2:

=> 2(72 − y) − 3y = −34

=> 144 − 2y − 3y = −34

=> 144 − 5y = −34

=> 5y = 144 + 34 = 178

=> y = 178 ÷ 5 = 35.6

Therefore The correct answer is 35.6.

Additional Information

Ratio Division Rule

To divide a total sum S into a ratio a : b, the parts are [a/(a+b)] × S and [b/(a+b)] × S.

Linear Equations

For two variables, substitution or elimination methods are used to find the values of x and y.

Net Change Property

If values in a sum change, the new sum = original sum + total increase − total decrease.

Q4. Answer: (b) 3/7

Shortcut Trick

Factor out the smallest power: 9^(x−1)(9¹ − 1) = 72

8 × 9^(x−1) = 72 => 9^(x−1) = 9 => x − 1 = 1 => x = 2

Substitute x = 2 in the expression: (2 × 2 − 1) / (2 × 2 + 3) = 3 / 7

Therefore The correct answer is 3/7.

Alternate Method

Given: 9^x − 9^(x−1) = 72

Formula Used: Laws of Indices: a^m − a^(m−n) = a^m(1 − a^(−n))

=> 9^x − (9^x / 9) = 72

=> 9^x (1 − 1/9) = 72

=> 9^x (8/9) = 72

=> 9^x = (72 × 9) / 8

=> 9^x = 9 × 9 = 81

=> 9^x = 9^2

Comparing the exponents as the bases are equal:

=> x = 2

Now, substitute the variable x into the required expression:

=> Value = (2x − 1) / (2x + 3)

=> Value = (2 × 2 − 1) / (2 × 2 + 3)

=> Value = (4 − 1) / (4 + 3) = 3/7

Therefore The correct answer is 3/7.

Additional Information

Laws of Indices

For any non-zero base, the quotient rule states that a^m ÷ a^n = a^(m−n).

Comparison Property

If a^x = a^y and a ≠ 1, 0, or −1, then the powers must be equal, such that x = y.

Negative Exponents

A term with a negative exponent can be written as its reciprocal with a positive exponent: a^(−n) = 1 / a^n.

Q5. Answer: (a) 20%

Shortcut Trick

Let the Cost Price (CP) of 1 pen be 1 unit.

Total CP of 60 pens = 60 units.

Selling Price (SP) of 60 pens = CP of 72 pens = 72 units.

Profit = 72 − 60 = 12 units.

Profit % = (12 ÷ 60) × 100 = 20%.

Therefore The correct answer is 20%.

Alternate Method

Given:

Quantity of pens bought = 60

Selling Price (SP) of 60 pens = Cost Price (CP) of 72 pens

Formula Used:

Profit % = [(Total SP − Total CP) ÷ Total CP] × 100

Calculations:

=> Let the CP of 1 pen = Rs. x

=> Total CP of 60 pens = Rs. 60x

=> Total SP of 60 pens = CP of 72 pens = Rs. 72x

=> Profit = Rs. 72x − Rs. 60x = Rs. 12x

=> Profit % = (12x ÷ 60x) × 100

=> Profit % = 1/5 × 100 = 20%

Therefore The correct answer is 20%.

Additional Information

Profit and Loss Formulas

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

Quantity Based Trick

If CP of 'a' articles = SP of 'b' articles, then Profit/Loss % = [(a − b) ÷ b] × 100. A positive result indicates profit, while negative indicates loss.

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Marked Price (MP) and Discount

Selling Price = Marked Price × (100 − Discount %) ÷ 100. Discount is always calculated on the Marked Price.

Q6. Answer: (d) 75 seconds

Shortcut Trick

Convert speed of Train X: 72 × (5/18) = 20 m/s.

Relative Speed (Opposite) = Total Length ÷ Time = 500 ÷ 15 = 100/3 m/s.

Speed of Train Y = (100/3) − 20 = 40/3 m/s.

Relative Speed (Same) = 20 − (40/3) = 20/3 m/s.

Time to overtake = 500 ÷ (20/3) = 75 sec.

Therefore The correct answer is 75 sec.

Alternate Method

Given:

Length of Train X (L_X) = 200 m

Length of Train Y (L_Y) = 300 m

Speed of Train X (S_X) = 72 km/hr = 72 × (5/18) = 20 m/s

Time in opposite direction (T_(opp)) = 15 sec

Formula Used:

Relative Speed (Opposite) = S1 + S2

Relative Speed (Same) = |S1 − S2|

Time = (L1 + L2) ÷ Relative Speed

Calculations:

=> Total distance to cover = 200 + 300 = 500 m

=> In opposite direction: S_X + S_Y = 500 ÷ 15

=> 20 + S_Y = 100/3

=> S_Y = 100/3 − 20 = (100 − 60)/3 = 40/3 m/s

=> In same direction: Relative speed = S_X − S_Y = 20 − 40/3

=> Relative speed (same) = (60 − 40)/3 = 20/3 m/s

=> Time to overtake = Total Distance ÷ Relative Speed (same)

=> Time = 500 ÷ (20/3) = 500 × (3/20)

=> Time = 25 × 3 = 75 sec

Therefore The correct answer is 75 sec.

Additional Information

Relative Speed Concept

When two objects move in opposite directions, their speeds are added (S1 + S2). When they move in the same direction, their speeds are subtracted (S1 − S2).

Unit Conversion

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

Total Distance for Trains

Whether crossing each other or overtaking, the total distance to be covered is always the sum of the lengths of the two trains (L1 + L2).

Q7. Answer: (a) 20

Shortcut Trick

The Third Proportional (c) of two numbers a and b is calculated as: $c = b^2 \div a$.

Given values: a = 5 and b = 10.

Applying the trick: c = (10 × 10) ÷ 5

c = 100 ÷ 5 = 20.

Therefore The correct answer is 20.

Alternate Method

Given: First number (a) = 5, Second number (b) = 10.

Formula Used: If three numbers a, b, and c are in continued proportion, then a : b :: b : c, which means a/b = b/c.

Let the third proportional be x.

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=> 5 : 10 :: 10 : x

=> 5 ÷ 10 = 10 ÷ x

=> 1 ÷ 2 = 10 ÷ x

=> x = 10 × 2

=> x = 20

Therefore The correct answer is 20.

Additional Information

Mean Proportional

The mean proportional between two numbers a and b is √(a × b).

Fourth Proportional

If four numbers a, b, c, d are in proportion (a:b = c:d), then the fourth proportional d = (b × c) ÷ a.

Continued Proportion

Three numbers a, b, c are in continued proportion if the ratio of the first to the second is the same as the ratio of the second to the third (a/b = b/c).

Q8. Answer: (b) 7:48 am

Shortcut Trick

To find the next time trains from Delhi, Lucknow, and Jaipur depart together, calculate the LCM of their departure intervals.

LCM(12, 18, 27) = 108 minutes.

Convert 108 minutes to hours: 108 ÷ 60 = 1 hour 48 minutes.

Add this duration to the initial departure time: 6:00 am + 1:48 = 7:48 am.

Therefore The correct answer is 7:48 am.

Alternate Method

Given:

Interval for Delhi train = 12 min

Interval for Lucknow train = 18 min

Interval for Jaipur train = 27 min

Initial simultaneous departure = 6:00 am

Formula Used:

Next simultaneous event = Initial time + LCM of individual intervals.

Calculations:

=> Prime factorization of 12 = 2 × 2 × 3 = $2^2 \times 3^1$

=> Prime factorization of 18 = 2 × 3 × 3 = $2^1 \times 3^2$

=> Prime factorization of 27 = 3 × 3 × 3 = 3^3

=> LCM = 2^(max(2,1,0)) × 3^(max(1,2,3)) = $2^2 \times 3^3$

=> LCM = 4 × 27 = 108 minutes

=> Converting minutes to hours: 108 minutes = 60 minutes + 48 minutes = 1 hour 48 minutes

=> Next meeting time = 6:00 am + 1 hour 48 minutes

=> Next meeting time = 7:48 am

Therefore The correct answer is 7:48 am.

Additional Information

Least Common Multiple (LCM)

The smallest number that is a multiple of two or more numbers. It is used to find the first time periodic events coincide.

Relationship between LCM and HCF

For any two numbers A and B, LCM(A, B) × HCF(A, B) = A × B. This is a fundamental property in number theory.

Periodic Events

For problems involving traffic lights, bells, or circular tracks, the next time of coincidence is always the LCM of their individual time periods.

Q9. Answer: (a) 12%

Shortcut Trick

Ratio of the two parts of the Marked Price = 70% : 30% = 7 : 3.

Total Percentage Discount = [(Part1 × Rate1) + (Part2 × Rate2)] ÷ (Total Parts)

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Total Discount % = [(7 × 15) + (3 × 5)] ÷ (7 + 3)

Total Discount % = (105 + 15) ÷ 10 = 120 ÷ 10 = 12%

Therefore The correct answer is 12%.

Alternate Method

Given: Marked Price (MP) = Rs. 50,000; Discount1 = 15% on 70% MP; Discount2 = 5% on remaining MP.

=> First part of MP = 70% of 50,000 = (70 ÷ 100) × 50,000 = Rs. 35,000

=> Second part of MP = 30% of 50,000 = (30 ÷ 100) × 50,000 = Rs. 15,000

=> Discount 1 = 15% of 35,000 = 0.15 × 35,000 = Rs. 5,250

=> Discount 2 = 5% of 15,000 = 0.05 × 15,000 = Rs. 750

=> Total Discount Amount = 5,250 + 750 = Rs. 6,000

=> Total Percentage Discount = (Total Discount ÷ Total MP) × 100

=> Total Discount % = (6,000 ÷ 50,000) × 100 = 12%

Therefore The correct answer is 12%.

Additional Information

Weighted Average Discount

When different portions of a Marked Price are sold at different discount rates, the overall discount is the weighted average: D_(total) = (w1d1 + w2d2) ÷ (w1 + w2).

Successive Discounts

If two discounts d1 and d2 are applied one after another, the single equivalent discount is [d1 + d2 − (d1 × d2) ÷ 100]%.

Net Selling Price

The Selling Price is calculated as MP × [1 − (Discount % ÷ 100)]. In this problem, SP = Rs. 50,000 − Rs. 6,000 = Rs. 44,000.

Q10. Answer: (d) Rs. 4840

Shortcut Trick

Effective Compound Interest rate for 2 years at 10% = 10 + 10 + (10 × 10)/100 = 21%.

Total Amount percentage = 100% + 21% = 121%.

Total Amount = 121% of Rs. 4000 = 1.21 × 4000.

Total Amount = Rs. 4840.

Therefore The correct answer is Rs. 4840.

Alternate Method

Given:

Principal (P) = Rs. 4000

Rate (R) = 10% per annum

Time (n) = 2 years

Formula Used:

Amount (A) = $P(1 + R/100)^n$

Calculations:

=> $A = 4000 \times (1 + 10/100)^2$

=> $A = 4000 \times (110/100) \times (110/100)$

=> $A = 4000 \times (1.1) \times (1.1)$

=> $A = 4000 \times 1.21$

=> $A = 4840$

Therefore The correct answer is Rs. 4840.

Additional Information

Compound Interest Formula

Compound Interest (CI) = Amount − Principal = $P[(1 + R/100)^n - 1]$.

Difference between CI and SI

For 2 years, the difference (D) between CI and SI is given by $D = P(R/100)^2$.

Effective Rate for 2 Years

If the rate is r%, the effective compound interest rate for 2 years is $(2r + r^2/100)\%$.

Q11. Answer: (b) 27.1%

Shortcut Trick

Use the Ratio Method: 10% discount = 1/10 (MP = 10, SP = 9).

For three successive discounts: (10 × 10 × 10) : (9 × 9 × 9) => 1000 : 729.

Total discount = 1000 − 729 = 271 units.

Equivalent discount % = (271 ÷ 1000) × 100 = 27.1%.

Therefore The correct answer is 27.1%.

Alternate Method

Given: Three successive discounts of 10% each.

Formula: Net Discount for two successive discounts a and b = (a + b − (a × b ÷ 100))%.

=> Let the Marked Price (MP) be Rs. 100.

=> First discount = 10% of 100 = Rs. 10. Price becomes = 100 − 10 = Rs. 90.

=> Second discount = 10% of 90 = Rs. 9. Price becomes = 90 − 9 = Rs. 81.

=> Third discount = 10% of 81 = Rs. 8.1. Price becomes = 81 − 8.1 = Rs. 72.9.

=> Total Single Discount = MP − Final Selling Price (SP)

=> Total Discount = 100 − 72.9 = 27.1.

=> Equivalent Discount Percentage = (27.1 ÷ 100) × 100 = 27.1%.

Therefore The correct answer is 27.1%.

Additional Information

Successive Discount for n periods

The final multiplier for successive discounts d1, d2, ... d_n is (1 − d1/100) × (1 − d2/100) × ... × (1 − d_n/100).

Difference between Discount and Profit

Discount is always calculated on the Marked Price (MP), while Profit or Loss is calculated on the Cost Price (CP).

Mark-up Percentage

The percentage by which the cost price is increased to set the marked price: Mark-up % = [(MP − CP) ÷ CP] × 100.

Q12. Answer: (b) 7 5/7 hours

Shortcut Trick

Let the total capacity of the tank be LCM(18, 9, 27) = 54 units.

Efficiency: M = +3, N = +6, and Leakage = −2.

Net efficiency when all are open = 3 + 6 − 2 = 7 units/hr.

Time required = Total capacity ÷ Net efficiency = 54 ÷ 7 = 7 5/7 hr.

Therefore The correct answer is 7 5/7 hr.

Alternate Method

Given:

Time taken by Tap M = 18 hr

Time taken by Tap N = 9 hr

Time taken by Leakage to empty = 27 hr

Person/Tap	Time (hr)	Total Work (LCM)	Efficiency
Tap M	18	54	+3
Tap N	9	+6	
Leakage	27	−2	

Calculations:

=> Net efficiency of (M + N + Leakage) = 3 + 6 − 2

=> Net efficiency = 7 units/hr

=> Time taken to fill the tank = Total Work ÷ Net Efficiency

=> Time = 54 ÷ 7 hr

=> Time = 7 5/7 hr

Therefore The correct answer is 7 5/7 hr.

Additional Information

Efficiency and Time Relationship

Efficiency is inversely proportional to time. If a pipe fills a tank in 'x' hours, its 1-hour work is 1/x.

Negative Work (Leakage)

In pipes and cisterns, a filling tap does positive work, while a leakage or outlet pipe does negative work.

Combined Rate Formula

Net Rate = (1/M) + (1/N) − (1/L), where L is the time taken by the leakage to empty the tank.

Q13. Answer: (a) 1

Shortcut Trick

Check the divisibility rule of 4: the last two digits must be divisible by 4.

The last two digits of 2X2 are X2.

Test the options: If X = 1, the number is 12, which is divisible by 4 (12 ÷ 4 = 3).

Testing other digits: 02, 22, and 42 are not divisible by 4.

Therefore The correct answer is 1.

Alternate Method

Given: A three-digit number 2X2.

Formula Used: A number is divisible by 4 if the number formed by its last two digits is a multiple of 4.

Calculations:

=> Let the digits be checked for X2:

=> If X = 1 → 12 ÷ 4 = 3 (Remainder = 0) Therefore Divisible

=> If X = 2 → 22 ÷ 4 = 5.5 (Remainder ≠ 0) Therefore Not Divisible

=> If X = 0 → 02 ÷ 4 = 0.5 (Remainder ≠ 0) Therefore Not Divisible

=> If X = 4 → 42 ÷ 4 = 10.5 (Remainder ≠ 0) Therefore Not Divisible

Therefore The correct answer is 1.

Additional Information

Divisibility by 2

A number is divisible by 2 if its last digit is even (0, 2, 4, 6, or 8).

Divisibility by 8

A number is divisible by 8 if the number formed by its last three digits is divisible by 8.

Divisibility by 3

A number is divisible by 3 if the sum of its digits is divisible by 3.

Divisibility by 5

A number is divisible by 5 if its last digit is either 0 or 5.

Q14. Answer: (d) 1

Shortcut Trick

Net efficiency of Tap B (filling in 11 hr) and Tap C (emptying in 11 hr) is zero.

Therefore, the effective rate of filling the cistern depends only on Tap A.

Rate of Tap A = 1 cistern per 4 hr => 1/4 cistern per hour.

To fill 1/4th of the empty cistern, time = (1/4) ÷ (1/4) = 1 hr.

Therefore The correct answer is 1 hr.

Alternate Method

Given: Tap A (filling) = 4 hr, Tap B (filling) = 11 hr, Tap C (emptying) = 11 hr.

Assume Total Capacity of the cistern = LCM of (4, 11, 11) = 44 units.

Tap	Hours	Total Work	Efficiency
Tap A (+)	4	44 units	11
Tap B (+)	11	4	
Tap C (−)	11	−4	

=> Combined Efficiency of all taps = 11 + 4 − 4 = 11 units/hr

=> Target to fill one-fourth of the cistern = 1/4 × 44 = 11 units

=> Required Time = Target Work ÷ Combined Efficiency

=> Required Time = 11 ÷ 11 = 1 hr

Therefore The correct answer is 1 hr.

Additional Information

Inlet and Outlet Pipes

Inlet pipes fill the tank (positive efficiency), while outlet pipes or leaks empty the tank (negative efficiency).

LCM Method for Capacity

Assuming the cistern capacity as the LCM of individual times makes calculation easier by providing integer efficiency values.

Total Time Formula

If multiple taps work together, the total time is calculated as: 1/T_(total) = 1/T1 + 1/T2 − 1/T3.

Q15. Answer: (a) 84

Shortcut Trick

Direct Calculation: Weighted Average = Σ(Score × Weight) ÷ ΣWeights

Weighted Sum = (75 × 2) + (80 × 3) + (90 × 5)

Weighted Sum = 150 + 240 + 450 = 840

Total Weight = 2 + 3 + 5 = 10

Weighted Average = 840 ÷ 10 = 84

Therefore The correct answer is 84.

Alternate Method

Given: Scores of the student are 75, 80, and 90 with respective weights 2, 3, and 5.

Formula Used: Weighted Average = [(w1 × x1) + (w2 × x2) + (w3 × x3)] ÷ (w1 + w2 + w3)

=> Total weighted points = (75 × 2) + (80 × 3) + (90 × 5)

=> Total weighted points = 150 + 240 + 450

=> Total weighted points = 840

=> Total sum of weights = 2 + 3 + 5 = 10

=> Weighted Average = 840 ÷ 10 = 84

Therefore The correct answer is 84.

Additional Information

Weighted Mean Formula

The weighted mean is calculated as x_w = (Σw_ix_i) ÷ Σw_i, where w is the weight and x is the value.

Simple Average vs Weighted Average

A simple average treats all data points equally (weights = 1), whereas a weighted average assigns relative importance to different values.

Deviation Method

Assume a mean 'A', then Average = A + [Σw_i(x_i − A) ÷ Σw_i]. This simplifies calculations with large numbers.

Q16. Answer: (d) C

Shortcut Trick

Scheme A discount: 44 + 12 − (44 × 12) ÷ 100 = 50.72%

Scheme B discount: 1 − (0.82 × 0.57 × 0.77) ≈ 64% (highest)

Scheme C discount: (4 × 8 + 6 × 38) ÷ 10 = 26%

Scheme D discount: 3 ÷ 10 × 100 = 30%

Least beneficial scheme for customer is the one with the minimum discount.

Therefore The correct answer is Scheme C.

Alternate Method

Given: Total toys to buy = 10. Let Marked Price (MP) of each toy = Rs. 100.

Formula Used: Total Discount % = (Total Discount ÷ Total MP) × 100

=> Total MP for 10 toys = 10 × 100 = Rs. 1000.

=> Scheme A: Successive 44% and 12% => Discount = 1000 − [1000 × 0.56 × 0.88] = Rs. 507.2 (50.72%)

=> Scheme B: Successive 18%, 43%, 23% => Final Price = 1000 × 0.82 × 0.57 × 0.77 ≈ Rs. 359.9 => Discount ≈ Rs. 640.1 (64.01%)

=> Scheme C: 8% on 1st 4 toys + 38% on next 6 toys => Discount = (4 × 8) + (6 × 38) = 32 + 228 = Rs. 260 (26%)

=> Scheme D: Buy 10, pay for 7 => 3 items are free => Discount = (3 ÷ 10) × 100 = 30%

=> Comparing all discounts: 64.01% > 50.72% > 30% > 26%.

=> Since 26% is the lowest discount, Scheme C is the least beneficial to the customer.

Therefore The correct answer is Scheme C.

Additional Information

Successive Discount Formula

For two successive discounts x% and y%, the effective discount is (x + y − xy/100)%.

Buy X Get Y Free

The discount percentage in "Buy X Get Y Free" schemes is calculated as: [Y ÷ (X + Y)] × 100.

Customer Benefit Rule

A scheme is most beneficial when the discount is maximum and least beneficial when the discount is minimum.

Q17. Answer: (c) 8

Shortcut Trick

Total reduction in the sum = 48 × 2 = 96.

Total reduction in the average = 12.

Number of terms (k) = (Total change in sum) ÷ (Change in average).

k = 96 ÷ 12 = 8.

Therefore The correct answer is 8.

Alternate Method

Given:

Original average of k numbers = x

Reduction = 48 from any two numbers

New average = x − 12

Formula Used:

Average = Sum of observations ÷ Number of observations

Calculations:

=> Original Sum = k × x

=> Total reduction from the sum = 48 + 48 = 96

=> New Sum = (k × x) − 96

=> New Average = New Sum ÷ k

=> x − 12 = (kx − 96) ÷ k

=> k × (x − 12) = kx − 96

=> kx − 12k = kx − 96

=> 12k = 96

=> k = 96 ÷ 12

=> k = 8

Therefore The correct answer is 8.

Additional Information

Arithmetic Change in Average

If a value 'n' is subtracted from every observation in a set, the average also decreases by 'n'.

Sum of Observations

Total Sum = Average × Number of items. Any change in the sum affects the average proportionally to the number of items.

Net Deviation Method

The sum of deviations of all items from their average is always zero. New average can be found by adding (Total Change ÷ Count) to the old average.

Q18. Answer: (d) 68 km/h

Shortcut Trick

Average Speed = (Total Distance) ÷ (Total Time)

Total Distance = (72 × 3) + (60 × 1.5) = 216 + 90 = 306 km

Total Time = 3 + 1.5 = 4.5 hr

Average Speed = 306 ÷ 4.5 = 68 km/h

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Therefore The correct answer is 68 km/h.

Alternate Method

Given:

Speed1 = 72 km/h, Time1 = 3 hr

Speed2 = 60 km/h, Time2 = 1.5 hr

Formula Used:

Distance = Speed × Time

Average Speed = Total Distance ÷ Total Time

Calculations:

=> Distance in first part (D1) = 72 × 3 = 216 km

=> Distance in second part (D2) = 60 × 1.5 = 90 km

=> Total Distance = 216 + 90 = 306 km

=> Total Time = 3 + 1.5 = 4.5 hr

=> Average Speed = 306 ÷ 4.5

=> Average Speed = 3060 ÷ 45

=> Average Speed = 68 km/h

Therefore The correct answer is 68 km/h.

Additional Information

Average Speed for Equal Distance

If a journey is divided into two equal distances with speeds x and y, the average speed is given by (2xy) ÷ (x + y).

Unit Conversion

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

Relative Speed

When two objects move in the opposite direction, relative speed is (u + v). In the same direction, relative speed is (u − v).

Q19. Answer: (c) 8568

Shortcut Trick

Identify the values as a = 24, b = −7, and c = −17.

Check the sum: 24 + (−7) + (−17) = 24 − 24 = 0.

Apply the Algebraic Identity: If a + b + c = 0, then $a^3 + b^3 + c^3 = 3abc$.

Calculation: 3 × 24 × (−7) × (−17) = 72 × 119 = 8568.

Therefore The correct answer is 8568.

Alternate Method

Given:

Expression: $24^3 + (-7)^3 + (-17)^3$

Formula Used:

The standard algebraic identity is $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$.

Calculations:

=> Let a = 24, b = −7, and c = −17.

=> First, evaluate the sum (a + b + c).

=> a + b + c = 24 + (−7) + (−17) = 24 − 24 = 0.

=> Substituting (a + b + c) = 0 into the identity:

=> $a^3 + b^3 + c^3 - 3abc = 0 \times (a^2 + b^2 + c^2 - ab - bc - ca) = 0$.

=> $a^3 + b^3 + c^3 = 3abc$.

=> Now, calculate the value of 3abc:

=> Value = 3 × 24 × (−7) × (−17).

=> Value = 72 × 119.

=> Value = 8568.

Therefore The correct answer is 8568.

Additional Information

Special Case of Cubic Identity

If a + b + c = 0, then $a^3 + b^3 + c^3 = 3abc$. This is widely used in simplifying sum of cubes when the bases sum to zero.

Alternate Condition for 3abc

The expression $a^3 + b^3 + c^3$ also equals 3abc if a = b = c, as the second bracket $(a^2 + b^2 + c^2 - ab - bc - ca)$ becomes zero.

Square of Trinomial

Related identity: $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$.

Q20. Answer: (a) 6

Shortcut Trick

To make the number 92419x divisible by 13, first find the remainder of 924190 ÷ 13.

924190 ÷ 13 → Remainder is 7.

Required digit = Divisor − Remainder

Required digit = 13 − 7 = 6.

Therefore The correct answer is 6.

Alternate Method

Given: Original transaction code = 92419. Divisor = 13.

Let the least digit to be appended at the end be x.

The new number becomes 924190 + x.

=> Perform division of 924190 by 13 to find the remainder:

=> 92 ÷ 13 = 7, Remainder = 1

=> 14 ÷ 13 = 1, Remainder = 1

=> 11 ÷ 13 = 0, Remainder = 11

=> 119 ÷ 13 = 9, Remainder = 2

=> 20 ÷ 13 = 1, Remainder = 7

=> So, 924190 ≡ 7 (mod 13).

=> For the number to be divisible by 13, (7 + x) must be a multiple of 13.

=> 7 + x = 13

=> x = 13 − 7 = 6.

Therefore The correct answer is 6.

Additional Information

Divisibility Rule of 13

Multiply the last digit of the number by 4 and add it to the rest of the number. If the resulting sum is divisible by 13, the original number is also divisible.

Remainder Addition Rule

To make a number N divisible by D, the smallest number to add is (D − R), where R is the remainder obtained when N is divided by D.

Unit Digit Concept

Appending a digit to the end of a number N is equivalent to shifting the existing number one place to the left: N_(new) = 10 × N + x.

Q21. Answer: (a) 952

Shortcut Trick

Ratio of half-diagonals = (224/2) : (420/2) = 112 : 210 = 8 : 15 (divided by 14).

Using Pythagorean triplet (8, 15, 17), the side ratio is 17.

Actual side of rhombus = 17 × 14 = 238 m.

Perimeter = 4 × Side = 4 × 238 = 952 m.

Therefore The correct answer is 952 m.

Alternate Method

Given:

Diagonal 1 (d1) = 224 m

Diagonal 2 (d2) = 420 m

Formula Used:

Side of rhombus (a) = $\sqrt{[(d1/2)^2 + (d2/2)^2]}$

Perimeter of rhombus = 4 × a

Calculations:

=> Half of Diagonal 1 = 224 ÷ 2 = 112 m
=> Half of Diagonal 2 = 420 ÷ 2 = 210 m
=> Side (a) = √(112² + 210²)
=> Side (a) = √(12544 + 44100)
=> Side (a) = √56644
=> Side (a) = 238 m
=> Perimeter = 4 × 238
=> Perimeter = 952 m
Therefore The correct answer is 952 m.
Additional Information
Properties of a Rhombus
A rhombus is a quadrilateral with all sides equal. Its diagonals bisect each other at right angles (90°).
Area of Rhombus
The area of a rhombus can be calculated using diagonals as: Area = 1/2 × d1 × d2.
Relation between Side and Diagonals
For a rhombus with side 'a' and diagonals d1 and d2, the relation is: $4a^2 = d1^2 + d2^2$.

Q22. Answer: (d) 100 km

Shortcut Trick
When time is constant, the distance covered is directly proportional to the speed.
Ratio of Speeds = 5 : 7 => Ratio of Distances = 5 : 7.
Given Faster car (7 units) covers 140 km.
1 unit = 140 ÷ 7 = 20 km.
Slower car (5 units) distance = 5 × 20 = 100 km.
Therefore The correct answer is 100 km.
Alternate Method
Given:
Ratio of Speeds = 5 : 7
Faster car distance = 140 km | Time = 2 hr
Formula Used:
Speed = Distance ÷ Time
Calculations:
=> Speed of the faster car = 140 ÷ 2 = 70 kmph
=> According to the ratio, if the speeds are 5x and 7x, then:
=> 7x = 70 kmph
=> x = 10 kmph
=> Speed of the slower car = 5 × 10 = 50 kmph
=> Distance covered by the slower car in 2 hours = Speed × Time
=> Distance = 50 × 2 = 100 km
Therefore The correct answer is 100 km.
Additional Information
Direct Proportionality of Distance
If time is constant, the ratio of distances covered is equal to the ratio of speeds: D1/D2 = S1/S2.
Inverse Proportionality of Time
If distance is constant, the ratio of speeds is inversely proportional to the ratio of time taken: S1/S2 = T2/T1.
Average Speed Formula
When a person travels equal distances at speeds x and y, the average speed is (2 × x × y) ÷ (x + y).

Q23. Answer: (d) 2

Shortcut Trick
For complementary angles, sin α = cos β implies α + β = 90°.
Equating the angles: 6A + 12A = 90° => 18A = 90°.

Dividing by 2 gives the target angle: 9A = 45°.

Substitute the value: tan 45° + cot 45° = 1 + 1 = 2.

Therefore The correct answer is 2.

Alternate Method

Given: sin 6A = cos 12A

Formula Used: sin θ = cos(90° − θ) or cos θ = sin(90° − θ)

=> sin 6A = cos 12A

=> sin 6A = sin(90° − 12A)

=> 6A = 90° − 12A

=> 18A = 90°

=> A = 5°

=> 9A = 9 × 5° = 45°

=> tan 9A + cot 9A = tan 45° + cot 45°

=> Since tan 45° = 1 and cot 45° = 1

=> 1 + 1 = 2

Therefore The correct answer is 2.

Additional Information

Co-function Identities

Trigonometric functions of complementary angles are related as sin θ = cos(90° − θ), tan θ = cot(90° − θ), and sec θ = cosec(90° − θ).

Reciprocal Relations

Tangent and cotangent are reciprocals of each other, where tan θ × cot θ = 1.

Sum of tan and cot

The expression tan θ + cot θ can be simplified to 2 / sin 2θ, which equals 2 when θ = 45°.

Q24. Answer: (a) 24

Shortcut Trick

In a trapezoid (where AB || DC), the length of the line segment joining the midpoints of the diagonals is always equal to half the absolute difference between the lengths of the parallel sides.

Formula: EF = (AB − DC) ÷ 2

=> EF = (74 − 26) ÷ 2

=> EF = 48 ÷ 2 = 24 cm.

Therefore The correct answer is 24 cm.

Alternate Method

Given: Parallel sides AB = 74 cm and DC = 26 cm. E and F are midpoints of diagonals AC and BD.

Formula Used: In triangle ADC and triangle ADB, the line segment joining the midpoints of two sides is parallel to the third side and half its length.

Let M be the midpoint of the non-parallel side AD.

=> In triangle ADC, M and E are midpoints of AD and AC respectively.

=> ME = DC ÷ 2 = 26 ÷ 2 = 13 cm.

=> In triangle ADB, M and F are midpoints of AD and BD respectively.

=> MF = AB ÷ 2 = 74 ÷ 2 = 37 cm.

=> Since AB || DC, the points M, E, and F are collinear.

=> EF = MF − ME

=> EF = 37 − 13 = 24 cm.

Therefore The correct answer is 24 cm.

Additional Information

Median of a Trapezoid

The segment connecting the midpoints of the non-parallel sides is called the median, and its length is (a + b) ÷ 2.

Midsegment Theorem

The line segment joining the midpoints of two sides of a triangle is parallel to the third side and half as long.

Area of a Trapezoid

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The area is calculated as ½ × (sum of parallel sides) × height, or Area = ½ × (a + b) × h.

Q25. Answer: (b) 9875

Shortcut Trick

Find the LCM of divisors 7, 6, and 10, which is 210.

Identify the largest 4-digit multiple of 210 by dividing 9999 ÷ 210.

9999 ÷ 210 = 47 with a remainder of 129.

Subtract the remainder from 9999 to get 9870, then add the common remainder 5.

Required Number = 9870 + 5 = 9875.

Therefore The correct answer is 9875.

Alternate Method

Given: Divisors are 7, 6, and 10. The common remainder in each case is 5.

Formula Used: Required Number = (LCM of divisors × k) + Remainder, where k is a constant to find the largest 4-digit number.

Step-by-step Calculation:

=> LCM of 7, 6, and 10:

7 = 7

6 = 2 × 3

10 = 2 × 5

=> LCM = 2 × 3 × 5 × 7 = 210.

=> Largest 4-digit number = 9999.

=> Divide 9999 by 210: 9999 ÷ 210 = 47.614...

=> Largest multiple of 210 below 9999 = 210 × 47 = 9870.

=> Adding the remainder: 9870 + 5 = 9875.

Therefore The correct answer is 9875.

Additional Information

General Form for LCM Remainders

If a number leaves the same remainder r when divided by x, y, and z, the general form of the number is LCM(x, y, z) × k + r.

Finding N-digit Largest Number

To find the largest n-digit number divisible by L, calculate (Largest n-digit number − Remainder of [Largest n-digit number ÷ L]).

Dividend Rule

Dividend = (Divisor × Quotient) + Remainder. This rule helps verify divisibility and remainder constraints.

Q26. Answer: (d) 16

Shortcut Trick

First ratio (a + 2) : (b − 2) = (6 + 2) : (8 − 2) = 8 : 6 = 4 : 3.

Second ratio (c + 4) : (d − 4) = (12 + 4) : (d − 4) = 16 : (d − 4).

Since the ratios are equal: 4 / 3 = 16 / (d − 4).

By comparison, 16 is 4 × 4, so (d − 4) must be 3 × 4 = 12.

Solving for d: d = 12 + 4 = 16.

Therefore The correct answer is 16.

Alternate Method

Given: a = 6, b = 8, c = 12 and the proportion (a + 2) / (b − 2) = (c + 4) / (d − 4).

Formula: If x : y = p : q, then x/y = p/q.

Calculations:

=> (6 + 2) / (8 − 2) = (12 + 4) / (d − 4)

=> 8 / 6 = 16 / (d − 4)

=> 4 / 3 = 16 / (d − 4)

=> 4 × (d − 4) = 16 × 3

=> 4d − 16 = 48

=> 4d = 48 + 16

=> 4d = 64

=> d = 64 / 4 = 16

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Therefore The correct answer is 16.

Additional Information

Definition of Proportion

A proportion is an equation that states that two ratios are equal. If a : b = c : d, then a × d = b × c.

Cross-Multiplication Rule

For any fractional equation a/b = c/d, the product of the extremes (a and d) equals the product of the means (b and c).

Fourth Proportional

In the proportion a : b = c : d, the term d is called the fourth proportional to a, b, and c, calculated as d = (b × c) / a.

Q27. Answer: (c) 240

Shortcut Trick

Difference in percentage = 40% − 25% = 15%

According to the question, 15% of the number corresponds to 36.

=> 1% of the number = 36 ÷ 15 = 2.4

=> 100% of the number = 2.4 × 100 = 240

Therefore The correct answer is 240.

Alternate Method

Given:

Percentage 1 = 40%

Percentage 2 = 25%

Difference in values = 36

Formula Used:

Number = (Difference in values × 100) ÷ (Difference in percentages)

Calculations:

Let the number be x.

=> 40% of x − 25% of x = 36

=> 0.40x − 0.25x = 36

=> 0.15x = 36

=> x = 36 ÷ 0.15

=> x = 3600 ÷ 15

=> x = 240

Therefore The correct answer is 240.

Additional Information

Percentage Change Formula

Percentage change = (Difference ÷ Original Value) × 100. This is useful for finding percentage increases or decreases.

Fractional Conversion

Converting percentages to fractions can simplify calculations: 25% = 1/4 and 40% = 2/5. The difference (2/5 − 1/4) = 3/20.

Base Value Concept

In problems where a number is unknown, always assume the base number to be 100% or 100 units for easier calculation.

Q28. Answer: (b) Rs. 100

Shortcut Trick

Net Interest Percentage = Rate × Time

Net Interest Percentage = 5% × 2 = 10%

Simple Interest = 10% of 1000

Simple Interest = Rs. 100

Therefore The correct answer is Rs. 100.

Alternate Method

Given:

Principal (P) = Rs. 1000

Rate (R) = 5% per annum

Time (T) = 2 years

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Formula Used:

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> SI = (1000 × 5 × 2) ÷ 100

=> SI = (1000 × 10) ÷ 100

=> SI = 10000 ÷ 100

=> SI = Rs. 100

Therefore The correct answer is Rs. 100.

Additional Information

Amount Formula

The total sum payable after a specific time is the Amount, calculated as A = Principal + Simple Interest.

SI vs CI for First Year

For the first year, if interest is compounded annually, both Simple Interest and Compound Interest remain exactly the same.

Relationship of SI to Variables

Simple Interest is directly proportional to the Principal, Rate, and Time. If any of these double, the interest also doubles.

Q29. Answer: (b) 12 years

Shortcut Trick

Let the age of the younger sibling be x.

Equation based on condition: x + (2x − 4) = 44 years.

=> 3x − 4 = 44 => 3x = 48 => x = 16 years.

The two ages are 16 and (44 − 16) = 28 years.

Difference = 28 − 16 = 12 years.

Therefore The correct answer is 12 years.

Alternate Method

Given:

Total sum of ages = 44 years

Relation: One sibling = 2 × (Other sibling) − 4 years

Calculations:

=> Let the age of the younger sibling = x

=> Age of the older sibling = 2x − 4

=> x + 2x − 4 = 44

=> 3x = 44 + 4

=> 3x = 48

=> x = 16

=> Younger sibling age = 16 years

=> Older sibling age = 2(16) − 4 = 32 − 4 = 28 years

=> Difference = 28 − 16 = 12 years

Therefore The correct answer is 12 years.

Additional Information

Constant Age Difference

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

Age Ratio Problems

If the current ages are in the ratio a:b, then after n years, their ages will be (a+n) and (b+n). The ratio changes but the difference (b−a) stays same.

Sum of Ages in 'n' Years

If the current sum of ages of k people is S, then after n years, the new sum will be S + (k × n).

Q30. Answer: (d) 4.5

Shortcut Trick

Solve the expression from innermost to outermost using VBODMAS logic.

Vinculum and Small Bracket: (3.2 − 0.4) = 2.8

Curly Braces: {3.3 − 2.8} = 0.5

Square Brackets: [6.5 − 0.5] = 6.0

Final Step: 10.5 − 6.0 = 4.5

Therefore The correct answer is 4.5.

Alternate Method

Given: 10.5 − [6.5 − {3.3 − (3.2 − (2.2 − 1.8))}]

Method: Using the VBODMAS rule (Vinculum, Brackets, Of, Division, Multiplication, Addition, Subtraction).

=> 10.5 − [6.5 − {3.3 − (3.2 − 0.4)}]

=> 10.5 − [6.5 − {3.3 − 2.8}]

=> 10.5 − [6.5 − 0.5]

=> 10.5 − 6.0

=> 4.5

Therefore The correct answer is 4.5.

Additional Information

VBODMAS Rule

It defines the sequence of operations: Vinculum (bar), Brackets, Of, Division, Multiplication, Addition, and Subtraction.

Brackets Order

Solve brackets in this specific order: Round Brackets () → Curly Braces { } → Square Brackets [].

Vinculum (Bar)

A horizontal line over an expression indicates that it must be simplified first, even before the round brackets.

Q31. Answer: (b) All courts within the territory of India

The correct answer is All courts within the territory of India.

Key Points

• Article 141 of the Indian Constitution explicitly mandates that the law declared by the Supreme Court shall be binding on all courts within the territory of India.

• The term law declared signifies the ratio decidendi, which refers to the legal principles or the core reasoning upon which a judicial decision is based, rather than the final order itself.

• This provision is fundamental to the doctrine of precedents (stare decisis) in India, ensuring uniformity, certainty, and predictability in the judicial administration across various states and union territories.

• The binding nature of these judgments extends to all High Courts, District Courts, and Subordinate Courts, which are legally obligated to follow the interpretations of the Apex Court.

• While the Supreme Court binds all other courts, it is not bound by its own previous decisions, as established in the landmark Bengal Immunity Co. v. State of Bihar case, allowing it to overrule past judgments for the sake of justice.

Additional Information

• Nature of Supreme Court Judgments:

• Ratio Decidendi: The binding part of the judgment that creates a legal precedent for lower courts to follow in similar cases.

• Obiter Dicta: These are remarks or opinions expressed by judges 'by the way' that do not form the basis of the decision. While not legally binding under Article 141, they carry strong persuasive value.

• Prospective Overruling: The Supreme Court has the unique power to declare that a particular judgment will only apply to future cases and not affect past transactions.

• Related Constitutional Articles:

• Article 129: Designates the Supreme Court as a Court of Record, meaning its proceedings are recorded for perpetual memory and it has the power to punish for its contempt.

• Article 142: Grants the Supreme Court inherent power to pass any decree or order necessary for doing complete justice in any cause or matter.

• Article 144: Directs all authorities, including civil and judicial authorities, to act in aid of the Supreme Court.

Q32. Answer: (b) Masaki Kashiwara

The correct answer is Masaki Kashiwara.

Key Points

• Masaki Kashiwara, a distinguished mathematician from Kyoto University, was officially announced as the recipient of the Abel Prize 2025 on March 26, 2025.

• The Norwegian Academy of Science and Letters awarded him for his fundamental contributions to algebraic analysis and

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representation theory, fields where he has been a visionary for over five decades.

• The citation particularly emphasizes his pioneering development of the theory of D-modules and his groundbreaking discovery of crystal bases, which provide an algebraic language for studying systems of linear partial differential equations.

• By receiving this honor, Kashiwara became the first Japanese mathematician to win the Abel Prize since its establishment in 2003.

• The award ceremony was held on May 20, 2025, at the University of Oslo, where King Harald V of Norway presented the prize to the laureate.

• His work, specifically the Sato-Kashiwara theory, bridges several mathematical disciplines, including microlocal analysis, symplectic geometry, and algebraic geometry.

Additional Information

• Abel Prize Overview:

• It was established by the Government of Norway in 2001 to commemorate the 200th birth anniversary of Niels Henrik Abel, a legendary Norwegian mathematician.

• Managed by the Norwegian Academy of Science and Letters, it is often termed the Nobel Prize of Mathematics because the traditional Nobel categories do not include mathematics.

• The prize includes a monetary reward of 7.5 million Norwegian kroner.

• Other Notable Laureates:

• Luis Caffarelli: Awarded the prize in 2023 for his contributions to the regularity theory of nonlinear partial differential equations.

• Avi Wigderson: Received the prize in 2021 (shared with László Lovász) for foundational work in theoretical computer science and discrete mathematics.

• Karen Uhlenbeck: Honored in 2019, she was the first woman to receive the Abel Prize for her achievements in geometric partial differential equations and gauge theory.

• Michel Talagrand: Awarded the prize in 2024 for his research in probability theory and functional analysis.

Q33. Answer: (a) IISER Kolkata

Concept:

Microplastics are tiny plastic particles less than 5 mm in size that pose a significant threat to global ecosystems. While aquatic and terrestrial plastic pollution is well-documented, atmospheric transport of these particles to remote and protected regions is a recent area of critical research. Detecting these particles in pristine environments like the Sundarbans signifies that even uninhabited, protected natural fortresses are no longer safe from human-induced pollution.

Given

• Year of study: 2025

• Pollutant type: Airborne microplastics

• Location: Sundarbans mangroves (specifically the Chula Kathi Protection Camp)

Calculation/Explanation

In January 2025, a team of scientists conducted an intensive eight-day winter campaign in the Sundarbans Biosphere Reserve. Using high-volume air samplers, they detected an average of 10 ± 6 microplastic particles per 100 cubic metres of air. The study, published in the international journal Science of the Total Environment, provided the first evidence of atmospheric microplastics in a protected natural ecosystem in India.

The research was led by Abhinandan Ghosh and Dr. Gopala Krishna Darbha from the Indian Institute of Science Education and Research (IISER) Kolkata. Their findings revealed that tiny fibres and fragments, predominantly made of industrial polymers like polypropylene (PP) and polyethylene (PE), were being transported through the air from urban sources into the remote mangrove forests.

Comparing this information with the provided options:

• IISER Kolkata: The institute that conducted the study.

• IIT Kharagpur: Not the primary institute for this specific atmospheric study.

• NIO Goa: Focused on oceanography, not the lead on this airborne study in the Sundarbans.

• WII Dehradun: Focused on wildlife, not the primary authors of this environmental chemistry paper.

Final Answer: IISER Kolkata

Q34. Answer: (d) New York, USA

The correct answer is New York, USA.

Key Points

• The 69th session of the Commission on the Status of Women (CSW69) was convened at the United Nations Headquarters in New York, USA, from 10 to 21 March 2025.

• The primary focus of this session was the review and appraisal of the implementation of the Beijing Declaration and Platform for

Action, marking the landmark 30th anniversary of its adoption in 1995.

• This comprehensive review, commonly referred to as Beijing+30, evaluated the progress made toward gender equality and the empowerment of all women and girls globally, while identifying remaining structural gaps.

• The session also addressed the outcomes of the 23rd special session of the General Assembly and discussed strategies to overcome challenges hindering the achievement of the 2030 Agenda for Sustainable Development.

• The Commission on the Status of Women (CSW) serves as the principal global intergovernmental body exclusively dedicated to the promotion of women's rights and the shaping of global standards on gender policy.

Additional Information

• Commission on the Status of Women (CSW):

• It was established by ECOSOC resolution 11(II) on 21 June 1946 as a functional commission of the Economic and Social Council (ECOSOC).

• The annual sessions are traditionally held at the United Nations Headquarters in New York, bringing together Member States, UN entities, and Non-Governmental Organizations (NGOs).

• Beijing Declaration and Platform for Action (1995):

• Adopted at the Fourth World Conference on Women, it is considered the most progressive blueprint for advancing women's rights across 12 critical areas, including poverty, education, health, and violence against women.

• The 30-year appraisal at CSW69 aimed to mobilize political will and resources to address emerging global issues such as climate change and the digital divide.

Q35. Answer: (b) Bal Gangadhar Tilak

The correct answer is Bal Gangadhar Tilak.

Key Points

• Bal Gangadhar Tilak, a leading figure of the Extremist faction of the Indian National Congress, authored the seminal work Gita Rahasya (The Secret of the Gita) between 1910 and 1911.

• The book was written while Tilak was serving a six-year prison sentence in Mandalay Jail, Burma (modern-day Myanmar), following his conviction for sedition.

• Originally composed in the Marathi language and published in 1915, the work is formally known as Shrimadh Bhagavad Gita Rahasya or Karma Yoga Shastra.

• Tilak provided a revolutionary interpretation of the Bhagavad Gita, shifting the focus from Sanyasa (renunciation) to Karma Yoga (the path of selfless action) to inspire the masses during the Indian Independence Movement.

• He argued that the Gita teaches the performance of duty and Nishkama Karma (action without desire for results) as a moral obligation for social and political justice.

• Commonly revered as Lokmanya (accepted by the people), Tilak utilized cultural and religious symbols, such as the Ganesh Chaturthi and Shivaji Jayanti festivals, to mobilize nationalist sentiment.

Additional Information

• Bipin Chandra Pal:

• Regarded as the Father of Revolutionary Thoughts in India, he was an integral part of the Lal-Bal-Pal triumvirate.

• He played a crucial role in the Swadeshi Movement and authored works such as The Soul of India and The New Spirit.

• Aurobindo Ghose:

• Initially an extremist leader and editor of Bande Mataram, he later transitioned into a spiritual philosopher in Pondicherry.

• His literary contributions include Essays on the Gita, The Life Divine, and the epic poem Savitri.

• Lala Lajpat Rai:

• Known as Sher-e-Punjab (Lion of Punjab), he was a prominent leader of the Arya Samaj and the Indian National Congress.

• He is famous for writing Unhappy India and The Story of My Deportation, and for his martyrdom during the Simon Commission protests in 1928.

Therefore, the correct option is 2.

Q36. Answer: (b) Dadu Mian

The correct answer is Dadu Mian.

Key Points

• The Farazi Movement (or Faraizi Movement) was founded by Haji Shariatullah in 1818 in East Bengal to advocate for radical religious, social, and political changes within the Islamic community.

• Dadu Mian (whose real name was Mohammad Mohsin) was the son of Haji Shariatullah and took leadership of the movement in 1840, significantly expanding its influence during the 19th century.

• Under Dadu Mian, the movement shifted from pure religious reform to a powerful agrarian uprising against the exploitation of

zamindars (landlords) and British indigo planters.

• He organized a disciplined paramilitary force and established a parallel government in parts of Bengal, popularizing the revolutionary doctrine that land belongs to God and therefore no tax should be paid to human masters.

Additional Information

• U Kiang Nongbah:

• A legendary freedom fighter from the Jaintia Hills (present-day Meghalaya).

• He led an armed uprising against the British in 1862 following the imposition of the House Tax.

• Majnu Shah (Maznoom Shah):

• A prominent leader of the Fakir-Sannyasi Rebellion that occurred in Bengal during the late 18th century.

• He led groups of wandering Fakirs in raids against the British East India Company factories and treasuries.

• Birsa Munda:

• A tribal freedom fighter and folk hero who belonged to the Munda tribe.

• He spearheaded the Munda Rebellion (also known as Ulgulan or the Great Tumult) in the Chhota Nagpur region between 1899 and 1900 against British colonial rule and the Dikus (outsiders).

Q37. Answer: (d) Stockholm Conference, 1972

The correct answer is Stockholm Conference, 1972.

Key Points

• The United Nations Conference on the Human Environment (UNCHE), held in Stockholm, Sweden, from June 5 to June 16, 1972, was the first global conference to make the environment a major international issue.

• The event was attended by representatives from 113 countries and led to the adoption of the Stockholm Declaration, which established 26 principles for environmental management and 109 recommendations for international action.

• One of the primary outcomes of the summit was the creation of the United Nations Environment Programme (UNEP), the leading global environmental authority that sets the global environmental agenda.

• The conference emphasized the link between economic development and environmental integrity, laying the groundwork for the concept of sustainable development.

• To mark the start of this historic event, the United Nations General Assembly designated June 5 as World Environment Day, which has been celebrated annually since 1973.

Additional Information

• Rio Conference, 1992:

• Commonly known as the Earth Summit or UNCED, it took place in Rio de Janeiro, Brazil.

• It resulted in landmark agreements including Agenda 21, the United Nations Framework Convention on Climate Change (UNFCCC), and the Convention on Biological Diversity (CBD).

• Johannesburg Summit, 2002:

• Known as the World Summit on Sustainable Development (WSSD) or Rio+10, it focused on the implementation of the goals set during the 1992 Earth Summit.

• Key themes included poverty eradication, water sanitation, and sustainable energy.

• Doha Climate Meeting, 2012:

• The COP 18 meeting resulted in the Doha Amendment to the Kyoto Protocol, extending its commitment period until 2020.

• It addressed the Loss and Damage mechanism for developing countries vulnerable to climate change.

Q38. Answer: (b) Ten Degree Channel

The correct answer is Ten Degree Channel.

Key Points

• The Ten Degree Channel is a major water body in the Bay of Bengal that acts as a physical separator between the Andaman Islands to the north and the Nicobar Islands to the south.

• It derives its name from its geographical location on the 10° N latitude line, which runs directly between the two island groups.

• The channel is approximately 150 kilometers (93 miles) wide from north to south and is deep enough to facilitate international shipping and maritime traffic.

• Specifically, it separates Little Andaman (the southernmost island of the Andaman archipelago) from Car Nicobar (the northernmost island of the Nicobar archipelago).

• This channel is ecologically significant and serves as a vital corridor for marine biodiversity in the Indian Ocean region.

Additional Information

• Palk Strait:

• It is a strait located between the Tamil Nadu state of India and the Jaffna District of Sri Lanka.

• It connects the Bay of Bengal in the northeast with the Palk Bay and the Gulf of Mannar in the southwest.

• Duncan Passage:

• This is a narrow strait in the Indian Ocean, measuring approximately 48 kilometers (30 miles) in width.

• It separates Rutland Island (part of the Great Andaman group) to the north from Little Andaman to the south.

• Nine Degree Channel:

• Located in the Arabian Sea, it is part of the Lakshadweep archipelago.

• It separates the island of Minicoy from the main Lakshadweep islands (specifically Kalpeni and Suheli Par) and lies on the 9° N latitude.

• Eight Degree Channel:

• This channel separates the Minicoy Island of India from the Maldives.

Q39. Answer: (c) 64.3%

The correct answer is 64.3%.

Key Points

• The Sustainable Development Goals − National Indicator Framework (SDG NIF) Progress Report 2025 was released by the Ministry of Statistics and Programme Implementation (MoSPI) on June 29, 2025, to commemorate National Statistics Day.

• This report provides a comprehensive review of India's progress toward the 2030 Agenda using 284 national indicators developed in consultation with various ministries and NITI Aayog.

• Under SDG Goal 1 (No Poverty), Indicator 1.3.1 tracks the proportion of the population covered by social protection floors/systems, which includes benefits for children, the unemployed, older persons, and the vulnerable.

• According to the data snapshot provided in the report, social protection coverage in India experienced a significant surge from 22.0% in 2016 to 64.3% in 2025.

• This massive expansion indicates that nearly two-thirds of the Indian population is now receiving at least one form of social protection benefit, reflecting the government's push for inclusive growth.

Additional Information

• The expansion of social protection is attributed to several large-scale government initiatives:

• Aadhaar-linked identification: The use of encrypted Aadhaar as a unique identifier allowed for a more accurate count of beneficiaries across multiple schemes.

• Major Welfare Schemes: Programs such as MGNREGA (employment), PM-POSHAN (nutrition), Ayushman Bharat (health), and the e-Shram portal for unorganized workers have significantly widened the safety net.

• Global Recognition: The International Labour Organization (ILO), in its World Social Protection Report 2024-26, also noted that India's social protection coverage effectively doubled in the last few years.

• Future Projections: While the 2025 report recorded 64.3%, preliminary data for the 2026 Progress Report suggests a further increase to approximately 65.3%.

Q40. Answer: (d) United Nations Development Programme

The correct answer is United Nations Development Programme.

Key Points

• The United Nations Development Programme (UNDP) serves as the global development network for the United Nations, facilitating change and connecting countries to knowledge and resources.

• It was officially established on November 22, 1965, following the merger of the Expanded Programme of Technical Assistance (EPTA) and the Special Fund.

• Headquartered in New York City, the organization operates in approximately 170 countries and territories to eradicate poverty and reduce inequalities.

• The UNDP is the primary body responsible for assisting nations in achieving the Sustainable Development Goals (SDGs), also known as the Global Goals, by the year 2030.

Additional Information

• Human Development Reports (HDR):

• The UNDP is widely recognized for publishing the annual Human Development Report, which introduced the Human Development Index (HDI).

• The HDI is a composite statistic used to rank countries by level of human development, focusing on longevity, education, and per capita income.

• Governance and Leadership:

• The agency is led by an Administrator, a position currently held by Achim Steiner. The Administrator is the third highest-ranking

official in the United Nations.

• The UNDP Executive Board, consisting of representatives from 36 nations, provides intergovernmental support and supervision for the activities of the organization.

• Focus Areas:

• It focuses on three main pillars: Sustainable Development, Democratic Governance and Peacebuilding, and Climate and Disaster Resilience.

Q41. Answer: (a) Gandharva

The correct answer is Gandharva.

Key Points

• In ancient Indian musicology, Gandharva refers to a highly structured, formal, and sacred musical tradition that was believed to be of divine origin and pleasing to the gods.

• As detailed in the Natyashastra by Bharata Muni and the Dattilam by Dattila, this genre was defined by the strict union of three elements: Svara (notes), Tala (rhythm), and Pada (meaningful text).

• It was considered Anadi-Nidhana (eternal) and was categorized as Marga music, representing a spiritual path intended for liberation (Moksha) rather than mere entertainment.

• The name is derived from the Gandharvas, who are celestial beings and divine musicians in Hindu mythology, highlighting the genre's association with the heavens and ritualistic worship.

• Unlike later evolving styles, Gandharva music was rigid in its rules, ensuring that the sanctity and specific spiritual vibrations of the hymns were preserved through centuries.

Additional Information

• Gana:

• While often used as a general term for singing, in the context of ancient treatises, Gana referred to the broader practice of musical performance that eventually allowed for regional and creative variations, moving away from the strict Gandharva rituals.

• Dhrupad:

• This is one of the oldest surviving forms of Hindustani Classical Music, characterized by its austere and grand nature.

• Although it has roots in ancient Vedic chanting and Prabandhas, it flourished significantly later during the medieval period under patrons like Raja Man Singh Tomar of Gwalior and Emperor Akbar.

• Prabandh:

• A structured musical composition that was highly popular between the 11th and 14th centuries.

• It served as a vital evolutionary link between the ancient Gandharva style and modern classical forms, with Jayadeva’s Gita Govinda being a famous example of this literary-musical structure.

Q42. Answer: (b) Pradhan Mantri Jan Vikas Karyakram (PMJVK)

The correct answer is Pradhan Mantri Jan Vikas Karyakram (PMJVK).

Key Points

• The Ministry of Minority Affairs announced support to several central universities in October 2025 to establish Centres of Excellence (CoE) focused on promoting and preserving heritage and classical languages.

• This significant initiative is being implemented under the Pradhan Mantri Jan Vikas Karyakram (PMJVK), which is a Centrally Sponsored Scheme (CSS) designed to improve socio-economic conditions and basic amenities for minority communities.

• The project aims to facilitate advanced research, digitization of ancient manuscripts, and the development of specialized degree and diploma courses in languages like Arabic, Persian, Sanskrit, Pali, and Prakrit.

• Key academic institutions designated for these centres include Jamia Millia Islamia (JMI), Aligarh Muslim University (AMU), the University of Delhi, and the Central Institute of Buddhist Studies (CIBS) in Leh.

• This move is aligned with the National Education Policy (NEP) 2020, which emphasizes the preservation of India's linguistic diversity and the integration of traditional Indian knowledge systems into modern higher education.

• The PMJVK scheme, formerly known as the Multi-sectoral Development Programme (MsDP), has been restructured to prioritize high-impact projects in education, health, and skill development within Minority Concentration Areas (MCAs).

Additional Information

• Pradhan Mantri Virasat Ka Samvardhan (PM VIKAS):

• An integrated scheme focusing on the livelihood, skilling, and entrepreneurship of minority communities, particularly for traditional artisans and craftspersons.

• It converges several previous initiatives including Seekho aur Kamao, USTTAD, Hamari Dharohar, Nai Roshni, and Nai Manzil.

• National Minorities Development Finance Corporation (NMDFC):

• A Schedule C Government Company incorporated in 1994 that provides concessional loans for self-employment to individuals from notified minority communities.

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• It operates through State Channelising Agencies (SCAs) to provide micro-credit and educational loans.

• Maulana Azad National Fellowship (MANF):

• A fellowship scheme that provides financial assistance to students from notified minority communities to pursue higher research programs like M.Phil and Ph.D. in Indian universities.

Q43. Answer: (b) Promoting gender-specific vocational training and education

The correct answer is Promoting gender-specific vocational training and education.

Key Points

• Vocational training provides rural women with specialized skills in sectors such as agro-processing, handicrafts, textile manufacturing, and digital literacy, facilitating their entry into the workforce.

• Gender-specific education acknowledges and addresses the unique socio-cultural barriers women face, such as limited mobility and domestic responsibilities, by providing flexible learning schedules and local training centers.

• Economic empowerment through skill development leads to a multiplier effect; women tend to reinvest a higher portion of their income into their family's nutrition, health, and children's education.

• Empowering women enables them to participate in local governance and decision-making bodies like Gram Sabhas, ensuring that community development projects are inclusive and address the needs of all demographics.

• By shifting from unpaid subsistence labor to income-generating activities, women contribute directly to the Gross Domestic Product (GDP) and reduce the poverty gap in rural regions.

Additional Information

• Women's Empowerment:

• Defined as the process of increasing women's self-worth and their ability to determine their own choices and influence social change.

• It involves five core dimensions: economic, social, political, psychological, and physical autonomy.

• Self-Help Groups (SHGs): Often serve as the primary platform for delivering vocational training and microfinance to rural women.

• Community Development:

• A holistic process focused on improving the social, economic, and environmental conditions of a specific locality.

• Integration of women into the rural economy is a prerequisite for achieving Sustainable Development Goal 5 (Gender Equality) and Goal 8 (Decent Work and Economic Growth).

Q44. Answer: (a) Dravidian style

The correct answer is Dravidian style.

Key Points

• The Dravidian style of temple architecture is native to South India and reached its zenith under the patronage of dynasties such as the Pallavas, Cholas, Pandyas, and the Vijayanagara Empire.

• The most striking feature of this style is the Gopuram, which is a monumental, multi-storied gateway tower decorated with intricate sculptures of deities and celestial beings.

• In the Dravidian style, the temple complex is always enclosed within a high boundary wall (Prakara), and the Gopurams serve as the grand entry points into these enclosures.

• The main tower over the sanctum is called the Vimana, which is shaped like a stepped pyramid that rises geometrically, distinguishing it from the curved towers of Northern styles.

• Other essential elements of this architecture include a temple tank known as the Kalyani or Pushkarni and a pillared hall called the Mandapa.

Additional Information

• Nagara style:

• Prevalent in North India, this style is characterized by the absence of elaborate boundary walls and Gopurams.

• The primary feature is the Shikhara, a curvilinear tower that rises over the Garbhagriha (sanctum sanctorum).

• Vesara style:

• A hybrid style that originated in the Deccan region under the Western Chalukyas and Hoysalas.

• It incorporates elements from both Nagara and Dravidian styles, often featuring a star-shaped base and a fusion of tower designs.

• Pala style:

• Developed in the Bengal and Bihar regions between the 8th and 12th centuries.

• It is known for the extensive use of terracotta and burnt bricks, with temple shapes often influenced by local thatched bamboo huts.

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Q45. Answer: (d) United Kingdom

The correct answer is United Kingdom.

Key Points

• John McFall is a British citizen and a former Paralympic sprinter who has been selected for a pioneering mission to the International Space Station (ISS).

• He was selected by the European Space Agency (ESA) in November 2022 as the world's first parastronaut, a term used for an astronaut with a physical disability.

• As part of the 'Fly!' feasibility study, McFall is working with ESA and its international partners to evaluate the technical, safety, and functional requirements for a person with a physical disability to live and work in microgravity.

• The mission, anticipated around 2025, aims to demonstrate that space exploration can be inclusive, making the United Kingdom a leader in the evolution of human spaceflight criteria.

• His selection followed a rigorous process involving over 22,500 applicants, highlighting the shift in space agencies toward broader human diversity in space missions.

Additional Information

• Biographical Background:

• John McFall lost his right leg in a motorcycle accident at the age of 19 and later became a professional athlete, winning a Bronze medal in the 100m at the 2008 Beijing Paralympic Games.

• In addition to his athletic achievements, he is a highly qualified orthopedic surgeon, holding a medical degree from Cardiff University and being a member of the Royal College of Surgeons.

• International Space Agency Context:

• ESA (European Space Agency): Headquartered in Paris, it represents 22 member states, including the United Kingdom. The UK Space Agency funds the UK's involvement in ESA programs.

• NASA (United States), CSA (Canada), and ASA (Australia): While these agencies collaborate on the ISS, the specific parastronaut initiative is currently a flagship project of the European Space Agency.

Q46. Answer: (a) 1236–1240

The correct answer is 1236-1240.

Key Points

• Razia Sultan, the daughter of Shamsuddin Iltutmish, ascended the throne of the Delhi Sultanate in 1236, becoming the first female Muslim ruler in the Indian subcontinent.

• Her father, Iltutmish, broke tradition by nominating her as his successor, believing his sons were incompetent and addicted to wine and pleasure.

• Despite her nomination, the Turkish nobility initially placed her brother, Ruknuddin Firuz, on the throne; however, his misrule led to a rebellion, allowing Razia to claim power with the support of the people of Delhi.

• She ruled with great efficiency for four years, discarding the purdah (veil), leading military expeditions, and issuing coins in her name as Sultan Jalalat-ud-Dunya wa-l-Din.

• Her reign ended in 1240 after a series of revolts by the Chahalgani (The Forty Turkish nobles) who resented her independent authority and her patronage of Jamal-ud-Din Yaqut, an Abyssinian slave.

• In 1240, she was defeated by Ikhtiyar-ud-din Altunia, the governor of Bhatinda; though she married him to regain power, they were both defeated and killed by the forces of Muizuddin Bahram Shah near Kaithal in October 1240.

Additional Information

• Iltutmish:

• Belonged to the Slave Dynasty (Mamluk Dynasty) and is credited with introducing the Silver Tanka and Copper Jital coins.

• He established the Chahalgani system to consolidate the power of the Turkish elite.

• Mamluk Dynasty:

• Founded by Qutb-ud-din Aibak in 1206, it was the first of the five dynasties that made up the Delhi Sultanate.

• The term Mamluk refers to an Arabic designation for a slave who converted to Islam.

• Minhaj-i-Siraj:

• A contemporary historian who wrote the Tabaqat-i-Nasiri, providing detailed accounts of Razia Sultan's administrative capabilities and the gender-based prejudices she faced.

Q47. Answer: (a) Leading the anti-Simon Commission protests, where he suffered fatal injuries

The correct answer is Leading the anti-Simon Commission protests, where he suffered fatal injuries.

Key Points

• Lala Lajpat Rai, popularly known as Punjab Kesari (The Lion of Punjab), was a towering leader of the Indian Independence

Movement and a key member of the Lal-Bal-Pal extremist trio.

• In 1928, the British government appointed the Simon Commission to report on political reforms in India. Since the commission lacked any Indian members, it was met with nationwide boycotts and protests.

• On October 30, 1928, Rai led a non-violent protest against the commission in Lahore. During this demonstration, the police superintendent James A. Scott ordered a brutal lathi charge.

• Rai was severely injured in the chest during the assault. Despite his condition, he addressed the public, stating that the blows he received would be the last nails in the coffin of the British Empire.

• He passed away due to his injuries on November 17, 1928. His death sparked intense revolutionary fervor, leading Bhagat Singh and his associates to retaliate by assassinating John Saunders.

Additional Information

• Incorrect Options Analysis:

• Salt March (1930): This was a landmark act of non-violent civil disobedience led by Mahatma Gandhi from Sabarmati to Dandi. Lala Lajpat Rai had died two years prior to this event.

• Bardoli Satyagraha (1928): This movement in Gujarat was led by Sardar Vallabhbhai Patel to protest against unfair tax increases. It was here that Patel earned the title Sardar.

• Nehru Report (1928): This was the first major Indian effort to draft a constitution. It was chaired by Motilal Nehru, not Lala Lajpat Rai, and it initially advocated for Dominion Status rather than complete independence.

• Literary and Institutional Contributions:

• Rai was the founder of the Servants of the People Society (1921) and was instrumental in the establishment of the Punjab National Bank.

• His notable literary works include Unhappy India, Young India, and the History of the Arya Samaj.

Q48. Answer: (c) 2014-15

The correct answer is 2014-15.

Key Points

• The Price Stabilisation Fund (PSF) was established by the Government of India in the 2014-15 financial year to mitigate extreme volatility in the prices of essential agri-horticultural commodities.

• The fund was initially set up under the Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) with an original corpus of Rs. 500 crores.

• The primary objective of the PSF is to promote direct purchase from farmers or farmers' organizations at the farm gate or mandi to maintain a strategic buffer stock.

• It provides interest-free loans to State Governments and Central Agencies to undertake procurement and distribution operations when market prices rise significantly.

• The fund originally focused on onions and potatoes to protect consumers from price spikes while ensuring remunerative prices for producers.

Additional Information

• Administrative Transition:

• In April 2016, the Price Stabilisation Fund was transferred from the Ministry of Agriculture to the Department of Consumer Affairs (DoCA) under the Ministry of Consumer Affairs, Food and Public Distribution.

• Commodity Expansion:

• While it started with potatoes and onions, the scope of the fund was later expanded to include various pulses such as Tur, Moong, Gram, Urad, and Masur to ensure national food security.

• Operational Mechanism:

• The fund operates as a revolving fund, meaning the capital is replenished through the sale proceeds of the commodities released into the market during lean periods.

• Central agencies like NAFED (National Agricultural Cooperative Marketing Federation of India) and SFAC (Small Farmers' Agri-Business Consortium) are key players in managing these buffer stocks.

Q49. Answer: (b) kg?m/s²

The correct answer is kg?m/s².

Key Points

• Force is fundamentally defined by Newton's Second Law of Motion, which states that the force applied to an object is the product of its mass and its acceleration (F = m × a).

• The S.I. base unit for mass is the kilogram (kg), which is one of the seven fundamental units of the International System of Units.

• Acceleration is a derived quantity defined as the rate of change of velocity over time. Since velocity is measured in meters per second (m/s) and time is measured in seconds (s), the unit for acceleration is m/s².

• By substituting these base units into the physical formula, the unit for Force becomes kg × m/s², which is collectively termed the Newton (N).

• One Newton is defined as the amount of force required to accelerate a mass of one kilogram at a rate of one meter per second squared (1 N = 1 kg?m/s²).

Additional Information

• Linear Momentum:

• The unit kg?m/s represents Linear Momentum (p = m × v), which describes the quantity of motion of a moving body.

• Work and Energy:

• The unit kg?m²/s² is the base unit equivalent of the Joule (J), used to measure Work (Force × Displacement) and Energy.

• Historical Context:

• The Newton was named in honor of Sir Isaac Newton, whose Principia Mathematica (1687) laid the foundations for classical mechanics.

• S.I. Base Units:

• The system relies on seven base units, including the meter (m) for length, kilogram (kg) for mass, and second (s) for time, from which all other units like the Newton, Pascal, and Watt are derived.

Q50. Answer: (a) Grid pattern intersecting at right angles

The correct answer is Grid pattern intersecting at right angles.

Key Points

• The Harappan Civilization, also known as the Indus Valley Civilization, is renowned for its sophisticated urban planning and advanced engineering.

• The Lower Town of Harappan cities, such as Mohenjo-daro and Harappa, was characterized by a systematic arrangement where roads and streets were laid out in a grid pattern.

• The main streets were designed to be straight and broad, intersecting each other precisely at right angles (90 degrees), effectively dividing the residential areas into rectangular or square blocks.

• This chessboard pattern ensured efficient movement and reflected a high degree of administrative control and architectural foresight.

• The streets were integrated with an elaborate drainage system, where smaller drains from houses led into larger drains running alongside the main roads.

Additional Information

• Urban Structure of Harappan Cities:

• Citadel: A raised area on the western side, typically housing important public buildings like the Great Bath and the Granary.

• Lower Town: Located on the eastern side, this was the residential sector where common citizens lived, featuring houses made of baked bricks.

• Standardization: Unlike other contemporary civilizations, Harappan cities utilized standardized burnt bricks with a ratio of 1:2:4 for construction.

• Drainage Technology: Every house had its own bathroom and was connected to the street drains, which were covered with stone slabs or bricks for maintenance.

• Alternative Patterns:

• Circular or Radial Patterns: These layouts involve streets curving or branching out from a central point, which were not characteristic of Harappan planning.

• Irregular Patterns: These are found in unplanned settlements where growth is organic rather than pre-determined, the opposite of the highly organized Indus Valley sites.

Q51. Answer: (c) Afghanistan, Bangladesh, and Pakistan

The correct answer is Afghanistan, Bangladesh, and Pakistan.

Key Points

• The Citizenship (Amendment) Act, 2019 (CAA), seeks to amend the Citizenship Act, 1955, to facilitate Indian citizenship for specific categories of illegal migrants.

• The Act specifically targets individuals belonging to six minority religious communities: Hindus, Sikhs, Buddhists, Jains, Parsis, and Christians.

• These individuals must hail from three specific neighboring countries: Afghanistan, Bangladesh, and Pakistan.

• To be eligible, the person must have entered India on or before the cut-off date of December 31, 2014, fleeing religious persecution or the fear of religious persecution in their respective home countries.

• The CAA 2019 reduces the period of residency required for naturalization for these groups from the standard 11 years to 5 years.

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• The Act ensures that such individuals will not be treated as illegal migrants under the Foreigners Act, 1946, or the Passport (Entry into India) Act, 1920.

Additional Information

• Geographical Exemptions:

• The provisions of the CAA 2019 do not apply to the tribal areas of Assam, Meghalaya, Mizoram, and Tripura as included in the Sixth Schedule of the Constitution of India.

• It also excludes areas covered under the Inner Line Permit (ILP) system, which includes Arunachal Pradesh, Mizoram, Manipur, and Nagaland.

• Excluded Nations:

• Neighboring countries such as Sri Lanka (home to Eelam Tamils), Myanmar (home to Rohingya), Bhutan, and Nepal are not included in the scope of this particular amendment.

• The Act focuses exclusively on minorities from the three designated Islamic Republics where these six communities are historically recognized as religious minorities.

• OCI Status:

• The Act also contains provisions regarding the cancellation of Overseas Citizen of India (OCI) registration if the OCI holder violates any law notified by the Central Government.

Q52. Answer: (d) Teak

The correct answer is Teak.

Key Points

• Tropical Deciduous Forests, also known as Monsoon Forests, are the most widespread forest type in India, occupying regions that receive annual rainfall between 70 cm and 200 cm.

• Teak (scientific name Tectona grandis) is the most dominant and characteristic tree species of these forests. It is highly valued for its durable and high-quality timber, used extensively in furniture making and construction.

• These forests are characterized by the seasonal shedding of leaves. The trees shed their foliage for about six to eight weeks during the dry summer to minimize water loss through transpiration.

• The distribution of Teak is concentrated in the central parts of India, the Deccan Plateau, the eastern slopes of the Western Ghats, and the foothills of the Himalayas.

• Tropical deciduous forests are further classified into Moist Deciduous (100−200 cm rainfall) and Dry Deciduous (70−100 cm rainfall), with Teak being a primary component of both, though it thrives best in the moist subtype.

Additional Information

• Mangrove:

• Found in coastal regions and deltaic areas influenced by tides and saline water.

• Characterized by pneumatophores or breathing roots. Major examples include the Sunderbans in West Bengal, where Sundari trees are found.

• Deodar:

• A prominent species of the Montane (Himalayan) Forests, specifically found in the Western Himalayas.

• Grows at altitudes between 1,500 and 2,500 meters and provides strong, aromatic timber used in structural work.

• Fir:

• A coniferous tree typical of the Temperate and Alpine Forests at higher altitudes in the Himalayas.

• Usually found at elevations above 2,500 meters, where temperatures are significantly lower.

• Other Deciduous Species:

• In Moist Deciduous Forests, other important species include Sal, Shisham, Hurra, Mahua, Amla, Semul, Kusum, and Sandalwood.

• In Dry Deciduous Forests, common trees include Sal, Peepal, Neem, and Khair.

Q53. Answer: (a) Black soil

The correct answer is Black soil.

Key Points

• Black soil, also popularly known as Regur soil or Black Cotton Soil, is scientifically categorized as Vertisols due to its high clay content and unique expansive properties.

• The most defining characteristic of this soil is its exceptional moisture retention capacity; it swells and becomes sticky when wet, and develops deep wide cracks upon drying, which facilitates self-aeration or self-plowing.

• Geologically, it is derived from the weathering of volcanic rocks (Basalt) found in the Deccan Trap region, covering approximately 15% of India total land area including Maharashtra, Gujarat, and parts of Madhya Pradesh.

• It is chemically rich in minerals such as calcium carbonate, magnesium, potash, and lime, but generally lacks phosphorus, nitrogen, and organic matter.

• The soil is ideally suited for cotton cultivation because the crop requires sustained moisture levels throughout its growth cycle, which the deep clayey layers of black soil provide efficiently.

Additional Information

• Other Soil Types:

• Laterite soil:

• Formed through the process of intense leaching in regions with high temperatures and heavy seasonal rainfall.

• Rich in iron oxide and aluminum, it is primarily used for growing cashew nuts, tea, and coffee.

• Red soil:

• Develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern parts of the Deccan Plateau.

• Its reddish color is attributed to a wide diffusion of iron in crystalline and metamorphic rocks; it appears yellow when in hydrated form.

• Sandy soil:

• Consists of large particles with high porosity, leading to very low water-holding capacity.

• Mainly found in arid and semi-arid regions like Rajasthan, it is generally unsuitable for moisture-intensive crops like cotton.

Q54. Answer: (c) H3-24L

The correct answer is H3-24L.

Key Points

• Chandrayaan-5 is the official designation for the Lunar Polar Exploration (LUPEX) mission, which is a collaborative venture between the Indian Space Research Organisation (ISRO) and the Japan Aerospace Exploration Agency (JAXA).

• The mission is designed to explore the South Pole region of the Moon, specifically focusing on the presence, abundance, and quality of water ice and other resources.

• As per the bilateral agreement, Japan (JAXA) is responsible for providing the Launch Vehicle and the Lunar Rover, while India (ISRO) is responsible for developing the Lander system.

• The designated launch vehicle for this mission is the H3-24L, a specific heavy-lift configuration of Japan's new flagship H3 Rocket.

• The H3-24L configuration features two LE-9 engines in the first stage, four solid rocket boosters (SRB-3), and a Large-type fairing to accommodate the mission's payload.

• The mission is tentatively scheduled for launch around 2028 from the Tanegashima Space Center in Japan.

Additional Information

• GSLV Mk III (LVM3):

• Known as the Launch Vehicle Mark-3, it is India's most powerful heavy-lift rocket.

• It was used for the successful Chandrayaan-2 and Chandrayaan-3 missions.

• It consists of two S200 solid boosters, an L110 liquid core stage, and a C25 cryogenic upper stage.

• GSLV Mk II:

• A three-stage vehicle featuring four liquid strap-on motors and a Cryogenic Upper Stage (CUS).

• It is primarily used to launch INSAT class communication satellites into Geosynchronous Transfer Orbit (GTO).

• PSLV-C45:

• A specific flight of the Polar Satellite Launch Vehicle (PSLV) in its QL variant (with four strap-on motors).

• It famously launched the EMISAT satellite and 28 international customer satellites in April 2019.

Q55. Answer: (d) Processes

The correct answer is Processes.

Key Points

• The Processes tab in modern Windows Task Manager (introduced in Windows 10 Version 1709) provides a granular, real-time view of hardware resource consumption for every active software and system process.

• It features a dedicated GPU column that displays the percentage of the Graphics Processing Unit being utilized by individual applications, allowing users to identify which specific program is causing heavy graphical load.

• Adjacent to the GPU usage percentage, the GPU Engine column specifies which part of the hardware is being leveraged, such as 3D, Video Encode, or Video Decode, for each running process.

• This tab is the primary tool for troubleshooting performance bottlenecks caused by specific background tasks or high-demand software like video editors and games.

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Additional Information

• Performance Tab:

• Provides high-level, system-wide telemetry and graphical data for the CPU, RAM, Disk, and GPU.

• While it displays dedicated video memory and shared system memory usage, it does not breakdown the utilization by specific application names.

• App History Tab:

• Displays cumulative resource usage (such as CPU time and network data) over a specific time period, typically 30 days.

• It primarily tracks Universal Windows Platform (UWP) applications and does not offer live per-app GPU monitoring for all software.

• Startup Tab:

• Lists applications that are configured to launch automatically when the user logs into Windows.

• Its main function is to monitor and manage Startup impact on the BIOS boot time, rather than real-time GPU utilization during active use.

Q56. Answer: (d) Siddhesvara Mahadeva Temple

The correct answer is Siddhesvara Mahadeva Temple.

Key Points

• Brihadeeswara Temple, also known as Rajarajeswaram, is a classic example of Dravidian architecture located in Thanjavur, Tamil Nadu. Built by the Chola emperor Raja Raja I between 1003 and 1010 CE, it features a massive 13-story Vimana (temple tower) that stands approximately 66 meters high.

• The Shore Temple at Mahabalipuram represents the structural phase of Pallava architecture. Constructed under Narasimhavarman II (Rajasimha) in the 8th century, it is one of the oldest structural stone temples in South India and a key Dravidian monument.

• The Gangaikondacholapuram Temple was built by Rajendra I, the son of Raja Raja I, to commemorate his victory over the Pala dynasty of Bengal. It follows the Dravidian style with a slightly concave Vimana, distinguishing it from the Thanjavur temple.

• Siddhesvara Mahadeva Temple (specifically the ones located in Bhubaneswar, Odisha or Barakar, West Bengal) is a prime example of the Nagara style of architecture. These temples are characterized by a Rekha Deul (curvilinear spire) and a Jagamohana (assembly hall), which are defining traits of the Kalinga school of North Indian architecture, not the Dravidian style.

Additional Information

• Dravidian Architecture Features:

• The presence of high enclosure walls and magnificent gateway towers known as Gopurams.

• The main temple tower, called the Vimana, is a stepped pyramid that rises geometrically.

• The presence of a large temple tank (water reservoir) within the complex is a mandatory feature.

• The Garbagriha (sanctum sanctorum) is connected to the assembly hall via an Antarala (vestibule).

• Nagara Architecture Features:

• The entire temple is usually built on a stone platform with steps leading up to it.

• Unlike Dravidian temples, they typically do not have elaborate boundary walls or Gopurams.

• The tower is called a Shikhara, which is curvilinear in shape and topped by a stone disc called an Amalaka and a Kalasha.

Q57. Answer: (d) Amino acids

The correct answer is Amino acids.

Key Points

• Proteins are complex nitrogenous macromolecules composed of long chains of monomers known as amino acids, which are linked together by peptide bonds.

• The digestion of proteins begins in the stomach, where the highly acidic environment created by hydrochloric acid (HCl) facilitates the activation of the enzyme pepsin. Pepsin breaks down the large protein molecules into smaller fragments called proteoses and peptones.

• The process continues in the small intestine, where the pancreas releases proteolytic enzymes, including trypsin, chymotrypsin, and carboxypeptidases, which further hydrolyze the peptides into dipeptides.

• The final stage occurs at the brush border of the small intestine, where the enzyme dipeptidase (found in the succus entericus) breaks the remaining dipeptides into individual, free amino acids.

• These amino acids represent the simplest form of proteins and are the final products that can be absorbed through the intestinal mucosa into the bloodstream for use in growth, repair, and enzyme production.

Additional Information

• Glucose:

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• It is a monosaccharide and the primary end product of carbohydrate digestion.

• Complex carbohydrates like starch are broken down by amylase and maltase into glucose to provide immediate energy for metabolic activities.

• Fatty acids and Glycerol:

• These are the fundamental building blocks and end products of fat (lipid) digestion.

• Bile salts from the liver first emulsify fats, which are then chemically broken down by lipase enzymes into fatty acids and glycerol for absorption into the lacteals (lymphatic vessels).

Q58. Answer: (b) The Speaker of the Lok Sabha

The correct answer is The Speaker of the Lok Sabha.

Key Points

• The Railway Convention Committee (RCC) is an ad-hoc Parliamentary Committee that is specifically constituted to review the financial arrangements between the Railway Undertaking and the General Finances of the government.

• The committee consists of a total of 18 members of Parliament, drawn from both houses.

• The composition includes 12 members from the Lok Sabha and 6 members from the Rajya Sabha.

• The Speaker of the Lok Sabha nominates the members representing the lower house, while the Chairman of the Rajya Sabha nominates the members representing the upper house.

• The Chairman of the Railway Convention Committee is appointed by the Speaker of the Lok Sabha from among the members of the committee.

• The formation of the committee is initiated by a resolution moved by the Minister of Railways in the Lok Sabha, which is subsequently concurred in by the Rajya Sabha.

Additional Information

• Functions of the RCC:

• The primary function is to determine the rate of dividend payable by the Railways to the General Revenues.

• It also examines various aspects of railway finances, such as the Railway Development Fund and the Depreciation Reserve Fund.

• Historical Background:

• The committee owes its origin to the Separation Convention of 1924 (Acworth Committee recommendation), which separated Railway Finance from General Finance.

• The first Railway Convention Committee in independent India was set up in 1949.

• Roles of Other Authorities:

• Chairman of the Rajya Sabha: While the Chairman nominates the 6 members from the Rajya Sabha, the overall coordination and the appointment of the committee head lie with the Speaker.

• President and Prime Minister: Neither the President of India nor the Prime Minister has any constitutional or procedural role in the nomination of members to Parliamentary Committees, as these are legislative bodies independent of the executive for internal appointments.

Q59. Answer: (c) Rajendra I

The correct answer is Rajendra I.

Key Points

• Rajendra I (reigned 1014−1044 CE) was the son of the legendary Chola king Rajaraja I and is considered one of the greatest military conquerors in Indian history.

• He launched a daring military expedition to North India around 1022−1023 CE, crossing the Godavari and reaching the banks of the Ganges River.

• During this campaign, his forces defeated Mahipala I, the ruler of the Pala Dynasty of Bengal and Bihar.

• To celebrate this victory and the symbolic arrival of the holy river in the south, he assumed the prestigious title Gangaikonda, which literally translates to The Conqueror of the Ganges.

• He established a new imperial capital named Gangaikondacholapuram in the Ariyalur district of modern-day Tamil Nadu to commemorate his northern triumphs.

• At the new capital, he constructed a magnificent Shiva Temple (similar to the Brihadisvara Temple) and a massive artificial lake called Cholagangam, filled with water brought from the Ganges.

Additional Information

• Vijayalaya:

• He was the founder of the Imperial Chola line in the 9th century.

• He captured Tanjore (Thanjavur) from the Muttharaiyar chiefs and assumed the title Parakesarivarman.

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• Rajaraja I:

• The father of Rajendra I, he ruled from 985−1014 CE and built the iconic Brihadisvara Temple at Thanjavur.

• He held titles such as Mummudi Chola, Jayangonda, and Sivapadasekhara.

• Pulakesin II:

• He was the most powerful ruler of the Chalukya Dynasty of Badami in the Deccan.

• He is famously known for stopping the southward march of Emperor Harshavardhana on the banks of the Narmada, earning the title Dakshinapatha Pathisvara.

Q60. Answer: (c) Non-justiciable but fundamental in governance

The correct answer is Non-justiciable but fundamental in governance.

Key Points

• The Directive Principles of State Policy (DPSP) are contained in Part IV of the Indian Constitution, spanning from Article 36 to Article 51.

• According to Article 37, the provisions of this part are non-justiciable, which means they are not enforceable by any court. Unlike Fundamental Rights, a citizen cannot sue the government for the non-fulfillment of these directives.

• Despite their non-justiciable nature, Article 37 explicitly mandates that these principles are fundamental in the governance of the country, and it shall be the duty of the State to apply these principles in making laws.

• The core aim of DPSP is to create a Welfare State by ensuring social and economic justice, serving as a guide for the Legislature and the Executive in policy formulation.

Additional Information

• Source and Influence:

• The DPSP are borrowed from the Irish Constitution (which in turn took them from the Spanish Constitution).

• They are similar to the Instrument of Instructions mentioned in the Government of India Act, 1935.

• Categorization:

• Socialistic Principles: Aim at providing social and economic justice (e.g., Article 38, Article 39).

• Gandhian Principles: Based on the ideology of Mahatma Gandhi (e.g., Article 40 regarding Village Panchayats).

• Liberal-Intellectual Principles: Based on liberalism (e.g., Article 44 regarding Uniform Civil Code).

• Legal Status:

• In the Minerva Mills Case (1980), the Supreme Court ruled that the Indian Constitution is founded on the bedrock of the balance between Fundamental Rights and Directive Principles.

• While Fundamental Rights establish political democracy, DPSP strive to establish social and economic democracy.

Q61. Answer: (a) Processing and control

The correct answer is Processing and control.

Key Points

• The Central Processing Unit (CPU) is widely regarded as the brain of the computer, responsible for interpreting and executing most of the commands from the computer's hardware and software.

• The Control Unit (CU) is a core component that manages and coordinates the activities of all other units. It directs the flow of data between the processor, memory, and peripheral devices by generating timing and control signals.

• The Arithmetic Logic Unit (ALU) is the part of the CPU where actual data processing occurs. It performs fundamental arithmetic operations (addition, subtraction, multiplication, division) and logical comparisons (equal to, greater than, less than).

• The CPU operates through a cycle known as the Instruction Cycle or Fetch-Decode-Execute cycle, where it retrieves instructions from RAM, determines the required action, and carries out the task.

• The primary function of the CPU is to process input data into meaningful information while maintaining synchronized control over the entire system architecture.

Additional Information

• Functional Units of a Computer:

• Input Unit: Devices like the keyboard and mouse that feed raw data into the system.

• Output Unit: Devices like the monitor (display) and printer that present the processed results to the user.

• Storage Unit: This consists of Primary Memory (RAM/ROM) for immediate data access and Secondary Storage (HDD/SSD) for permanent data retention.

• CPU Components:

• Registers: Small, high-speed storage locations within the CPU used to hold instructions and data currently being processed.

• Cache Memory: A small amount of high-speed SRAM that sits between the CPU and the main memory to speed up data retrieval processes.

• Clock Speed: Measured in Gigahertz (GHz), it determines the number of cycles a CPU can perform per second, directly impacting processing power.

Q62. Answer: (a) Petroleum

The correct answer is Petroleum.

Key Points

• Non-renewable resources are natural substances that exist in finite quantities and cannot be replaced or regenerated by natural processes within a short geological timeframe.

• Petroleum, commonly referred to as crude oil, is a fossil fuel composed primarily of hydrocarbons and other organic compounds.

• It was formed over millions of years from the remains of ancient marine organisms, such as plankton and algae, which were subjected to intense heat and pressure deep within the Earth's crust.

• Because the consumption rate of petroleum significantly exceeds its extremely slow rate of natural formation, it is classified as an exhaustible resource.

• Once extracted and consumed, these reserves are depleted forever, making them unsustainable for long-term energy security compared to renewable alternatives.

Additional Information

• Renewable Energy Sources:

• Solar Energy: Harvested using photovoltaic cells or solar thermal collectors, this energy originates from nuclear fusion in the Sun and is considered inexhaustible.

• Wind Energy: Generated by the kinetic energy of airflows caused by the uneven heating of the Earth's surface; it is a clean, perpetual resource.

• Biomass: Derived from organic materials like wood, agricultural crops, and animal waste. It is renewable because plants can be regrown in relatively short cycles.

• Environmental Context:

• The use of petroleum is a major contributor to carbon dioxide (CO_2) emissions, leading to the greenhouse effect and climate change.

• In contrast, renewable sources like wind and solar produce little to no greenhouse gases during operation, supporting global decarbonization efforts.

Q63. Answer: (a) Bengaluru

The correct answer is Bengaluru.

Key Points

• The Society of Association Executives (SAE) India was officially launched on October 25, 2025, at the Hilton, Embassy Manyata Business Park in Bengaluru, Karnataka.

• The organization serves as the first unified platform in the country specifically for association leadership, aiming to professionalize the management of trade bodies, professional societies, and non-profits.

• The leadership of the newly formed society includes Dr. Ramesh S. Bilimagga as the President and Dr. Ishwar Gilada as the General Secretary.

• The launch was the result of a strategic collaboration between GConvene, led by Ms. Kalpana Uberoi, and Gregg H. Talley, an international expert in association management from the Talley Management Group (TMG).

• The primary objective of SAE India is to empower associations through shared learning, policy advocacy, and global collaboration, positioning them as critical drivers of India's economic development.

Additional Information

• Strategic Global Alignment:

• SAE India is strategically aligned with major global bodies including the American Society of Association Executives (ASAE), the European Society of Association Executives (ESAE), and the African Society of Association Executives (AfSAE).

• This alignment facilitates the adoption of international standards and best practices in the governance of member-based organizations within India.

• Digital Ecosystem:

• During the Bengaluru launch, the society unveiled a dedicated web platform designed to act as a nerve center for knowledge exchange and professional networking among industry changemakers.

• Sector Significance:

• The association sector in India comprises thousands of organizations that set professional standards and drive innovation across diverse sectors like healthcare, technology, and manufacturing.

• While SAEINDIA is a well-known mobility engineering society, the Society of Association Executives (SAE) India is a distinct entity focused on the management profession of associations themselves.

Q64. Answer: (a) West Bengal

The correct answer is West Bengal.

Key Points

• West Bengal is the largest producer of jute in India, accounting for approximately 75% to 80% (nearly three-fourths) of the total production of the country.

• The state dominance is primarily due to the fertile Ganga-Brahmaputra delta, which provides new alluvial soil (Khadar) that is rich in nutrients and renewed annually by seasonal floods.

• The Hooghly river belt serves as the central hub for the jute industry, offering the necessary hot and humid climate with temperatures between 24°C and 35°C and annual rainfall exceeding 150 cm.

• Processing jute requires an immense amount of clean soft water for retting (the process of soaking stalks to separate fibers), which is abundantly supplied by the river systems in the state.

• The availability of skilled inexpensive labor from neighboring regions and well-connected waterway transportation further supports the massive scale of cultivation and manufacturing in this region.

Additional Information

• Other Producing States:

• Bihar: It is the second-largest producer, with cultivation concentrated in the Purnea, Katihar, and Saharsa districts.

• Assam: The Brahmaputra valley facilitates significant jute production, ranking it third in India.

• Odisha: Production is mainly localized in coastal districts like Cuttack, Puri, and Balasore.

• Golden Fibre:

• Jute is known as the Golden Fibre because of its silky shine and high commercial value.

• It is 100% biodegradable and recyclable, making it an eco-friendly alternative to synthetic fibers.

• Major products include gunny bags, hessian cloth, carpets, ropes, and twines.

• Institutional Support:

• The National Jute Board and the Jute Corporation of India (JCI) work towards price stabilization and the welfare of jute farmers.

• The Jute Packaging Materials Act, 1987 mandates the use of jute for packing foodgrains and sugar to sustain domestic demand.

Q65. Answer: (a) Article 9

The correct answer is Article 9.

Key Points

• Article 9 of the Constitution of India explicitly states that no person shall remain a citizen of India if they have voluntarily acquired the citizenship of any foreign State.

• This provision acts as a definitive prohibition of dual citizenship, reinforcing the principle of single citizenship within the Indian legal framework.

• The article specifies that any person who acquires foreign nationality will not be considered a citizen by virtue of Article 5, Article 6, or Article 8.

• The Constitution of India does not allow individuals to hold Indian passports while simultaneously holding the passport of another country, ensuring undivided loyalty to the Republic of India.

• Citizenship matters are governed under Part II of the Constitution, which includes Articles 5 to 11, outlining the criteria for citizenship at the time of the Constitution's commencement on January 26, 1950.

Additional Information

• Article 5:

• Deals with citizenship at the commencement of the Constitution for persons having their domicile in the territory of India.

• Requires the person to be born in India, or have parents born in India, or have been resident for at least five years.

• Article 7:

• Provides rights of citizenship for certain migrants to Pakistan who later returned to India under a permit for resettlement or permanent return.

• It overrides Article 5 and Article 6 for individuals who migrated after March 1, 1947.

• Article 3:

• Falls under Part I of the Constitution, dealing with the Union and its Territory.

• Empowers Parliament to form new states, increase or diminish the area of any state, and alter state boundaries or names.

• Citizenship Act, 1955:

• Provides comprehensive rules for the acquisition and termination of citizenship after the commencement of the Constitution.

• Introduced concepts like the Overseas Citizenship of India (OCI), which provides certain rights to the Indian diaspora without granting full citizenship or voting rights.

Q66. Answer: (a) Incomplete Dominance

The correct answer is Incomplete Dominance.

Key Points

• Incomplete dominance is a genetic phenomenon where the dominant allele does not completely mask the effects of a recessive allele, resulting in a blended phenotype in the heterozygote.

• In the cross described, the true-breeding red-flowered plant (genotype RR) and the true-breeding white-flowered plant (genotype rr) produce F1 progeny with the genotype Rr.

• The pink phenotype observed in the F1 generation is an intermediate expression between red and white, which characterizes incomplete dominance.

• This pattern of inheritance was famously observed by Carl Correns in Mirabilis jalapa (Four o clock plant) and is also seen in Antirrhinum majus (Snapdragon).

• In the F2 generation, produced by selfing the F1 hybrids, the phenotypic ratio and genotypic ratio are identical at 1:2:1 (1 Red : 2 Pink : 1 White).

Additional Information

• Complete Dominance:

• Occurs when the dominant allele completely covers up the recessive allele in the heterozygous state.

• The F1 phenotype is identical to the dominant parent, as seen in Mendel's pea plant experiments (e.g., Tall vs. Dwarf).

• Co-dominance:

• A condition where both alleles are simultaneously and equally expressed in the heterozygote without blending.

• Classic examples include the ABO blood group (specifically the AB type) and sickle-cell trait.

• Sex-linkage:

• Refers to the inheritance of genes located on the sex chromosomes (X or Y).

• Traits like Haemophilia and Red-green color blindness follow this pattern, often showing criss-cross inheritance.

Q67. Answer: (c) Presiding over Rajya Sabha sessions

The correct answer is Presiding over Rajya Sabha sessions.

Key Points

• Under Article 64 and Article 89 of the Indian Constitution, the Vice-President of India serves as the ex-officio Chairman of the Rajya Sabha (Council of States). It is the Vice-President, not the President, who is responsible for presiding over Rajya Sabha sessions, maintaining order, and regulating the business of the house. Hence, statement 3 is the correct identification of what is NOT a presidential function.

• The President is empowered by Article 72 to grant pardons, reprieves, respites, or remissions of punishment or to suspend, remit, or commute the sentence of any person convicted of any offence in specific cases, such as court-martial or death sentences. Hence, statement 1 is a function of the President.

• According to Article 123, the President has the legislative power to promulgate ordinances during the recess of Parliament. These ordinances have the same force and effect as an Act of Parliament but must be approved by Parliament within six weeks of its reassembly. Hence, statement 2 is a function of the President.

• Article 85 mandates that the President shall from time to time summon each House of Parliament to meet. The President also has the authority to prorogue the Houses and dissolve the Lok Sabha. Hence, statement 4 is a function of the President.

Additional Information

• Constitutional Role of the Vice-President

• The Vice-President acts as the President during a vacancy caused by death, resignation, or removal, but otherwise performs the primary function of Chairman of the Rajya Sabha.

• While presiding, the Vice-President does not have a vote in the first instance but holds a casting vote in case of an equality of votes.

• Executive and Legislative Powers of the President

• The President is the Supreme Commander of the Defence Forces of India.

• All executive actions of the Government of India are formally taken in the name of the President.

• The President appoints the Prime Minister, other Ministers, the Attorney General, and Governors of States.

• A bill passed by Parliament becomes an Act only after receiving the Presidential assent under Article 111.

Q68. Answer: (a) Sliding friction

The correct answer is Sliding friction.

Key Points

• Sliding friction, also referred to as kinetic friction, is the resistive force that acts between two solid surfaces when one is sliding

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over the other.

• When a book is pushed across a table, the physical contact between the two surfaces results in the interlocking of microscopic irregularities (projections and depressions), which opposes the relative motion.

• The direction of this frictional force is always parallel to the contact surfaces and opposite to the direction of the applied force or motion.

• The magnitude of sliding friction is determined by the coefficient of kinetic friction (μ_k) and the normal force (N), expressed as $f_k = \mu_k N$.

• It is a non-conservative force, meaning it dissipates kinetic energy into thermal energy (heat), which is why surfaces often warm up when rubbed together.

Additional Information

• Rolling friction:

• Occurs when a spherical or cylindrical object, such as a ball, wheel, or roller, rolls over a surface.

• It is significantly weaker than sliding friction because the area of contact is minimal, making it easier to move heavy loads using wheels or ball bearings.

• Fluid friction:

• Also known as viscous drag, this is the resistance encountered by objects moving through fluids (liquids or gases).

• It depends on the viscosity of the medium, the shape of the object (streamlining), and the speed of motion.

• Magnetic friction:

• Refers to electromagnetic braking or eddy current damping, where motion is resisted by magnetic fields and induced currents.

• It does not require physical contact between surfaces and is used in modern high-speed trains and gym equipment.

Q69. Answer: (a) MS Word

The correct answer is MS Word.

Key Points

• MS Word, also known as Microsoft Word, is a premier word processing application developed by Microsoft. It is a core component of the Microsoft Office Suite and is designed primarily for the creation, editing, and formatting of text-based documents.

• As an application software, it serves the end-user directly to perform specific productive tasks. It operates on a WYSIWYG (What You See Is What You Get) interface, ensuring that the content appearing on the screen is exactly what will be printed.

• The software supports various file formats, most notably the .docx extension, which is based on XML, and the older .doc binary format. It allows users to manipulate text through font styles, paragraph alignment, and page layout settings.

• Advanced features of MS Word include Mail Merge for bulk documentation, Macros for task automation, and integrated tools for collaborative editing via OneDrive. It also provides robust referencing tools, such as citations and bibliographies, making it essential for academic and professional environments.

• In the hierarchy of software, it sits above the Operating System, relying on system resources to execute its functions while providing a user-friendly interface for document production.

Additional Information

• BIOS (Basic Input/Output System):

• This is a type of firmware or system software stored on a ROM chip on the motherboard.

• It performs the POST (Power-On Self-Test) to ensure hardware components are functioning before loading the bootloader of the operating system.

• Operating Systems (Windows and Linux):

• Windows is a widely used proprietary Operating System (OS) developed by Microsoft, providing a Graphical User Interface (GUI) for managing hardware and software resources.

• Linux is an open-source kernel that serves as the foundation for various Linux distributions (like Ubuntu or Fedora). It is known for its security and multi-user multitasking capabilities.

• Both Windows and Linux are categorized as system software because they manage the fundamental operations of the computer hardware and provide a platform for application software like MS Word to run.

Q70. Answer: (d) Compact Disc

The correct answer is Compact Disc.

Key Points

• A Compact Disc is a digital optical disc data storage format that was co-developed by Sony and Philips, officially hitting the market in 1982.

• The technology utilizes a semiconductor laser with a wavelength of approximately 780 nanometers to read data stored as microscopic pits and lands on a spiral track.

• Standard CDs have a physical diameter of 120 millimeters and a thickness of 1.2 millimeters, providing a storage capacity of 700 MB or about 80 minutes of uncompressed Pulse Code Modulation (PCM) audio.

• Structurally, a CD consists of a polycarbonate plastic substrate, a thin reflective layer (usually aluminum), and a protective lacquer coating to prevent oxidation and physical damage.

• In computer terminology, the CD-ROM (Read-Only Memory) standard was established in the Yellow Book (1985), allowing discs to store computer data rather than just audio.

Additional Information

• Variations of CD Technology:

• CD-R (Compact Disc-Recordable): Uses a photosensitive organic dye layer that allows a laser to burn data onto the disc once.

• CD-RW (Compact Disc ReWritable): Employs a phase-change alloy (typically silver, indium, antimony, and tellurium) that can be melted and recrystallized to erase and rewrite data multiple times.

• VCD (Video Compact Disc): A format for storing video on a CD using MPEG-1 compression, popular before the advent of DVDs.

• Distinction from Software Commands:

• The acronym cd in a Command Line Interface (CLI) like Windows Command Prompt or Linux Terminal stands for Change Directory, which is used to navigate between different folders in a file system.

• Successor Technologies:

• DVD (Digital Versatile Disc): Introduced in 1995, offering 4.7 GB storage using a 650 nm red laser.

• Blu-ray Disc: Uses a 405 nm blue-violet laser to achieve capacities of 25 GB or more per layer.

Q71. Answer: (b) 29

According to the given Venn diagram:

The shaded area represents teachers are there who are also Dentists but not Surgeons are 29.

Hence, the correct answer is "Option 2".

Q72. Answer: (d) HKD : KNG

The logic follows here,

Logic: Each letter in the first group is shifted forward by 3 positions to form the second group

For 'DIP' related to 'GLS':

D(4)	**I(9)**	**P(16)**
+3 ↓	+3 ↓	+3 ↓
G(7)	L(12)	S(19)

For 'BST' related to 'EVW':

B(2)	**S(19)**	**T(20)**
+3 ↓	+3 ↓	+3 ↓
E(5)	V(22)	W(23)

Applying the same logic to the options:

Analyzing 'HKD' related to 'KNG':

H(8)	**K(11)**	**D(4)**
+3 ↓	+3 ↓	+3 ↓
K(11)	N(14)	G(7)

The pair HKD : KNG perfectly follows the +3 shift pattern observed in the given sets.

Hence, the correct answer is 'Option 4'.

Q73. Answer: (b) 76

The logic follows here,

Logic: The sequence of additions is: 3, 6, 9, 12, 15.

• 67 + 3 = 70

• 70 + 6 = 76

• 76 + 9 = 85

• 85 + 12 = 97

• 97 + 15 = 112

Therefore, the number that should come in place of the question mark is 76.

Hence, the correct answer is option 2

Q74. Answer: (a) EH-JB

The logic followed here is:

Option 1) EH-JB

Option 2) OR-TM

Option 3) LO-QJ

Option 4) HK-MF

The letter-cluster that DOES NOT belong to the group is: EH-JB

Hence, the correct answer is "Option (1)"

Q75. Answer: (d) 9

Given number: 52178436

Arranging the digits of the number 52178436 in ascending order from left to right:

Left 1 2 3 4 5 6 7 8 Right

• Third from the left = 3

• Third from the right = 6

• The sum of these two digits is 3 + 6 = 9.

Hence, the correct answer is "Option 4".

Q76. Answer: (a) Two

Given : Seven people, N, V, C, Y, E, F and G, are sitting in a row, facing north.

1. Only two people sit to the left of V
2. Only two people sit between N and V
3. F sits fourth from the right end.
4. E is the immediate neighbour of G and V.
5. Y does not sit to the right of C.

The final arrangement is,

Two people sit between Y and E: V and F

Hence, the correct answer is "Option 1."

Q77. Answer: (d) CZD 46

The logic followed here is:

Logic: Alphabet (-1) and Number (-5)

So, 'CZD 46' will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

Q78. Answer: (a) S

Seven boxes, M, N, O, P, Q, R and S, are kept one over the other, but not necessarily in the same order.

1. No box is kept above O.
2. Only three boxes are kept between O and S.
3. M is kept immediately above S.
4. Only one box is kept between Q and M.
5. Only four boxes are kept between Q and P.
6. R is kept at some place above N.

The Final Arrangement is,

7	**O**
6	Q
5	R
4	M

3	S
2	N
1	P

The box kept second below R (at position 5) is S (at position 3).

Hence, the correct answer is "Option 1".

Q79. Answer: (b) (5, 3, 15)

The logic followed here is:

Logic: First Number × Second Number = Third Number

For the first set (2, 7, 14)

=> 2 × 7 = 14.

For the second set (3, 16, 48)

=> 3 × 16 = 48.

Similarly,

In Option 2: (5, 3, 15)

=> 5 × 3 = 15.

Hence, the correct answer is 'Option 2'.

Q80. Answer: (a) CEH

The logic followed here is

Logic: The difference between the consecutive letters in each group is +2.

Option 1) CEH

Option 2) PRT

Option 3) SUW

Option 4) HJL

Thus, out of all options "CEH" is the odd one out.

Hence, the correct answer is 'Option 1'.

Q81. Answer: (c) One

Given: A, B, D, J, O, T, and Z are sitting around a circular table facing the center.

1. J sits third to the left of B.

2. A sits to the immediate right of B.

3. A sits second to the left of O

4. Only two people sit between O and D when counted from the left of D.

5. Z is an immediate neighbor of J.Only one place is vacant and one person is left. So,

The final Arrangement is,

One people sit between O and Z when counted from the right of O.

Hence, "Option - (3)" is the correct answer.

Q82. Answer: (d) Neither conclusion (I) nor (II) follows

The least possible Venn diagram for the given statements is:

Conclusions:

(I) Some vehicles are tools. - Does not follow (As there is no direct relation between vehicles and tools, maybe it is possible but not definite. Hence, it is false.

(II) All tools are machines. - Does not follow (Some machine are tools and some tools are machines.) Hence, it is false.

Neither conclusion (I) nor (II) follows

Hence, the correct answer is "Option 4"

Q83. Answer: (c) Two

Given : left 1358274 right

Arranged in the ascending order from left to right :

Original number	1	3	5	8	2	7	4
Arranged in the ascending order from left to right :	1	2	3	4	5	7	8

Two Digits will remain unchanged as compared to that in the original number: 1 and 7

Hence, the correct answer is 'Option 3.'

Q84. Answer: (d) 9 km to the West

Given:

• Mr. Yorly starts from Point A and drives 16 km towards South.

• He then takes a right turn, drives 14 km, turns right and drives 44 km.

• He then takes a right turn and drives 2 km, turns right drives 15 km.

• He then takes a left turn drives 21 km.

• He takes a final right turn, drives 13 km and stops at Point P

The final Diagram,

The direction he should drive in order to reach Point A is 9 km in west direction.

Hence, the correct answer is 'Option 4'.

Q85. Answer: (b) 25th

Given:

Total number of students in the row = 54

Position of Gagan from the right end = 13^(th)

Since Nitin is 17^(th) to the left of Gagan, his position from the right end will be further away.

Position of Nitin from the right end = Position of Gagan from the right end + 17

= 13 + 17

= 30

So, Nitin is 30^(th) from the right end.

Position of Nitin from the left end = (Total number of students + 1) − Position from the right end

= (54 + 1) − 30

= 55 − 30

= 25

Hence, the correct answer is 'Option 2'.

Q86. Answer: (d) Father's father

Family Chart:

Given: ‘A + B ÷ C – D x E ÷ F

Symbol	÷	×	–	•
Meaning	Brother	Mother	Husband	Father

Therefore, A is the father of C, who is the father of F → A is the Father's father of F.

Hence, the correct answer is 'Option 4'.

Q87. Answer: (d) UOSV

The logic followed in this pattern is a consistent shift in the alphabetical order of each letter.

For 'JDHK' related to 'OIMP':

J(10)	D(4)	H(8)	K(11)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
O(15)	I(9)	M(13)	P(16)

For 'MGKN' related to 'RLPS':

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M(13)	G(7)	K(11)	N(14)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
R(18)	L(12)	P(16)	S(19)

Applying the same logic to 'PJNQ':

P(16)	J(10)	N(14)	Q(17)
+5 ↓	+5 ↓	+5 ↓	+5 ↓
U(21)	O(15)	S(19)	V(22)

Thus, PJNQ is related to UOSV.

Hence, the correct answer is 'Option 4'.

Q88. Answer: (c) F

The logic follows here.

Logic: Each vowel is replaced by its subsequent letter (+1) and each consonant by its preceding letter (−1) in alphabetical order.

C	U	R	R	E	N	T
B	V	Q	Q	F	M	S

New group of letters formed is: B V Q Q F M S

Left B V Q Q F M S Right

Third from the right in the new group of letters thus formed is F.

Hence, the correct answer is option 3

Q89. Answer: (d) 8

The logic followed here is,

Therefore, the code for C is 8.

Hence, the correct answer is "Option 4"

Q90. Answer: (a) Two

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

Required condition: Perfect Square — Even Digit — Odd Digit.

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

So, there are two such even digits in the given series.

Hence, the correct answer is 'Option 1'.

Q91. Answer: (a) 6

The logic follows here.

Logic: The pattern is based on adding consecutive perfect squares 1^2, 2^2, 3^2, 4^2, 5^2) to the preceding number

• $5 + 1^2 = 5 + 1 = 6$

• $6 + 2^2 = 6 + 4 = 10$

• $10 + 3^2 = 10 + 9 = 19$

• $19 + 4^2 = 19 + 16 = 35$

• $35 + 5^2 = 35 + 25 = 60$

Hence, the correct answer is "Option 1."

Q92. Answer: (d) KE -9

The logic followed here is:

QX 18 → SS 4:

EL 10 → GG −4:

Similarly, for IJ 5 → KE −9

Thus, IJ 5 is related to KE −9.

Hence, the correct answer is 'Option 4'.

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Q93. Answer: (c) 9

Given number: 36857219

When the digits are arranged in ascending order from left to right, the new sequence is:

Left 12356789 Right

The second digit from the left in the new number is 2.

The third digit from the right in the new number is 7

So, Sum of these two number 2 + 7 = 9.

The correct answer is 'Option 3'.

Q94. Answer: (c) ATX

The logic followed here is:

Therefore, the term that replaces the question mark is ATX.

Hence, the correct answer is option 3

Q95. Answer: (b) B 25

The pattern followed here is,

• The pattern for letters is: Previous letter + 9 = Next letter.

• The pattern for numbers is: Previous number − 5 = Next number.

By combining both patterns, the missing term is B 25.

Hence, the correct answer is option 2

Q96. Answer: (a) Two

Given: (Left) K D D U R V U D E C Q D V A D R D G D E D Z D J (Right)

The logic to be followed here is to identify 'D's that satisfy the specific condition mentioned in the question.

Required Condition: Vowel → D → Consonant

Given: (Left) K D D U R V U D E C Q D V A D R D G D E D Z D J (Right)

There are a total of two such 'D's in the series that satisfy the given conditions: A D R, E D Z

Hence, the correct answer is "Option 1."

Q97. Answer: (c) Wife's brother

Preparing the family tree using the following symbols,

Given : 'S – D + F ÷ H x K'

Code	•	•	×	÷
Relation	Son	Brother	Wife	Father

The family tree can be drawn using the given information,

Here, S is brother of H and H is wife of K so, we can see that S is wife brother's of K.

Hence, the correct answer is "Option 3".

Q98. Answer: (a) 3rd

The logic followed here is:

Total number of students in the row = 22

Position of Sunil from the left end = 17^(th)

Deepak is 3^(rd) to the right of Sunil.

Position of Deepak from the left end = Position of Sunil from the left end + 3

= 17 + 3

= 20^(th)

Position of Deepak from the right end = (Total number of students − Position of Deepak from the left end) + 1

= (22 − 20) + 1

= 2 + 1

= 3^(rd)

Hence, the correct answer is 'Option 1'.

Q99. Answer: (c) TTP

The logic followed here is.

Logic: The difference between the positional values of consecutive letters in each cluster is −1 and −3 based on the English alphabetical order.

For QPM

For BAX

For TTP

For SRO

The pattern observed in QPM, BAX, and SRO is the same. However, TTP follows a different pattern

Hence, the correct answer is option 3

Q100. Answer: (c) 2

The logic followed here is.

‘BRAK’ is coded as '4938.'

'ARCK' is coded as '2849.'

The code for ‘C’ in the given code language is 2.

Hence, the correct answer is "Option 3".

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