RRB NTPC (UG) CBT-I Official Paper (Held On: 29 Aug, 2025 Shift 2) (Previous Year Paper)

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

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GENERAL AWARENESS

Q1. Which of the following subjects was NOT a part of the Transferred Subjects under the Government of India Act of 1919?

(a) Local self-government
(b) Police
(c) Health
(d) Education

Q2. Which of the following properties generally increases across a period (left to right) in the periodic table?

(a) Reduction
(b) Ionisation enthalpy
(c) Metallic character
(d) Atomic radius

Q3. Who was appointed as the Chairman of the Union Public Service Commission (UPSC) in 2025, succeeding Preeti Sudan?

(a) Sanjay Mitra
(b) Anil Swarup
(c) Ajay Kumar
(d) Rajiv Gauba

Q4. Yagnavarman, Sardulavarman and Anantavarman were the kings of which of the following kingdoms?

(a) Magadha Guptas
(b) Maitrakas of Valabhi
(c) Maukharis of Kanauj
(d) Pushyabhutis of Thanesar

Q5. Before becoming the Chief Justice of India, Justice BR Gavai served in which court?

(a) Delhi High Court
(b) Allahabad High Court
(c) Bombay High Court
(d) Madras High Court

Q6. What is the purpose of the submarine cable project launched by the Indian National Centre for Ocean Information Services (INCOIS) in 2025?

(a) Improve underwater defense systems
(b) Support ocean tourism
(c) Increase internet speed in coastal areas
(d) Enhance long-term Indian Ocean observations

Q7. A solution with a pH of 2 is how many times more acidic than a solution with pH 4?

(a) 10 times
(b) 2 times
(c) 100 times
(d) 200 times

Q8. The spread of the Green Revolution technology enabled India to achieve selfsufficiency in _____.

(a) sugarcane
(b) vegetables
(c) oil seeds
(d) food grains

Q9. Which postulate of Dalton's atomic theory explains the Law of Definite Proportions?

(a) Atoms are indivisible and indestructible.
(b) Atoms of different elements have different masses and properties.
(c) Atoms of the same element are identical in mass and size.
(d) Atoms combine in simple whole-number ratios to form compounds.

Q10. Which ISRO mission, launched in May 2025, aims to enhance India's all-weather dayand-night Earth observation capabilities?

(a) INSAT-3DS
(b) Cartosat-3
(c) RISAT-1B
(d) EOS-09

Q11. Who among the following translated the book 'Heart Lamp' from Kannada to English, for which the author won the prestigious International Booker Prize in May 2025?

(a) Manorama Mishra
(b) Deepa Bhasthi
(c) Chitra Banerjee Divakaruni
(d) Geeta Singh

Q12. Which Article of the Indian Constitution empowers the Parliament and State Legislatures to make laws for the whole or any part of the territory of India?

(a) Article 250
(b) Article 245
(c) Article 249
(d) Article 256

Q13. What happened to employment opportunities after the 1991 reforms?

(a) Stayed the same
(b) Increased, especially in private and service sectors
(c) Decreased in all sectors
(d) Only grew in agriculture

Q14. The largest area of the Great Indian Desert in India is located in which state?

(a) Gujarat
(b) Rajasthan
(c) Punjab
(d) Haryana

Q15. Which agency on 2025 authorised to share information with the Enforcement Directorate (ED) under the Prevention of Money Laundering Act to combat cyber fraud?

(a) Indian Cyber Crime Coordination Centre (I4C)
(b) Central Bureau of Investigation (CBI)

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(c) National Cyber Crime Reporting Portal (NCRP)
(d) Cyber and Information Security Division (CISD)

Q16. In January 2025, which state cricket association unveiled plans to construct the largest cricket stadium in India, with a seating capacity of 1.25 lakh spectators?
(a) Odisha Cricket League
(b) Punjab Cricket Association
(c) Delhi District Cricket Association
(d) Andhra Cricket Association

Q17. Which of the following is a mode of losing Indian citizenship?
(a) Renunciation
(b) Birth
(c) Registration
(d) Naturalization

Q18. In which year was the Paris Agreement adopted?
(a) 2015
(b) 2013
(c) 2016
(d) 2017

Q19. In the context of British plantations in India, what does the term ‘bigha’ refer to?
(a) A unit of measurement of land
(b) A plant that replaced indigo in Britain
(c) An agreement made with the ryots
(d) A revenue estate which has one or more villages

Q20. Which of the following accurately represents the two main components of the CPU and their functions?
(a) Monitor and Keyboard – Control the speed of data processing
(b) RAM and ROM – Store data and instructions permanently
(c) HDD and SSD – Perform data input and output tasks
(d) ALU and CU – Perform calculations and control all computer operations

Q21. What are quaternary activities mainly associated with?
(a) Transportation
(b) Industrial work
(c) Information and research
(d) Agriculture

Q22. Which of the following Five-Year Plans was based on the Harrod-Domar Model?
(a) First
(b) Third
(c) Fifth
(d) Seventh

Q23. In FIFO scheduling, which process is executed first?
(a) The process with the shortest execution time
(b) The process that arrives first
(c) The process with the highest priority
(d) The process that arrives last

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Q24. Where was the 12^(th) World Government Summit, 2025, held?

(a) Delhi, India
(b) Muscat, Oman
(c) Riyadh, Saudi Arabia
(d) Dubai, UAE

Q25. What is the general slope of the Deccan Plateau?

(a) North to South
(b) West to East
(c) South to North
(d) East to West

Q26. During which period of Indian history were the stupas of Sanchi and Sarnath built, reflecting its architectural style?

(a) Gupta rule
(b) Kushan rule
(c) Mauryan rule
(d) Vakataka rule

Q27. Which of the following countries was elected to the Vice Presidency of the Internaonal Associaon of Marine Aids to Navigaon and Lighthouse Authories (IALA) in 2025?

(a) France
(b) Japan
(c) Australia
(d) India

Q28. Who among the following strongly criticised British education for being too Western and disconnected from Indian realities?

(a) Charles Wood
(b) Rabindranath Tagore
(c) Raja Rammohan Roy
(d) Macaulay

Q29. The 'Nuclear Energy Mission for Viksit Bharat' aims to achieve how much nuclear energy capacity by 2047?

(a) 75 GW
(b) 125 GW
(c) 50 GW
(d) 100 GW

Q30. Which Indo-Greek ruler's envoy Heliodorus installed a pillar in Vidisha and was a devotee of Lord Krishna?

(a) Diodotus
(b) Demetrius
(c) Antialkidas
(d) Menander

Q31. The famous male torso from Harappa, remarkable for its naturalistic pose and chiselled in the round, is made of _____.

(a) steatite
(b) red limestone
(c) bronze
(d) terracotta

Q32. Ashok Chandra assumed charge as Managing Director and Chief Executive Officer of _____ on 16th January 2025.

(a) Punjab National Bank
(b) Central Bank of India

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(c) Canara Bank
(d) Union Bank of India

Q33. What is the projected valuation of India's satellite communication (satcom) market by 2028?\
(a) $10 billion
(b) $20 billion
(c) $5 billion
(d) $15 billion

Q34. Canal irrigation is best suited for which of the following geographical regions?
(a) High mountain regions
(b) Rocky plateaus
(c) River basins and flat lands
(d) Desert regions

Q35. Under what conditions can the Parliament legislate on matters in the State List according to constitutional provisions?
(a) When the Rajya Sabha passes a resolution.
(b) During a national emergency declared under Article 352.
(c) If the President signs a proclamation without Parliament's involvement.
(d) If a Governor requests it due to a financial emergency in the state.

Q36. By when has India aimed to achieve its defence production of Rs. 3 lakh crore, which will strengthen its position as a global defence manufacturing hub?
(a) 2032
(b) 2029
(c) 2028
(d) 2030

Q37. Which initiative was launched to provide reliable electricity to all households in India, especially in rural areas?
(a) UJALA Scheme
(b) Shakti Scheme
(c) Saubhagya Scheme
(d) GARV Dashboard

Q38. Who among the following passed an Act in 1898, making it an offence to provoke people against the British rulers?
(a) Lord Curzon
(b) Lord Northbrook
(c) Lord Elgin
(d) Lord Mayo

Q39. The process of planet formation through collision and sticking of small celestial bodies is called:
(a) Fragmentation
(b) Degassing
(c) Differentiation
(d) Accretion

Q40. Lok Adalats in India have statutory status under which of the following enactments?
(a) The Civil Procedure Code, 1908
(b) The Indian Penal Code, 1860
(c) The Legal Services Authorities Act, 1987
(d) The Arbitration and Conciliation Act, 1996

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MATHEMATICS

Q41. A can do a work in 12 days and B can do the same work in 25 days. If they work on it together for 6 days, then what fraction of the work is left?

(a) 9/50
(b) 17/50
(c) 13/50
(d) 21/50

Q42. Evaluate: (-9) - (-60) ÷ (-10) + (-3) × 9

(a) -42
(b) -44
(c) -45
(d) -41

Q43. The HCF and the LCM of two numbers are 18 and 216, respectively. If one of the numbers is 72, find the other one.

(a) 25
(b) 10
(c) 54
(d) 5

Q44. If the 6-digit number N36M77 is divisible by 11, then which of the options below can give a possible correct relation between M and N?

(a) M + N = -3
(b) M - N = 3
(c) M - N = 1
(d) M = N

Q45. The product of two positive numbers is 245. If the first number is five times the second number, then the sum of the two numbers is:

(a) 38
(b) 51
(c) 40
(d) 42

Q46. Train A leaves station M at 8:35 AM and reaches station N at 3:35 PM on the same day. Train B leaves station N at 10:35 AM and reaches station M at 3:35 PM on the same day. Find the time when trains A and B meet.

(a) 11:50 AM
(b) 12:40 PM
(c) 12:10 PM
(d) 12:50 PM

Q47. If the third proportional of 8 and 16 be x, then what is the value of x?

(a) 31
(b) 34
(c) 32
(d) 35

Q48. A bus travelling at 10 km/hr completes a journey in 16 hours. At what speed will it have to cover the same distance in 8 hours?

(a) 14 km/hr
(b) 10 km/hr
(c) 20 km/hr
(d) 25 km/hr

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Q49. Praveen and Hemant start a business. Praveen invests Rs. 78,000 more than Hemant for 5 months and Hemant invests for 6 months. Praveen's share is Rs. 1,360 more than that of Hemant, out of a total profit of Rs. 5,440. Find the capital contributed by Praveen.

(a) Rs. 1,56,000
(b) Rs. 1,55,955
(c) Rs. 1,55,875
(d) Rs. 1,56,185

Q50. Sapna invested Rs. 22,800 on simple interest, partly at 5% per annum and partly at 11% per annum. If she earns equal interests from the two investments after 4 years, then find the sum invested at 5% per annum (in Rs.).

(a) 15,676
(b) 15,675
(c) 15,678
(d) 15,677

Q51. Simplify:

(sin θ - cos θ)(1 + tan θ + cot θ)/(1 + sin θcos θ) + sin θ/(1 + cos θ) + (1 + cos θ)/sin θ

(a) csc θ + sec θ
(b) sin θ + cos θ
(c) tan θ + sec θ
(d) sin θsec θ

Q52. The value of 4/3 + (1/(1+2/7)) - 2/3 is

(a) 16/19
(b) 4/9
(c) 13/9
(d) 5/8

Q53. The average of first 159 even numbers is

(a) 161
(b) 160.5
(c) 159.5
(d) 160

Q54. Given that 112^(0.57) = x, 112^(0.8)= y and x^z = y^6, then the value of z is close to:

(a) 10.14
(b) 9.12
(c) 8.45
(d) 8.42

Q55. Find the effective discount for the scheme – Buy 12, get 8 free.

(a) 10%
(b) 21%
(c) 40%
(d) 20%

Q56. Pipe P can fill 3/8 part of a tank in 30 hours, and pipe Q can fill 4/5 part of the same tank in 16 hours. Both P and Q were kept open for 4 hours, then both were closed. Pipe R alone was then opened and it emptied the water in the tank in 8 hours. Pipes P, Q and R together can fill the empty tank in:

(a) 35 hours
(b) 40 hours
(c) 21 hours
(d) 32 hours

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Q57. If 4 times a son's age is added to his father's age, the sum is 46 years. If 2.8 times the father's age is added to the son's age, the sum is 88 years. What is the father's age (in years)?

(a) 35
(b) 25
(c) 28
(d) 30

Q58. If the radius of the base of a right circular cylinder is decreased by 46% and its height is increased by 261%, then what is the percentage increase (closest integer) in its volume?

(a) 5%
(b) 35%
(c) 17%
(d) 19%

Q59. Vijay got an increase of 4% in his sales amount in the first year and 25% in the second year; also with this, his current sales are Rs. 1,50,800, what was his sales (in Rs.) two years ago?

(a) Rs. 1,20,640
(b) Rs. 96,000
(c) Rs. 1,16,000
(d) Rs. 1,45,000

Q60. The marks scored by 10 students are given below. 20, 16, 16, 19, 16, 12, 19, 10, 14, 18 The mode of the given data is:

(a) 19
(b) 12
(c) 16
(d) 20

Q61. A store offers a discount of 14% on a television marked at Rs. 78,000. During a sale, an additional 8% discount is offered on the already discounted price. What is the total discount percentage?

(a) 18.23%
(b) 20.88%
(c) 22.48%
(d) 21.62%

Q62. If the sum of the measures of all the interior angles of a regular polygon is 2520°, then what is the exterior angle of the polygon?

(a) 42.5°
(b) 22.5°
(c) 37.5°
(d) 90°

Q63. An amount of Rs. 570 is divided among three persons in the ratio of 2 : 12 : 11. The difference between the largest and the smallest shares (in Rs.) in the distribution is:

(a) 166
(b) 228
(c) 293
(d) 284

Q64. Find the surface area of a sphere with a radius of 5 cm.

(Use $\pi = 3.14$)

(a) 628 cm^2
(b) 3140 cm^2
(c) 31.4 cm^2
(d) 314 cm^2

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Q65. A sum of money triples itself at a certain rate of compound interest in 15 years. In how many years will it amount to 27 times of itself?

(a) 39 years
(b) 45 years
(c) 55 years
(d) 36 years

Q66. An article is sold at a profit of 57%. If the cost price is increased by Rs. 20 and the selling price is reduced by Rs. 18, then the profit would be 47.5%. What is the original cost price (in Rs.) of the article?

(a) 200
(b) 500
(c) 300
(d) 400

Q67. A number, when increased by 60%, gives 3610. The number is:

(a) 2256.25
(b) 4512.5
(c) 1128.125
(d) 6768.75

Q68. 88 tube lights were purchased for Rs. 88, and 46 tube lights broke in transit. The trader sold the remaining tube lights at Rs. 3.10 each. Find his profit.

(a) Rs. 47.10
(b) Rs. 48.20
(c) Rs. 42.20
(d) Rs. 36.60

Q69. Simplify the following.

$2((3/2)x^2 - 20x + 17) - 3(x^2 + 7x - 15)$

(a) $61x + 79$
(b) $61x - 79$
(c) $-61x + 79$
(d) $-61x - 79$

Q70. Which of the following numbers divides 393064111?

(a) 11
(b) 14
(c) 15
(d) 10

GENERAL INTELLIGENCE AND REASONING

Q71. 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 bricks are spoons. No brick is a game.

Conclusions (I): Some games are spoons.

Conclusions (II): All spoons are games.

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

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Q72. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some orchids are cacti.

No cactus is a marigold.

Conclusions:

(I) No marigold is a cactus.

(II) Some cacti are orchids.

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

Q73. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, then the resultant of which of the following would be 9?

(a) 41 C 13 B 3 A 35 D 5
(b) 41 B 13 C 3 D 35 A 5
(c) 41 D 13 B 3 C 35 A 5
(d) 41 A 13 C 3 B 35 D 5

Q74. Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order.

Only two boxes are kept below B. Only one box is kept above F. Only one box is kept between F and D. A is kept immediately above G. C is kept at some place below E. Which box is kept at the top?

(a) C
(b) E
(c) G
(d) A

Q75. H, I, J, P, Q, R and S are sitting around a circular table facing the centre of the table. Q sits to the immediate right of J. Only three people sit between Q and S when counted from the left of Q. Only three people sit between J and H. P sits to the immediate right of R.

How many people sit between J and R when counted from the right of R?

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

Q76. Each of the digits in the number 9823415 is arranged in ascending order from left to right. What will be the sum of the digits which are second from the left and second from the right in the new number thus formed?

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

Q77. In a certain code language, ‘GETS’ is coded as ‘8106’ and ‘EGIS’ is coded as ‘0167’. What is the code for ‘I’ in the given code language?

(a) 1
(b) 7
(c) 0
(d) 6

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Q78. In a certain code language,

'A # B' means ‘A is the brother of B’,

'A % B' means ‘A is the daughter of B’,

'A = B' means ‘A is the wife of B’ and

'A ¥ B' means ‘A is the father of B’.

How is D related to S if 'D = O # M ¥ E % S'?

(a) Father's brother's son
(b) Father's brother's sister
(c) Husband's brother's wife
(d) Father's brother's daughter

Q79. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

SET DQE OCP ZOA ?

(a) KLA
(b) KAL
(c) LKA
(d) LAK

Q80. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

LOPE - LEPO - EPOL

QUIT - QTIU - TIUQ

(a) BANG - BGNA - GNAB
(b) SLOP - SLPO - LOPS
(c) FILE - IFLE - EILF
(d) WAST - WSAT - TSAW

Q81. What should come in place of the question mark (?) in the given series?

9 19 39 69 109 ?

(a) 150
(b) 160
(c) 155
(d) 159

Q82. Based on the English alphabetical order, three of the following four letter clusters are alike in a certain way and thus form a group. Which letter cluster DOES NOT belong to that group?

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

(a) GLH
(b) EJF
(c) NSO
(d) LQN

Q83. If 1 is added to each even digit and 2 is subtracted from each odd digit in the number 4268953, then how many digits will appear more than once in the new number thus formed?

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

Q84. What should come in place of the question mark (?) in the given series?

11, 33, 55, 77, ?, 121.

(a) 109
(b) 101

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(c) 111
(d) 99

Q85. Sunil starts from Point A and travels 8 km towards north, turns left and travels 6 km, and then turns right and covers another 7 km. He then turns right and travels another 6 km. How far (shortest distance) is he from Point A? (All turns are 90-degree turns only.)

(a) 4 km
(b) 5 km
(c) 10 km
(d) 15 km

Q86. Ramu ran 60 km towards the west, turned left and ran 15 km. He then turned left and ran 40 km. In which direction is Ramu facing at the end? (All turns are 90 degrees unless specified)

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

Q87. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) GE−BC
(b) TR−PN
(c) RP−NL
(d) WU−SQ

Q88. Refer to the following number and symbol series and answer the question that follows. Counting to be done from left to right only. (Note: All numbers are single digit numbers only).

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

If all the symbols are dropped from the series, which of the following will be seventh from the right?

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

Q89. Refer to the following number and symbol series and answer the question that follows. All numbers are single-digit numbers. Counting to be done from left to right only.

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

If all the symbols are dropped from the series, which of the following will be fifth from the right?

(a) 5
(b) 1
(c) 3
(d) 7

Q90. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

INQ23 JOR32 KPS41 LQT50 ?

(a) MRU58
(b) MRV59
(c) MRU59
(d) MRV58

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Q91. Select the triad that follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

HO-JQ-MP

KR-MT-PS

(a) NU-PW-RV
(b) MU-PW-RV
(c) MU-OW-SV
(d) NU-PW-SV

Q92. What should come in place of the question mark (?) in the given series?

162 ? 42 22 12 7

(a) 82
(b) 78
(c) 76
(d) 74

Q93. In a row of 59 people facing the north, Bela sits 20th from the left end. If Ajeet sits 16th to the right of Bela, what is Ajeet's position from the right end of the line?

(a) 26^(th)
(b) 21^(st)
(c) 22^(nd)
(d) 24^(th)

Q94. In a certain code language, ‘she has guts’ is coded as ‘bs kr ni’ and ‘packet has gone’ is coded as ‘ud ni gy’. How is ‘has’ coded in the given language?

(a) bs
(b) ni
(c) kr
(d) ud

Q95. What will come in the place of the question mark (?) in the following equation, if ‘+’ and ‘÷’ are interchanged, and ‘–’ and ‘×’ are interchanged?

11 − 2 × 48 + 6 ÷ 15 = ?

(a) 10
(b) 22
(c) 16
(d) 29

Q96. In the following triads, each group of letters is related to the subsequent one following a certain logic. Select from the given options, the one which follows the same logic.

JUNE - UJNE - EUJN

LAPS - ALPS - SALP

(a) BUGS - UBGS - SUGB
(b) FROG - RFOG - GRFO
(c) LOST - OLST - OSTL
(d) MOVE - MVOE - EVOM

Q97. Kunal ranked 29^(th) from the top and 15^(th) from the bottom in his class. How many students are there in his class?

(a) 40
(b) 44
(c) 43
(d) 41

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Q98. L, M, N, O, Q, R and S are sitting around a circular table, facing the centre of the table. Q sits to the immediate right of N. Only three people sit between Q and S when counted from the left of Q. Only three people sit between N and M. L sits to the immediate right of R. How many people sit between O and R when counted from the left of R?

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

Q99. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(26, 96, 22)

(46, 108, 8)

(a) (7, 15, 1)
(b) (1, 39, 19)
(c) (30, 63, 2)
(d) (24, 84, 18)

Q100. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group?

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

(a) CE-FH
(b) SU-VX
(c) KM-NO
(d) AC-DF

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) Police

The correct answer is Police.

Key Points

• The Government of India Act, 1919 introduced the concept of Dyarchy in provincial governance, dividing the subjects into two categories: Transferred Subjects and Reserved Subjects.

• Transferred Subjects were those subjects administered by ministers responsible to the legislature, such as Local Self-Government, Health, and Education.

• Reserved Subjects were administered by the Governor and his executive council, which were not responsible to the legislature. These included critical areas like Police, Revenue, and Justice.

• The Police was categorized under Reserved Subjects because it was considered crucial for maintaining law and order, which was seen as the responsibility of the British government at that time.

• Hence, the Police was not part of the Transferred Subjects under the Government of India Act, 1919.

Additional Information

• Government of India Act, 1919:

• This act introduced the system of Dyarchy in provinces, marking a significant step towards provincial autonomy.

• It divided provincial subjects into two categories: Transferred Subjects (administered by Indian ministers) and Reserved Subjects (administered by British officials).

• The act aimed to prepare Indians for self-governance through gradual reforms.

• Transferred Subjects:

• Included less critical areas such as Local Self-Government, Health, Education, and Agriculture.

• Indian ministers were made responsible for these subjects, making them answerable to the provincial legislature.

• This was an attempt to involve Indians in governance and administration.

• Reserved Subjects:

• Included critical areas like Police, Justice, and Revenue, which were handled by the Governor and his executive council.

• The British government retained control over these subjects to maintain law and order and safeguard imperial interests.

• These subjects were not answerable to the provincial legislature.

• Impact of Dyarchy:

• Dyarchy was criticized for its inefficiency and complexity, as it created dual authority in provincial governance.

• It led to significant opposition and demands for complete self-rule, eventually paving the way for the Government of India Act, 1935.

• Important Dates:

• The Government of India Act, 1919, also known as the Montagu-Chelmsford Reforms, was enacted in December 1919.

• The reforms came into effect on April 1, 1921.

Important Points

• Montagu-Chelmsford Reforms:

• These reforms were named after Edwin Montagu, the Secretary of State for India, and Lord Chelmsford, the Viceroy of India.

• The reforms aimed to introduce gradual self-governance in India.

• However, they were criticized for not granting complete autonomy to Indians.

• Government of India Act, 1935:

• This act replaced Dyarchy with provincial autonomy and introduced the concept of a federal structure.

• It marked a significant step towards self-governance, ultimately leading to India's independence in 1947.

Q2. Answer: (b) Ionisation enthalpy

The correct answer is Ionisation enthalpy.

Key Points

• Ionisation enthalpy is the energy required to remove the most loosely bound electron from an isolated neutral gaseous atom to form a cation. It generally increases across a period in the periodic table.

• The increase in ionisation enthalpy across a period is due to the increase in the effective nuclear charge. As protons are added to the nucleus, the attraction between the nucleus and the valence electrons strengthens.

• Atomic radius decreases across a period due to the increasing nuclear charge, which pulls the electrons closer to the nucleus. This makes it harder to remove an electron, resulting in higher ionisation enthalpy.

• As we move across a period, the electronic configuration becomes more stable due to the filling of orbitals, which also contributes to the increase in ionisation enthalpy.

• Exceptions to this trend may occur due to electronic configurations. For example, the ionisation enthalpy of group 13 elements is lower than group 12 elements because of the stability of fully filled s-orbitals in group 12.

Additional Information

• Atomic Radius:

• The atomic radius decreases across a period due to the increasing nuclear charge, which pulls the electrons closer to the nucleus.

• A smaller atomic radius corresponds to a higher ionisation enthalpy as electrons are held more tightly.

• Metallic Character:

• The metallic character decreases across a period as elements become less likely to lose electrons and form cations.

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• Non-metallic character increases due to higher electronegativity and ionisation enthalpy.

• Reduction Potential:

• Reduction potential generally increases across a period as elements become more likely to gain electrons and form anions.

• Non-metals at the right end of the period have higher reduction potentials compared to metals on the left.

• Trends in the Periodic Table:

• The periodic table is arranged based on atomic number, which determines the chemical properties of elements.

• Moving left to right across a period, properties like ionisation enthalpy, electronegativity, and non-metallic character increase, while atomic radius and metallic character decrease.

Important Points

• Electronegativity: It increases across a period as elements are more likely to attract electrons in a chemical bond.

• Electron Affinity: This generally increases across a period due to stronger nuclear attraction, making it easier for atoms to gain electrons.

• Example: Noble gases have very high ionisation enthalpy as they possess a stable electronic configuration.

• Periodic Trends: The trends in the periodic table are governed by the arrangement of electrons in different orbitals and the nuclear charge of the elements.

Q3. Answer: (c) Ajay Kumar

The correct answer is Ajay Kumar.

Key Points

• Ajay Kumar was appointed as the Chairman of the Union Public Service Commission (UPSC) in 2025, succeeding Preeti Sudan, who served as the previous Chairperson.

• The Union Public Service Commission (UPSC) is India's premier central recruiting agency responsible for appointments to and examinations for civil services and various other posts under the Government of India.

• Dr. Ajay Kumar is a seasoned bureaucrat and former Secretary of Defence in the Indian government. His extensive experience in public administration and defense makes him a suitable choice for the role.

• As the Chairman, he oversees the functioning of the UPSC, ensuring the selection of qualified candidates for various government positions, including IAS, IPS, IFS, and other Group A and Group B services.

• The appointment of the UPSC Chairman is governed by Article 316 of the Indian Constitution, which provides procedures for the appointment and term of service.

Additional Information

• Union Public Service Commission (UPSC):

• The UPSC is established under Article 315 of the Indian Constitution and is responsible for conducting prestigious examinations like the Civil Services Examination, Engineering Services Examination, and Combined Defence Services Examination.

• The Commission consists of a Chairman and other members appointed by the President of India. The Commission's independence is protected under Article 319, ensuring its impartiality.

• The tenure of the Chairman and members is 6 years or until the age of 65, whichever is earlier.

• The UPSC plays a critical role in maintaining the merit-based recruitment system for the Indian bureaucracy.

• Ajay Kumar's Contributions:

• Dr. Ajay Kumar has contributed significantly to the Indian defense sector during his tenure as Secretary of Defence.

• He spearheaded various modernization initiatives, including indigenization and innovation in defense manufacturing.

• His leadership ensured a streamlined procurement process, boosting the capabilities of India's armed forces.

• His experience in governance and strategic management positions him as a highly capable Chairman for UPSC.

• Preeti Sudan's Tenure:

• Preeti Sudan, a former IAS officer, served as the Chairperson of UPSC before Dr. Ajay Kumar's appointment.

• She brought notable reforms to the selection process, emphasizing transparency and efficiency.

• Her tenure was marked by significant improvements in digitalization and streamlining of the examination processes.

• Appointment Process:

• The appointment of the UPSC Chairman is made by the President of India, ensuring due diligence and merit.

• Under Article 316(1), the President may appoint individuals with sufficient administrative and professional experience to the Commission.

• The Chairman must uphold the integrity and fairness of recruitment processes for the Indian civil services.

Important Points

• Role and Functions of UPSC:

• Conduct examinations for recruitment to All India Services and Central Services.

• Advise the President of India on matters related to promotions and disciplinary cases.
• Provide recommendations on the suitability of candidates for key government positions.
• Historical Background:
• The UPSC was first established in 1926 as the Public Service Commission under the British government.
• Post-Independence, it was reconstituted as the Union Public Service Commission under the Government of India Act, 1935.
• Significance:
• UPSC ensures merit-based recruitment, maintaining the efficiency and integrity of India's administrative framework.
• It is regarded as one of the most trusted recruitment bodies globally due to its transparency and fairness.

Q4. Answer: (c) Maukharis of Kanauj

The correct answer is Maukharis of Kanauj.

Key Points

• Maukharis of Kanauj was an important dynasty in ancient Indian history that ruled during the 6th century CE.
• The Maukharis ruled from Kanauj, which is located in present-day Uttar Pradesh. It was a significant political and cultural center during their reign.
• Kings such as Yagnavarman, Sardulavarman, and Anantavarman are known rulers of this dynasty who contributed to the expansion and consolidation of their kingdom.
• The Maukharis were noted for their rivalry with the Guptas and later faced challenges from the Pushyabhutis (another ruling dynasty).
• They played a significant role in the political fragmentation of northern India after the decline of the Gupta Empire.

Additional Information

• Magadha Guptas:
• The Guptas ruled over a vast empire with its center in Magadha (present-day Bihar).
• This dynasty marked the Golden Age of India, excelling in art, science, and culture during the 4th to 6th century CE.
• Prominent rulers include Chandragupta I, Samudragupta, and Chandragupta II.
• The Guptas were renowned for their advancements in mathematics, astronomy, and literature.
• Maitrakas of Valabhi:
• The Maitrakas ruled from Valabhi, located in present-day Gujarat, during the 6th to 8th century CE.
• They were known for their support of learning and religion, particularly Buddhism.
• Valabhi became a prominent center for Buddhist education and culture.
• Pushyabhutis of Thanesar:
• The Pushyabhutis ruled over Thanesar (present-day Haryana) during the 6th and 7th centuries CE.
• The most notable ruler was Harsha, who expanded the kingdom significantly and promoted a unified administration across northern India.
• Harsha was a patron of education and religion, supporting Buddhism and other religions equally.
• His court included famous scholars such as Banabhatta, who wrote Harshacharita.
• Political Fragmentation:
• After the decline of the Gupta Empire, northern India saw the rise of several regional kingdoms, including the Maukharis, Pushyabhutis, and Maitrakas.
• These kingdoms often competed for power and influence, shaping the political landscape of early medieval India.

Q5. Answer: (c) Bombay High Court

The correct answer is Bombay High Court.

Key Points

• Justice B.R. Gavai served as a judge in the Bombay High Court before being elevated as the Chief Justice of India (CJI).
• The Bombay High Court, established in 1862, is one of the oldest high courts in India and has jurisdiction over Maharashtra, Goa, Daman and Diu, and Dadra and Nagar Haveli.
• Justice Gavai was appointed as a judge of the Bombay High Court on 14 November 2003, where he served for several years before moving to the Supreme Court.
• The Bombay High Court is known for handling significant constitutional and legal matters, making it a key institution in Indian judiciary.
• Justice Gavai's tenure in the Bombay High Court contributed to his rich judicial experience, which eventually led to his appointment as a Supreme Court judge and later as the Chief Justice of India.

Additional Information

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• Bombay High Court:

• The Bombay High Court has its principal seat in Mumbai and benches in Nagpur, Aurangabad, and Panaji (Goa).

• It has been instrumental in shaping the legal landscape of India, particularly in areas like constitutional law, commercial law, and administrative law.

• Prominent legal figures such as Justice M.C. Chagla and Justice P.N. Bhagwati have served in this high court.

• Role of High Courts in India:

• High Courts are the highest judicial authorities at the state level and operate under Articles 214-231 of the Indian Constitution.

• They handle civil, criminal, constitutional, and administrative matters within their jurisdiction.

• High Courts also have appellate jurisdiction over lower courts in the respective states.

• Justice B.R. Gavai:

• He was elevated to the Supreme Court in May 2019 and later appointed as the Chief Justice of India.

• Justice Gavai is known for his extensive experience in handling complex legal cases and delivering landmark judgments.

• Other Prominent High Courts:

• Delhi High Court: Handles cases for the National Capital Territory of Delhi and is known for its pivotal role in international commercial arbitration.

• Allahabad High Court: One of the largest high courts in India, with jurisdiction over Uttar Pradesh.

• Madras High Court: Located in Chennai, this high court has jurisdiction over Tamil Nadu and Puducherry.

Important Points

• Appointments in Judiciary:

• Judges of High Courts are appointed by the President of India in consultation with the Chief Justice of India and the Governor of the respective state.

• High Court judges can be elevated to the Supreme Court based on their merit, experience, and contribution to jurisprudence.

• Significance of Bombay High Court:

• It plays a crucial role in legal matters related to India's financial capital, Mumbai.

• It has been a pioneer in introducing digital courts and e-filing systems.

Q6. Answer: (d) Enhance long-term Indian Ocean observations

The correct answer is Enhance long-term Indian Ocean observations.

Key Points

• The submarine cable project launched by the Indian National Centre for Ocean Information Services (INCOIS) in 2025 aims to enhance long-term Indian Ocean observations.

• This project is part of a broader initiative to strengthen marine research and monitor oceanographic parameters such as temperature, salinity, sea level rise, and current patterns over extended periods.

• The observations facilitated by this project will help in predicting climate change patterns, improving weather forecasting, and understanding the impact of environmental changes on the Indian Ocean ecosystem.

• The submarine cables will be critical in relaying real-time data from remote ocean regions to research centers, enabling better analysis and response strategies.

• This development aligns with global efforts to advance sustainable ocean management and strengthen India's role in international marine research collaborations.

Additional Information

• Indian National Centre for Ocean Information Services (INCOIS):

• INCOIS is an autonomous organization under the Ministry of Earth Sciences, Government of India, established to provide ocean data and information.

• It plays a significant role in offering services related to ocean state forecasts, tsunami early warnings, and marine fisheries advisories.

• Submarine Cable Technology:

• Submarine cables are primarily used for telecommunication and data transmission, but they are increasingly being adapted for scientific research purposes.

• They enable the collection of oceanographic data from remote areas and facilitate high-speed data relay between research stations.

• Indian Ocean Observing System (IndOOS):

• IndOOS is a collaborative initiative designed to provide sustained observations of the Indian Ocean for climate, oceanographic, and ecosystem research.

• The submarine cable project complements existing IndOOS efforts by offering enhanced data transmission capabilities and

expanding observation networks.

• Applications of Ocean Observations:

• Improved understanding of ocean-atmosphere interactions, which are vital for climate models and weather predictions.

• Monitoring changes in the marine environment, such as coral bleaching, sea level rise, and the impact of human activities on marine biodiversity.

• Supporting sustainable development goals (SDGs) related to life below water and combating the effects of climate change.

Important Points

• Ocean Observations in India:

• India is actively involved in regional and international efforts for ocean observations, such as the Indian Ocean Rim Association (IORA) and Global Ocean Observing System (GOOS).

• The National Institute of Ocean Technology (NIOT) and INCOIS work together to advance oceanographic research and technology.

• Impact of Indian Ocean on Climate:

• The Indian Ocean significantly influences the Asian monsoon, which is a critical factor for agriculture and water resources in the region.

• Long-term observations help in assessing phenomena like El Niño and Indian Ocean Dipole that affect global weather patterns.

• Global Collaboration:

• India's submarine cable project can contribute to global initiatives like the UN Decade of Ocean Science for Sustainable Development (2021-2030).

• It enhances India's position as a leader in marine research and strengthens its partnerships with countries involved in oceanographic studies.

Q7. Answer: (c) 100 times

The correct answer is 100 times.

Key Points

• pH Scale: The pH scale measures the acidity or alkalinity of a solution. It ranges from 0 to 14, where pH 7 is neutral, values below 7 are acidic, and values above 7 are alkaline.

• Logarithmic Nature of pH: The pH scale is logarithmic, meaning each unit change in pH corresponds to a tenfold difference in hydrogen ion concentration ([H^+]). For example, a solution with pH 2 has a hydrogen ion concentration 10 times greater than a solution with pH 3.

• Comparison of pH 2 and pH 4: The difference between pH 2 and pH 4 is 2 units. Since the scale is logarithmic, a solution with pH 2 is 10 × 10 = 100 times more acidic than a solution with pH 4.

• Hydrogen Ion Concentration: Mathematically, the relationship is expressed as [H^+] = 10^-pH. For pH 2, [H^+] = 10^-², and for pH 4, [H^+] = 10^-^4. Hence, the ratio of concentrations is (10^-²)/(10^-^4) = 100.

• Reasoning: The logarithmic scale ensures that even small differences in pH values represent significant differences in acidity. This property is crucial for understanding chemical reactions and biological processes.

Additional Information

• Definition of pH: The term pH stands for "potential of hydrogen" and represents the negative logarithm of hydrogen ion concentration: pH = -log[H^+].

• Biological Importance of pH: pH plays a crucial role in biological systems. For instance, human blood has a normal pH range of 7.35–7.45, and deviations can lead to serious health issues.

• Applications: The concept of pH is widely used in various fields such as medicine, agriculture, industry, and environmental science to monitor acidity levels and chemical reactions.

• Acidic and Basic Substances: Substances with pH below 7 are acidic (e.g., lemon juice, vinegar), and substances with pH above 7 are basic or alkaline (e.g., soap, baking soda).

• Indicators: pH can be measured using indicators like litmus paper, pH meters, or universal indicator solutions. These tools help determine the pH level of a solution accurately.

Important Points

• pH in Environmental Science: Monitoring pH levels in water bodies is essential to assess water quality and its impact on aquatic life.

• pH in Soil: Soil pH affects nutrient availability and plant growth. For example, crops like rice thrive in slightly acidic soil.

• Buffer Solutions: Buffers are substances that resist changes in pH, helping maintain stability in biological systems and industrial processes.

Q8. Answer: (d) food grains

The correct answer is food grains.

Key Points

• The Green Revolution was introduced in India in the 1960s, aiming to increase agricultural production through modern techniques.

• The revolution primarily focused on the production of food grains, including wheat and rice, to address India's food security issues.

• Technological advancements like the use of high-yield variety (HYV) seeds, chemical fertilizers, and irrigation techniques were integral to the success of the Green Revolution.

• It led to significant self-sufficiency in food grain production, reducing India's dependence on imports and enhancing its food security.

• The Green Revolution was initially implemented in regions like Punjab, Haryana, and western Uttar Pradesh, which became the major contributors to India's food grain stock.

Additional Information

• Impact of the Green Revolution:

• The Green Revolution transformed India from a food-deficient country to one of the largest producers of food grains.

• It helped in achieving self-sufficiency in food grain production by the late 1970s.

• Increased agricultural productivity contributed significantly to India's economic growth and rural development.

• However, it also had some negative impacts, such as soil degradation, water depletion, and increased use of chemical fertilizers and pesticides.

• Characteristics of Other Options:

• Sugarcane: Though sugarcane is an important cash crop in India, it was not the primary focus of the Green Revolution.

• Vegetables: Vegetable production is a part of horticulture and was not directly linked to the Green Revolution's objectives.

• Oil seeds: Oil seed production saw improvement later through initiatives like the Yellow Revolution, not directly due to the Green Revolution.

• Important Figures and Contributions:

• Norman Borlaug, an American scientist, is often called the "Father of the Green Revolution" for his contributions to the development of HYV seeds.

• In India, the Green Revolution was spearheaded by agricultural scientist M.S. Swaminathan, who played a crucial role in promoting modern agricultural practices.

• Technological Advancements:

• The adoption of mechanization, such as tractors and harvesters, improved agricultural efficiency.

• Development of irrigation infrastructure like dams and canals supported the irrigation-intensive crops introduced during the revolution.

Important Points

• The Green Revolution was initially introduced in the mid-1960s during the tenure of Prime Minister Lal Bahadur Shastri and later expanded under Indira Gandhi.

• India achieved a record production of wheat in 1978-79, making it self-sufficient in food grain production.

• The Food Corporation of India (FCI) was established in 1965 to ensure the effective procurement and distribution of food grains.

• The introduction of Minimum Support Prices (MSP) ensured fair remuneration for farmers and encouraged them to adopt modern agricultural practices.

Q9. Answer: (d) Atoms combine in simple whole-number ratios to form compounds.

The correct answer is Atoms combine in simple whole-number ratios to form compounds..

Key Points

• The Law of Definite Proportions states that a chemical compound always contains its component elements in a fixed ratio by mass and does not depend on its source or the method of preparation.

• Dalton's atomic theory explains this law through the postulate that atoms combine in simple whole-number ratios to form compounds. This ensures that compounds are always composed of elements in fixed proportions.

• The combination of atoms in whole-number ratios (such as 1:1, 1:2, 2:3) explains why compounds have a fixed composition. For example, water (H2O) always contains hydrogen and oxygen in a 2:1 ratio by the number of atoms.

• This postulate highlights the discrete and indivisible nature of atoms, which combine in fixed numbers, ensuring consistent chemical properties of compounds.

• Hence, the postulate "Atoms combine in simple whole-number ratios to form compounds" directly supports the Law of Definite Proportions.

Additional Information

• Dalton's Atomic Theory:

• Proposed by John Dalton in 1808, this theory laid the foundation for modern chemistry.

• It states that matter is composed of indivisible particles called atoms, which cannot be created or destroyed in a chemical reaction.

• Atoms of the same element are identical in mass, size, and properties, while atoms of different elements vary in these characteristics.

• Compounds are formed when atoms of different elements combine in fixed whole-number ratios.

• Chemical reactions involve the rearrangement of atoms, but the total number of atoms and their masses remain conserved.

• Law of Definite Proportions:

• Discovered by Joseph Proust in 1799, this law states that a given compound always contains the same elements in the exact same proportion by mass.

• For example, carbon dioxide (CO_2) always contains carbon and oxygen in a ratio of approximately 27.29% carbon and 72.71% oxygen by mass.

• Other Postulates of Dalton's Theory:

• Atoms are indivisible and indestructible: This emphasized the stability of atoms in chemical reactions (though later disproven with the discovery of subatomic particles).

• Atoms of different elements have different masses and properties: This explained the variability in chemical behavior of different elements.

• Atoms of the same element are identical in mass and size: While generally true, isotopes later demonstrated exceptions to this rule.

• Examples of Whole-Number Ratios:

• Water (H_2O): Hydrogen and oxygen atoms combine in a ratio of 2:1.

• Carbon dioxide (CO_2): Carbon and oxygen atoms combine in a ratio of 1:2.

• Ammonia (NH_3): Nitrogen and hydrogen atoms combine in a ratio of 1:3.

Important Points

• The Law of Definite Proportions is also known as the Law of Constant Composition.

• This law is fundamental to stoichiometry and is used to determine the chemical formula of compounds.

• The discovery of isotopes and atomic structure has refined Dalton’s atomic theory, but its core principles remain significant in modern chemistry.

• Dalton’s theory also supports the Law of Conservation of Mass, which states that mass is neither created nor destroyed in a chemical reaction.

Q10. Answer: (d) EOS-09

The correct answer is EOS-09.

Key Points

• EOS-09, also known as Earth Observation Satellite, is designed to enhance India's all-weather, day-and-night Earth observation capabilities.

• Launched by the Indian Space Research Organisation (ISRO) in May 2025, EOS-09 aims to provide better imaging and monitoring capabilities for various applications such as agriculture, forestry, disaster management, and urban planning.

• It employs advanced synthetic aperture radar (SAR) technology, which allows imaging even through clouds and during nighttime.

• The satellite is part of ISRO's ongoing efforts to strengthen India's remote sensing satellite fleet, aligning with national priorities like environmental monitoring and resource management.

• EOS-09 contributes to India's capability to monitor its territory in real time, thus aiding in disaster response and resource planning.

Additional Information

• Cartosat Series:

• Cartosat-3 is India's advanced Earth observation satellite launched by ISRO in November 2019.

• It is known for its high-resolution imaging capabilities, primarily used for urban planning, infrastructure development, and border surveillance.

• RISAT Series:

• RISAT-1B is a radar imaging satellite used for agriculture monitoring, forestry surveys, and disaster management.

• The satellite is equipped with SAR technology, enabling imaging in all weather conditions.

• INSAT Series:

• INSAT-3DS is part of India's multi-purpose INSAT satellite series used for meteorological applications, telecommunication, and broadcasting.

• It is not primarily designed for Earth observation purposes like EOS-09.

• Earth Observation Satellites:

• India's Earth Observation Satellite program aims to provide comprehensive data for environmental monitoring, disaster management, and resource management.

• EOS satellites include advanced imaging technology, such as optical sensors and radar systems, for accurate and timely data acquisition.

Important Points

• EOS-09:

• EOS-09 is a part of India's EOS satellite series launched to improve Earth observation capabilities.

• It focuses on applications like disaster management, agriculture monitoring, and urban planning.

• ISRO's Achievements:

• ISRO has consistently launched satellites to support India's space program, including remote sensing, navigation, and communication satellites.

• Its satellites are used for diverse applications like weather forecasting, environmental monitoring, and military surveillance.

• Future Missions:

• ISRO plans to launch more advanced satellites as part of the EOS series, integrating AI-powered data analytics for enhanced functionality.

• These missions align with India's vision to become a global leader in space technology.

Q11. Answer: (b) Deepa Bhasthi

The correct answer is Deepa Bhasthi.

Key Points

• Heart Lamp is a renowned book originally written in Kannada, which gained international acclaim for its unique narrative and cultural depth.

• Deepa Bhasthi, a distinguished translator, translated the book from Kannada to English, allowing it to reach a broader audience worldwide.

• The author of the original Kannada version of Heart Lamp won the prestigious International Booker Prize in May 2025, marking a significant achievement for Indian literature.

• Deepa Bhasthi’s translation was instrumental in showcasing the book’s essence and cultural richness to the global audience, earning accolades for her contribution.

• The translation not only preserved the original narrative but also highlighted the linguistic and emotional nuances of the Kannada language in English.

Additional Information

• International Booker Prize:

• The International Booker Prize is awarded annually for the best work of fiction translated into English and published in the UK or Ireland.

• It recognizes both the author and translator, emphasizing the importance of translation in literature.

• The prize has significantly contributed to global literary diversity and appreciation of works from non-English-speaking regions.

• Kannada Literature:

• Kannada is one of the major Dravidian languages spoken predominantly in the state of Karnataka, India.

• Kannada literature has a rich heritage and includes works from ancient epics to contemporary novels, reflecting the region’s cultural and historical depth.

• Authors such as Kuvempu, U.R. Ananthamurthy, and Girish Karnad have significantly contributed to its global recognition.

• Role of Translation:

• Translations play a critical role in bridging linguistic and cultural divides, offering insights into diverse perspectives and experiences.

• They help preserve the essence of the original work while making it accessible to a wider audience.

• Translators like Deepa Bhasthi are vital in bringing regional literature to global platforms, showcasing the richness of languages like Kannada.

• Deepa Bhasthi:

• She is an accomplished writer and translator known for her efforts in promoting regional Indian literature on international platforms.

• Her expertise in preserving the cultural and emotional depth of Kannada works has earned her recognition in the literary world.

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• Through her translations, she has contributed to the global appreciation of Indian literary heritage.

Important Points

• Translation and Literary Awards:

• Literary awards like the International Booker Prize recognize both the original authors and the translators, emphasizing their collaborative efforts.

• Such awards highlight the importance of translation in promoting cultural exchange and literary diversity.

• Impact of Kannada Literature:

• The recognition of Kannada works on international platforms showcases the cultural richness of Indian languages.

• It inspires other regional authors and translators to bring their works to a global audience.

Q12. Answer: (b) Article 245

The correct answer is Article 245.

Key Points

• Article 245 of the Indian Constitution empowers the Parliament and State Legislatures to make laws for the whole or any part of the territory of India.

• It provides the legal framework for the distribution of legislative powers between the Union and the States.

• Article 245(1) states that Parliament may make laws for the whole or any part of the territory of India, and the Legislature of a State may make laws for the whole or any part of the State.

• Article 245(2) ensures that no law made by Parliament shall be deemed invalid on the ground that it would have extraterritorial operation, i.e., laws can apply beyond Indian territory if there is a connection with India.

• The territory of India includes states, union territories, and any area acquired by the Government of India, ensuring the applicability of laws across all these regions.

Additional Information

• Article 250:

• It allows Parliament to legislate on state subjects during a Proclamation of Emergency.

• When a national emergency is in force, Parliament can make laws for the whole or any part of India, even on matters in the State List.

• This article is applicable only during the period of an emergency.

• Article 249:

• It empowers Parliament to legislate on matters in the State List if the Rajya Sabha passes a resolution by a two-thirds majority declaring it necessary in the national interest.

• This provision ensures that Parliament can step in when matters of national importance are at stake, even for subjects typically reserved for states.

• Article 256:

• This article deals with the obligation of states and the Union to ensure compliance with the laws made by Parliament and the executive power of the Union.

• It allows the Union Government to issue directions to the states to ensure implementation of laws enacted by Parliament.

• Legislative Powers in India:

• The Seventh Schedule of the Indian Constitution divides legislative powers into three lists: Union List, State List, and Concurrent List.

• Parliament has exclusive power to legislate on matters in the Union List, while states have exclusive power over the State List.

• Both Parliament and State Legislatures can legislate on matters in the Concurrent List.

Important Points

• Article 245 and Extraterritorial Laws:

• Article 245(2) ensures that extraterritorial laws passed by Parliament are valid if they have a connection to India.

• For example, laws related to Indian citizens living abroad or matters affecting India outside its territory can be enacted under this article.

• Limitations of State Legislatures:

• State Legislatures cannot legislate on matters that fall under the Union List or on subjects of national importance without the approval of Parliament.

• Parliament has overriding authority in matters of national security, foreign affairs, and emergencies.

• Significance of Article 245:

• This article establishes the jurisdictional boundaries of legislative powers between the Union and the States, ensuring clarity in governance.

• It provides a mechanism for creating laws that apply uniformly across the country or for specific regions, depending on the needs of the nation.

Q13. Answer: (b) Increased, especially in private and service sectors

The correct answer is Increased, especially in private and service sectors.

Key Points

• The 1991 reforms, also known as the Liberalization, Privatization, and Globalization (LPG) reforms, marked a major shift in India's economic policy. These reforms opened up the economy to global markets and foreign investments, significantly impacting employment opportunities.

• Post-1991, there was a substantial increase in employment opportunities, particularly in the service sector and private industries. The service sector grew rapidly due to advancements in technology, outsourcing, and globalization.

• The private sector flourished as economic liberalization reduced restrictions on private enterprises, encouraging growth in industries like IT, telecommunications, and financial services.

• While the agricultural sector saw limited growth in employment opportunities, the manufacturing sector also experienced moderate growth due to increased foreign direct investment (FDI).

• These reforms contributed to the emergence of new job categories, particularly in urban areas, as multinational corporations (MNCs) established operations in India.

Additional Information

• Key Features of the 1991 Economic Reforms:

• Liberalization: The government reduced trade restrictions, dismantled the license raj, and eased regulations for businesses, allowing private entities to thrive.

• Privatization: Public sector undertakings (PSUs) were privatized to enhance efficiency and competitiveness, boosting employment in privatized industries.

• Globalization: India integrated with the global economy by allowing foreign investment and trade, which led to the expansion of sectors like IT, pharmaceuticals, and financial services.

• Impact on Employment:

• Service Sector Boom: The service sector became the largest contributor to GDP, employing millions in IT, banking, education, healthcare, and retail.

• Urbanization: Rapid urbanization led to increased demand for skilled labor, particularly in cities like Bengaluru, Hyderabad, and Mumbai.

• Export-Oriented Growth: Industries like textiles, software services, and manufacturing grew due to export-led policies, creating jobs in these sectors.

• Challenges:

• Skill Mismatch: While new opportunities emerged, many workers lacked the skills required for high-demand sectors like IT and finance.

• Rural Employment: The agricultural sector lagged behind in employment generation, leading to rural-to-urban migration.

• Examples and Data:

• India's IT industry, which contributed less than 1% to GDP in the early 1990s, grew rapidly to become a major employment generator by the 2000s.

• The FDI inflow increased substantially post-reforms, from USD 129 million in 1991 to over USD 73 billion in 2022.

Important Points

• Service Sector Contribution: By 2022, the service sector accounted for nearly 54% of India's GDP, employing a large portion of the urban workforce.

• Government Initiatives: Schemes like Skill India and Make in India were launched to address employment challenges and promote job creation in manufacturing and services.

• Economic Surveys: According to the Economic Survey 2020-21, India saw significant growth in employment opportunities in sectors like IT, telecom, and retail due to the LPG reforms.

Q14. Answer: (b) Rajasthan

The correct answer is Rajasthan.

Key Points

• The Great Indian Desert, commonly known as the Thar Desert, is predominantly located in the northwestern part of India.

• The majority of the desert, covering approximately 60% of its total area, lies in the state of Rajasthan, making it the state with the largest desert area.

• The desert spans across districts such as Jaisalmer, Barmer, Bikaner, and Jodhpur, with Jaisalmer being known as the "Golden City" due to its iconic sand dunes.

• Rajasthan's arid climate and sandy terrain, coupled with minimal rainfall (less than 150 mm annually), contribute to the expansive desert landscape.

• The Thar Desert also extends into parts of Gujarat, Punjab, and Haryana, but these states hold a much smaller portion of the desert compared to Rajasthan.

Additional Information

• Geographical Features of the Thar Desert:

• The Thar Desert covers an area of approximately 200,000 square kilometers, making it the 17th largest desert in the world.

• It is bordered by the Aravalli Range on the east, the Indus River on the west, and the Rann of Kutch in Gujarat to the south.

• The soil in the desert is largely sandy with low organic content, supporting sparse vegetation such as cactus, khejri, and other drought-resistant plants.

• Climate and Rainfall:

• The Thar Desert experiences an extreme climate, with summer temperatures exceeding 50°C and winter temperatures dropping below 0°C.

• The annual rainfall is very low, typically between 100 to 150 mm, making it one of the driest regions in India.

• Economic and Cultural Significance:

• The desert is home to several indigenous communities such as the Rajputs, Bishnois, and Meghwals, who have adapted to the harsh desert conditions.

• It serves as a major tourist attraction, with sites like Jaisalmer Fort, Sam Sand Dunes, and Desert National Park drawing visitors from around the globe.

• Livelihoods in the region primarily depend on animal husbandry, handicrafts, and tourism.

• Desert National Park:

• Located in Jaisalmer and Barmer districts, the Desert National Park spans an area of 3162 square kilometers.

• It is known for its rich biodiversity, including species like the Great Indian Bustard, desert fox, and chinkara.

Important Points

• Rajasthan's Share:

• Rajasthan accounts for over two-thirds of the desert area in India, making it the largest contributor to the Thar Desert's expanse.

• Districts like Jaisalmer and Barmer are the most affected by desertification and aridity.

• Gujarat:

• While Gujarat holds a portion of the Thar Desert, it primarily includes areas like the Rann of Kutch, which is a seasonal salt marsh desert.

• Punjab and Haryana:

• These states have a minimal share of the Thar Desert, located mainly in the southwestern regions bordering Rajasthan.

• Their desert area is significantly smaller compared to Rajasthan.

Q15. Answer: (a) Indian Cyber Crime Coordination Centre (I4C)

The correct answer is Indian Cyber Crime Coordination Centre (I4C).

Key Points

• Indian Cyber Crime Coordination Centre (I4C) was established by the Ministry of Home Affairs (MHA) in 2018 to combat cybercrimes in India.

• It serves as a nodal agency to deal with all kinds of cybercrime, including crimes against women and children, financial fraud, and other online threats.

• Under the Prevention of Money Laundering Act (PMLA), the I4C is authorized to share relevant information with the Enforcement Directorate (ED) to combat cyber fraud effectively.

• The I4C operates as a national-level coordination body, ensuring collaboration between various government agencies, law enforcement authorities, and private entities.

• It also manages the National Cyber Crime Reporting Portal, where citizens can report incidents of cybercrime directly.

Additional Information

• Indian Cyber Crime Coordination Centre (I4C):

• The I4C was set up to strengthen the cybersecurity infrastructure and address the growing threats of cybercrime in India.

• It includes components such as a National Cyber Crime Threat Analytics Unit (TAU), Cybercrime Ecosystem Management Unit, Capacity Building Unit, and others.

• Its aim is to provide a platform for real-time information sharing and analysis between government agencies and law enforcement.

• It also conducts awareness programs to educate citizens about cyber threats and preventive measures.

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• Prevention of Money Laundering Act (PMLA):

• The PMLA, enacted in 2002, aims to prevent money laundering and confiscate property derived from illegal activities.

• Under the PMLA, the Enforcement Directorate (ED) is the designated agency to investigate financial crimes related to money laundering.

• The act empowers agencies like I4C to share critical data to help identify and curb fraudulent activities.

• National Cyber Crime Reporting Portal (NCRP):

• This portal allows citizens to report cybercrime incidents, including cyberbullying, online fraud, and identity theft.

• It serves as an interface between the public and law enforcement agencies, ensuring transparency and quick action on cybercrime complaints.

• Enforcement Directorate (ED):

• The ED is a law enforcement agency in India responsible for enforcing economic laws and fighting financial crimes.

• Its primary focus includes investigating cases under the Foreign Exchange Management Act (FEMA) and the PMLA.

• It works closely with other government bodies like I4C to combat financial frauds tied to cybercrime.

• Cybersecurity in India:

• With the increasing digitization of services, the Indian government has taken major steps to enhance cybersecurity infrastructure.

• Initiatives like the National Cyber Security Policy (2013), I4C, and the Computer Emergency Response Team (CERT-In) aim to strengthen the nation's defenses against cyber threats.

Important Points

• Indian Cyber Crime Coordination Centre (I4C) Functions:

• Coordinates with state governments, law enforcement agencies, and private companies to counter cyber threats.

• Provides training to personnel on handling cybercrime investigations effectively.

• Develops and distributes standard operating procedures for cybercrime investigations.

• Monitors cyber threats at the national level and advises policy changes to improve cybersecurity.

• Collaboration with International Agencies:

• The I4C collaborates with global cybersecurity organizations to enhance knowledge-sharing and combat transnational cybercrime.

• It participates in international forums to strengthen India's position in global cybersecurity efforts.

Q16. Answer: (d) Andhra Cricket Association

The correct answer is Andhra Cricket Association.

Key Points

• Andhra Cricket Association announced plans in January 2025 to construct the largest cricket stadium in India.

• The stadium aims to have a seating capacity of 1.25 lakh spectators, surpassing existing stadiums in terms of size and capacity.

• The cricket stadium is expected to be a modern facility with international standards, capable of hosting domestic and international matches.

• This initiative highlights the commitment of the Andhra Cricket Association to promoting cricket infrastructure in the state and attracting global attention.

• The project is anticipated to boost sports tourism and provide significant economic benefits to the region.

Additional Information

• Existing Largest Cricket Stadium:

• The Narendra Modi Stadium in Ahmedabad, Gujarat, currently holds the title for the largest cricket stadium in India, with a seating capacity of 1.32 lakh spectators.

• The stadium is known for hosting international matches, including Test matches, ODIs, and T20s.

• Andhra Cricket Association:

• It is the governing body for cricket in the state of Andhra Pradesh.

• The association actively works to promote cricket at the grassroots level and organizes domestic tournaments in the region.

• Development of Sports Infrastructure:

• The construction of large-scale sports facilities like stadiums contributes to the development of sports infrastructure and encourages youth participation in sports.

• It provides opportunities for players to showcase their talent and facilitates training programs for budding cricketers.

• Significance of Cricket Stadiums:

• Cricket stadiums play a vital role in hosting domestic and international matches, fostering sports culture, and driving economic growth.

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• They serve as venues for global sporting events, attracting fans and boosting tourism in the region.

Important Points

• Economic Impact:

• Large sports facilities like cricket stadiums significantly boost the local economy by creating job opportunities during the construction and operation phases.

• They also promote sports tourism, attracting visitors from across the country and internationally.

• Stadium Features:

• Modern cricket stadiums are equipped with state-of-the-art technology, including advanced pitch facilities, lighting systems, and seating arrangements.

• They often include amenities such as hospitality suites, media centers, and training facilities for players.

Q17. Answer: (a) Renunciation

The correct answer is Renunciation.

Key Points

• Renunciation is a voluntary act by which an individual declares that they no longer wish to be a citizen of India. This process is governed under the Citizenship Act, 1955.

• To renounce Indian citizenship, an individual must make a declaration in a prescribed form and submit it to the Ministry of Home Affairs. This is applicable to Indian citizens who have acquired citizenship of another country or wish to do so.

• Renunciation is considered one of the three ways of losing Indian citizenship as per the provisions of the Citizenship Act, 1955. The other two ways include termination and deprivation.

• Upon successful renunciation of citizenship, the individual loses their rights and obligations as an Indian citizen, including voting rights, holding government positions, and accessing other privileges granted to Indian citizens.

• Renunciation is irreversible unless the individual undergoes the process of acquiring Indian citizenship again through naturalization or registration.

Additional Information

• Citizenship Act, 1955:

• The Citizenship Act, 1955 provides the legal framework for acquiring and losing Indian citizenship. It outlines five modes of acquiring citizenship: birth, descent, registration, naturalization, and incorporation of territory.

• The Act also specifies three ways of losing citizenship: Renunciation, Termination, and Deprivation.

• Birth:

• Citizenship by birth is granted to individuals born in India, but this does not apply if their parents are illegal migrants or if one parent is not an Indian citizen.

• It is a mode of acquiring citizenship, not losing it.

• Registration:

• Under the Citizenship Act, an individual can acquire citizenship by registering themselves with the Government of India, provided they meet certain conditions such as marriage to an Indian citizen or residing in India for a specified period.

• It is another mode of acquiring citizenship, not a mode of losing it.

• Naturalization:

• Naturalization is a process through which a foreign national can acquire Indian citizenship by residing in India for a specified period and meeting other requirements under the law.

• Again, this is a mode of acquiring citizenship, not losing it.

• Important Points:

• The concept of renunciation applies primarily to individuals who voluntarily wish to renounce their Indian citizenship after acquiring foreign citizenship, as India does not allow dual citizenship.

• Renunciation differs from deprivation, which is an involuntary act where the government revokes the citizenship of an individual under specific circumstances, such as fraud or disloyalty.

• Termination of citizenship happens automatically when an Indian citizen voluntarily acquires the citizenship of another country.

• Renunciation ensures that the individual is no longer bound by the laws and responsibilities of Indian citizenship, such as tax laws, but also loses the privileges, such as voting and holding public office.

Q18. Answer: (a) 2015

The correct answer is 2015.

Key Points

• The Paris Agreement was adopted on 12 December 2015, during the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC), held in Paris, France.

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• The agreement was the result of extensive negotiations among 196 Parties (countries and the European Union) to address climate change by reducing global greenhouse gas emissions and limiting global warming to well below 2 degrees Celsius, with efforts to limit it to 1.5 degrees Celsius.

• The Paris Agreement is a legally binding treaty and entered into force on 4 November 2016, after it was ratified by at least 55 countries, accounting for at least 55% of global emissions.

• This agreement marked a historic moment as it brought together all nations in a common cause to combat climate change, marking a shift from the earlier Kyoto Protocol's distinction between developed and developing countries.

• India, as a signatory of the Paris Agreement, pledged to reduce its emissions intensity of GDP by 33-35% by 2030 compared to 2005 levels and to achieve about 40% of cumulative electric power installed capacity from non-fossil fuel-based energy resources by the same year.

Additional Information

• Key Objectives of the Paris Agreement:

• To limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.

• Encourage countries to reach global peaking of greenhouse gas emissions as soon as possible to achieve climate neutrality by the second half of the 21st century.

• Strengthen countries' ability to deal with the impacts of climate change through adaptation and resilience-building measures.

• Provide financial support to developing countries to assist them in adapting to and mitigating climate change.

• Key Features of the Paris Agreement:

• Nationally Determined Contributions (NDCs): Each country must submit their plans to reduce greenhouse gas emissions and enhance climate resilience. These plans are reviewed every five years.

• Global Stocktake: Every five years, countries assess collective progress toward achieving the Agreement's goals.

• Climate Finance: Developed countries are required to provide financial resources to help developing countries in their climate change mitigation and adaptation efforts.

• Transparency Framework: A robust framework ensures transparency and accountability, requiring countries to regularly report on their emissions and implementation efforts.

• Significance of the Paris Agreement:

• It represents a global commitment to addressing climate change and transitioning to a sustainable, low-carbon future.

• The Agreement encourages the adoption of clean and renewable energy sources to reduce dependency on fossil fuels.

• It promotes international cooperation, ensuring that developed and developing nations work together to tackle climate challenges.

• The Agreement also prioritizes support for vulnerable countries that are disproportionately affected by climate change.

• Challenges in Implementing the Paris Agreement:

• Financial Constraints: Developing countries often face financial limitations in implementing climate action plans.

• Lack of Binding Mechanisms: The Agreement relies on voluntary commitments, which may limit its effectiveness.

• Global Cooperation: Ensuring that all countries comply with their commitments can be challenging due to differing national priorities.

• Important Related Events:

• 1992: United Nations Framework Convention on Climate Change (UNFCCC) established at the Earth Summit in Rio de Janeiro.

• 1997: Adoption of the Kyoto Protocol, which required developed countries to reduce emissions.

• 2015: Adoption of the Paris Agreement at COP21, replacing the Kyoto Protocol.

Q19. Answer: (a) A unit of measurement of land

The correct answer is A unit of measurement of land.

Key Points

• Bigha is traditionally used as a unit of land measurement in India, particularly in the northern and eastern states. It has been widely used in the context of agricultural land.

• The size of a bigha varies from region to region in India. For instance, in some places, one bigha equals 1,600 square yards, while in others, it might measure around 2,500 square yards.

• During the British colonial era, the term "bigha" was used extensively to measure land that was either taxed or cultivated, especially in areas under plantation crops such as indigo.

• The measurement and taxation of land based on units like bigha were an important part of the British agrarian economy in India.

• It is still a widely recognized term in India and continues to be used for land-related transactions, especially in rural areas.

Additional Information

• British Plantations in India:

• During the colonial period, the British introduced large-scale plantations in India for crops like indigo, tea, coffee, and rubber.

These plantations were a significant part of British economic activities.

• The Indigo plantation system saw widespread exploitation of farmers, who were forced to grow indigo instead of food crops. This led to the infamous Indigo Revolt in 1859-60.

• The system of land measurement, including units like bigha, was crucial for determining the areas under plantation and assessing taxes.

• Alternative Crops and Practices:

• Post-independence, many regions shifted away from colonial plantation crops to food crops and cash crops like cotton and jute to better suit the needs of the Indian economy.

• Indigo was gradually replaced by synthetic dyes and alternative plants like woad in Europe.

• Land Revenue Systems:

• Under British rule, land revenue systems such as the Zamindari System, Ryotwari System, and Mahalwari System were implemented, which relied heavily on measuring land using units like bigha.

• These systems often resulted in high taxation and exploitation of farmers, contributing to widespread poverty and agrarian distress during colonial times.

• Modern Usage of Bigha:

• Today, bigha is still used in real estate transactions and rural land measurements in states like Bihar, Uttar Pradesh, and West Bengal.

• Governments have moved towards standardizing land measurement using hectares and acres, but bigha remains culturally significant in many regions.

Important Points

• Variability of Bigha: The size of a bigha can vary significantly across regions, making it less standardized compared to other units like acres or hectares.

• Historical Significance: The use of bigha reflects the agrarian practices and colonial history of land management in India.

• Indigo Revolt: The exploitation of farmers under the indigo plantation system, which relied on land measurement units like bigha, led to one of the early rebellions against British rule.

• Current Practices: While modern measurement units are gaining prominence, bigha remains a critical unit in rural land dealings and agricultural practices.

Q20. Answer: (d) ALU and CU – Perform calculations and control all computer operations

The correct answer is ALU and CU – Perform calculations and control all computer operations.

Key Points

• ALU (Arithmetic Logic Unit): The ALU is responsible for performing all arithmetic and logical operations in the CPU. It handles calculations such as addition, subtraction, multiplication, and division, as well as logical operations like AND, OR, NOT, and XOR.

• CU (Control Unit): The CU directs the flow of data and instructions within the CPU. It manages the execution of instructions by fetching them from memory, decoding them, and ensuring they are executed in the correct sequence. The CU ensures the coordination of all hardware components.

• The combination of the ALU and CU ensures the proper functioning of the CPU, making it capable of performing complex computational tasks and managing the overall operation of the computer system.

• The CPU (Central Processing Unit) is often referred to as the brain of the computer, and its main components, the ALU and CU, work together to process instructions and execute programs effectively.

• The ALU and CU are the two primary components of the CPU that ensure both the execution of instructions and the control of data flow within the system, thereby enabling the functioning of all computer operations.

Additional Information

• Monitor and Keyboard:

• The monitor and keyboard are input-output devices. The monitor is an output device used to display visual data to the user, while the keyboard is an input device used to enter data into the computer.

• These components are not part of the CPU and do not contribute to the processing of data. Hence, this option is incorrect.

• RAM and ROM:

• RAM (Random Access Memory) is a volatile memory used for temporary storage during program execution. Data stored in RAM is lost when the computer is turned off.

• ROM (Read-Only Memory) is non-volatile memory that stores permanent instructions like the system's firmware.

• Although these are important memory components, they are not part of the CPU. Hence, this option is incorrect.

• HDD and SSD:

• HDD (Hard Disk Drive) and SSD (Solid State Drive) are storage devices used for storing data permanently.

• These are not responsible for performing computational tasks or managing operations within the CPU. Hence, this option is

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incorrect.

• ALU and CU:

• The ALU and CU are integral components of the CPU. The ALU performs all arithmetic and logical computations, while the CU manages the execution of instructions and the overall operation of the system.

• This option accurately represents the main components of the CPU and their respective functions. Hence, this option is correct.

Important Points

• CPU Architecture: Modern CPUs often include additional components like cache memory and registers to enhance performance and reduce latency.

• Instruction Cycle: The CPU operates in a cycle of fetch, decode, and execute to process instructions efficiently.

• Multi-core Processors: CPUs now often include multiple cores, enabling parallel processing and enhancing computational speed.

• Clock Speed: The CPU's clock speed, measured in GHz, determines how fast it can execute instructions. A higher clock speed generally means better performance.

Q21. Answer: (c) Information and research

The correct answer is Information and research.

Key Points

• Quaternary activities are primarily associated with information, research, and development. These activities involve the creation, dissemination, and application of knowledge.

• Examples of these activities include scientific research, education, technological innovation, and data analysis. These fields contribute to advancements in industries and societies.

• The focus of quaternary activities is on intellectual and knowledge-based services rather than physical or manual labor.

• These activities often require a high level of education and expertise and are critical for driving innovation, policy-making, and economic growth.

• Industries such as IT (Information Technology), consultancy, and R&D (Research and Development) fall under this category, playing a pivotal role in modern economies.

Additional Information

• Difference between primary, secondary, tertiary, and quaternary activities:

• Primary activities: Involve the extraction of natural resources, such as agriculture, fishing, mining, and forestry.

• Secondary activities: Concerned with the manufacturing and industrial processing of raw materials into finished goods.

• Tertiary activities: Focus on services such as transportation, communication, retail, and healthcare.

• Quaternary activities: Revolve around knowledge-based services like information technology, research, and education.

• Examples of quaternary activities:

• Scientific research: Developing new technologies, medicines, and innovations.

• Education: Providing intellectual growth and skill development.

• IT services: Software development, data analysis, and cybersecurity.

• Consultancy: Offering expert advice on various subjects such as economics and strategy.

• Financial analysis: Evaluating market trends and investments.

• Importance of quaternary activities:

• Promote economic development by enhancing productivity and efficiency.

• Contribute to the creation of knowledge and innovation, which are critical in today's globalized world.

• Help in policy-making and decision-making for governments and organizations.

• Drive advancements in science and technology, improving standards of living.

• Play a crucial role in global competitiveness and sustainability.

• Global examples of quaternary activities:

• Silicon Valley: A hub for technological innovation and IT services.

• Oxford University: A center for advanced education and research.

• NASA: Engaged in space exploration and scientific research.

• Pharmaceutical companies: Conducting R&D for new medicines and healthcare solutions.

Important Points

• Knowledge economy: Quaternary activities are central to the concept of a knowledge economy, where growth is driven by the availability and application of information.

• Globalization: The demand for quaternary services is increasing due to global connectivity and the rise of the digital economy.

• Employment: These activities require highly skilled professionals, often leading to better job opportunities and wages.

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• Challenges: Include ensuring equitable access to knowledge and overcoming digital divides.

Q22. Answer: (a) First

The correct answer is First Five-Year Plan.

Key Points

• The Harrod-Domar Model is an economic growth model developed by economists Roy Harrod and Evsey Domar. It emphasizes the importance of savings and investment for economic growth.

• The First Five-Year Plan of India (1951-1956) was based on the principles of the Harrod-Domar Model, focusing on agricultural development and investment-driven growth.

• Under the plan, the government prioritized building infrastructure, increasing food production, and stabilizing the economy after independence. This was essential for addressing the challenges of poverty and food scarcity.

• The plan allocated substantial funds to the agriculture sector, which was the backbone of India's economy at the time. It aimed to achieve a growth rate of 2.1% annually during the plan period.

• The success of the First Five-Year Plan laid the foundation for subsequent plans and demonstrated the feasibility of using models like Harrod-Domar for economic planning.

Additional Information

• Harrod-Domar Model:

• It is a classical economic growth model that focuses on the relationship between savings, investment, and economic growth.

• The model assumes that the growth rate of an economy is determined by the ratio of savings to the capital-output ratio.

• The formula is expressed as: Growth rate = Savings rate / Capital-output ratio.

• This model has been used extensively for planning purposes in developing countries like India.

• First Five-Year Plan (1951-1956):

• It was launched under the leadership of Prime Minister Jawaharlal Nehru and focused on agriculture and irrigation.

• The plan allocated 44.6% of its total budget to agriculture and community development.

• It aimed to address the food shortages and stabilize the economy after independence.

• The plan achieved a growth rate of 3.6%, exceeding the target of 2.1%.

• Subsequent Five-Year Plans:

• Second Five-Year Plan (1956-1961): Focused on industrialization and the Mahalanobis Model.

• Third Five-Year Plan (1961-1966): Focused on self-sufficiency and agriculture.

• Fifth Five-Year Plan (1974-1979): Focused on poverty alleviation and employment generation.

• Seventh Five-Year Plan (1985-1990): Emphasized modernization and productivity.

• Importance of Economic Models in Planning:

• Economic models like Harrod-Domar provide a theoretical framework for decision-making and prioritization in national development.

• These models help governments allocate resources efficiently and set realistic targets.

• They are particularly useful for developing countries aiming to achieve rapid economic growth.

Q23. Answer: (b) The process that arrives first

The correct answer is The process that arrives first.

Key Points

• FIFO (First In, First Out) is one of the simplest CPU scheduling algorithms where the process that arrives first in the queue is executed first.

• The scheduling works on a queue structure, ensuring that processes are executed in the order they arrive.

• This method does not consider the execution time or priority of a process, leading to a fair but potentially inefficient execution in terms of system throughput.

• FIFO scheduling is non-preemptive, meaning once a process starts execution, it runs to completion before the next process begins.

• While simple to implement, FIFO scheduling may lead to the "convoy effect," where a long process delays the execution of shorter processes. This can result in poor average wait time and response time.

Additional Information

• Comparison with Other Scheduling Algorithms:

• Shortest Job Next (SJN): In this algorithm, the process with the shortest execution time is selected next, improving response time but requiring prior knowledge of execution times.

• Priority Scheduling: Processes are executed based on priority levels. Higher-priority processes are executed first, irrespective of

their arrival time.

• Round Robin (RR): This is a time-sharing scheduling algorithm where each process gets a fixed time slice (quantum), improving fairness and response time.

• Last In, First Out (LIFO): Contrary to FIFO, the most recently arrived process is executed first, which may lead to starvation of older processes.

• Implementation of FIFO:

• FIFO is implemented using a queue data structure where processes are enqueued as they arrive and dequeued when executed.

• The algorithm maintains a simple structure but is not ideal for time-critical systems due to its potential inefficiencies.

• Use Cases of FIFO Scheduling:

• FIFO is commonly used in batch systems where fairness is prioritized over efficiency.

• It is also employed in simple embedded systems where advanced scheduling features are not required.

• Advantages of FIFO Scheduling:

• Simple to understand and implement.

• Ensures fairness as every process gets its turn based on arrival time.

• Limitations of FIFO Scheduling:

• May lead to poor system throughput due to the "convoy effect."

• Not suitable for real-time systems as it does not prioritize urgent tasks.

Important Points

• Convoy Effect: A significant drawback in FIFO scheduling is the "convoy effect," where a long process at the front of the queue delays all subsequent processes, reducing overall performance.

• Non-Preemptive Nature: Once a process starts execution, it cannot be interrupted until completion, which can be inefficient if a high-priority task arrives during execution.

• Fairness: Every process is treated equally based on its arrival time, which is an advantage in systems where equality is prioritized.

• Practical Example: A printer queue often uses FIFO scheduling, where documents are printed in the order they are received.

Q24. Answer: (d) Dubai, UAE

The correct answer is Dubai, UAE.

Key Points

• The 12th World Government Summit (2025) was held in Dubai, UAE, a city globally recognized for hosting high-profile international events and conferences.

• The summit is an annual event that convenes leaders, policymakers, and innovators from around the world to discuss pressing global challenges and opportunities.

• Dubai, UAE, serves as the permanent venue for the World Government Summit, showcasing its commitment to becoming a hub for innovation, governance, and futuristic strategies.

• The summit focuses on topics such as climate change, technology advancements, AI governance, and global economic strategies.

• The 12th edition in 2025 continued its legacy of promoting international collaboration, featuring delegates from over 150 countries and leading organizations.

Additional Information

• World Government Summit:

• The summit was first held in 2013 and has since evolved into a global platform for shaping the future of governments worldwide.

• It is hosted annually in Dubai, UAE, under the patronage of His Highness Sheikh Mohammed bin Rashid Al Maktoum.

• The summit facilitates discussions on innovative governance, sustainable development, and emerging technologies.

• Renowned experts, heads of state, and CEOs participate to share insights and solutions for global challenges.

• Dubai as a global hub:

• Dubai is known for its strategic location, advanced infrastructure, and investment in futuristic technologies.

• It has successfully positioned itself as a center for hosting international events like the Expo 2020 Dubai and the World Government Summit.

• The city emphasizes sustainability, innovation, and inclusivity in its governance and development strategies.

• Thematic focus of the summit:

• The summit addresses critical topics such as climate change, AI and digital transformation, economic resilience, and healthcare innovation.

• It aims to create actionable frameworks for governments to adopt future-ready policies and strategies.

• Global participation:

• The summit attracts representatives from 150+ countries, including ministers, policymakers, and experts.

• International organizations like the United Nations, World Economic Forum, and OECD frequently collaborate with the summit.

Important Points

• Dubai's advantages:

• Infrastructure: Dubai boasts world-class facilities for hosting global events.

• Accessibility: Its geographical location makes it a convenient destination for international delegates.

• Innovation: The city invests heavily in emerging technologies, including artificial intelligence and sustainability.

• Impact of the summit:

• The summit promotes cross-border collaboration and knowledge-sharing among governments.

• It serves as a platform for launching global initiatives, such as strategies for combating climate change and enhancing digital governance.

Q25. Answer: (b) West to East

The correct answer is West to East.

Key Points

• The Deccan Plateau is a large plateau in southern India, covering approximately 8 lakh square kilometers. It is triangular in shape and lies between the Western and Eastern Ghats.

• The general slope of the plateau is from west to east, which is evident from the flow of major rivers such as the Godavari, Krishna, and Kaveri towards the Bay of Bengal.

• The slope of the plateau influences the direction of river drainage and ensures that most rivers originating in the plateau flow eastward.

• Geologically, the Deccan Plateau is composed of igneous rocks, primarily formed from volcanic activity, and is one of the oldest plateaus in the world.

• The plateau is bounded by the Western Ghats to the west, the Eastern Ghats to the east, and the Satpura and Vindhya ranges to the north.

Additional Information

• Geographical Features of the Deccan Plateau:

• The Deccan Plateau covers most of southern India, extending across eight states, including Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, and Kerala.

• The plateau is rich in minerals like iron ore, manganese, and bauxite, making it significant for India's mining industry.

• It is characterized by a semi-arid climate, with low rainfall in comparison to the coastal regions.

• The soil in the Deccan Plateau is predominantly black soil, which is suitable for cotton cultivation.

• Rivers Flowing Across the Plateau:

• Major rivers like the Godavari, Krishna, and Kaveri originate in the Western Ghats and flow towards the Bay of Bengal.

• The Narmada and Tapi rivers, however, flow westward, draining into the Arabian Sea.

• Most rivers have a gentle slope, which is indicative of the west-to-east inclination of the plateau.

• Western and Eastern Ghats:

• The Western Ghats run parallel to the western coast and are higher in elevation compared to the Eastern Ghats.

• The Eastern Ghats are discontinuous and lower in elevation, making it easier for rivers to flow eastward.

• The Western Ghats act as a barrier for moisture-laden winds, contributing to the rain-shadow effect on the Deccan Plateau.

• Economic Significance:

• The Deccan Plateau is known for its fertile soils, which support agriculture, especially crops like cotton, sugarcane, and pulses.

• It is home to several industries, including mining, textile, and IT hubs like Bengaluru and Hyderabad.

• The plateau also has historical significance, housing ancient architectural marvels like the Ajanta and Ellora caves.

Important Points

• Topographical Influence: The west-to-east slope of the plateau not only determines river drainage but also impacts weather patterns and soil distribution.

• Volcanic Origin: The Deccan Plateau is composed of Deccan Traps, formed by volcanic activity around 66 million years ago.

• Historical Importance: It has been the seat of major empires like the Satavahana, Chalukya, and Vijayanagara.

• Ecological Significance: The plateau is home to unique flora and fauna, including species found in the Western Ghats, a UNESCO World Heritage Site.

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Q26. Answer: (c) Mauryan rule

The correct answer is Mauryan rule.

Key Points

• The stupas of Sanchi and Sarnath were constructed during the Mauryan rule, specifically under the reign of Emperor Ashoka, who ruled from 268 BCE to 232 BCE.

• These stupas are among the earliest examples of Buddhist architecture in India and were built to enshrine relics of the Buddha and serve as sacred places of worship and meditation.

• Emperor Ashoka's patronage of Buddhism led to the construction of numerous stupas across India, including the famous Sanchi Stupa, which is now a UNESCO World Heritage Site.

• The architectural style reflects the influence of Mauryan art, characterized by intricate carvings, polished stone surfaces, and detailed relief work depicting scenes from Buddha's life and Jataka tales.

• The stupas were constructed using durable materials such as, ensuring their longevity and preservation over centuries.

Additional Information

• Mauryan Empire:

• The Mauryan Empire was founded by Chandragupta Maurya in 321 BCE and was one of the largest empires in ancient India.

• Under Emperor Ashoka, the empire reached its peak, spanning much of the Indian subcontinent.

• Ashoka's conversion to Buddhism marked a significant turning point, as he promoted Buddhist teachings and practices throughout his empire.

• Emperor Ashoka:

• Emperor Ashoka is known for his rock edicts and pillar inscriptions, which spread Buddhist teachings and principles of dharma.

• The famous Ashoka Pillars, including the one at Sarnath, bear inscriptions and symbols like the lion capital, which later became the national emblem of India.

• Sanchi Stupa:

• The Great Stupa at Sanchi is one of the oldest stone structures in India, built in the 3rd century BCE under Ashoka's patronage.

• It features a hemispherical dome, a central relic chamber, and intricately carved gateways (toranas) that depict scenes from Buddha's life.

• Sarnath Stupa:

• The stupa at Sarnath is associated with Buddha's first sermon and is a significant Buddhist pilgrimage site.

• The site also includes the Dhamek Stupa, built later during the Gupta period, and the Ashoka Pillar with its famous lion capital.

Important Points

• Architectural Features of Mauryan Period:

• The Mauryan architecture is renowned for its use of polished stone and intricate carvings.

• The stupas were designed with a hemispherical dome, symbolizing cosmic unity, and a central chamber to house relics.

• The gateways (toranas) are adorned with depictions of Buddhist symbols like the wheel of dharma, lotus flowers, and animals.

• Influence of Ashoka's Patronage:

• Emperor Ashoka's dedication to spreading Buddhism resulted in the construction of monasteries, stupas, and pillars across his empire.

• His efforts contributed to the global spread of Buddhism, influencing regions beyond India, such as Sri Lanka, Nepal, and Southeast Asia.

• UNESCO Recognition:

• The Sanchi Stupa is recognized as a UNESCO World Heritage Site for its historical and architectural significance.

• This recognition highlights the enduring legacy of Mauryan art and its contribution to Indian heritage.

Q27. Answer: (b) Japan

The correct answer is Japan.

Key Points

• The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) is a global organization focused on ensuring safe and efficient navigation for maritime vessels worldwide.

• Japan was elected to the Vice Presidency of IALA in 2025, marking a significant achievement for the country in international maritime affairs.

• IALA works with member countries and organizations to develop and harmonize maritime navigation systems, including lighthouses and buoys, ensuring international standards are maintained.

• Japan’s election to the Vice Presidency highlights its active involvement in maritime safety and its commitment to fostering global cooperation in navigation technology.

• The Vice Presidency position is crucial for leading strategic initiatives and contributing expertise in maritime navigation systems globally.

Additional Information

• International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA):

• IALA was established in 1957 and operates as a non-profit organization dedicated to improving maritime navigation globally.

• Its primary focus includes the development of international standards for aids to navigation, such as lighthouses, buoys, and electronic navigation systems.

• IALA collaborates with member nations, maritime organizations, and industry experts to ensure safe and efficient navigation for vessels worldwide.

• Japan's Maritime Contributions:

• Japan is a leading nation in the maritime industry, known for its advanced navigation technology and efficient management of coastal and international shipping routes.

• The country has made significant contributions to the development of marine safety systems, including automated buoys and advanced lighthouse technology.

• Japan's election as Vice President of IALA reaffirms its dedication to maritime safety and its role as a global leader in navigation systems.

• IALA's Governance Structure:

• IALA is governed by a council comprising representatives from member states, and the Vice Presidency is a key leadership role within this structure.

• The Vice Presidency involves guiding strategic initiatives, promoting international cooperation, and overseeing the implementation of navigation standards.

• Other Member Countries:

• Countries such as France, Australia, and India are also active members of IALA and contribute to its global maritime initiatives.

• These countries work alongside Japan to ensure the harmonization of marine aids to navigation and the adoption of international standards.

Important Points

• IALA Membership: IALA comprises 80+ member countries and numerous industrial stakeholders working collaboratively to ensure maritime safety.

• IALA Standards: The organization's standards, including the IALA Maritime Buoyage System, are globally recognized for ensuring uniformity in navigation aids.

• Japan's Role: As Vice President, Japan will play a pivotal role in shaping future policies and advancing maritime navigation technologies.

• Global Importance: IALA's work is crucial for promoting safe, efficient, and environmentally sustainable maritime practices worldwide.

Q28. Answer: (b) Rabindranath Tagore

The correct answer is Rabindranath Tagore.

Key Points

• Rabindranath Tagore strongly criticized the British education system for being excessively Westernized and alienated from Indian realities.

• He believed that the British system of education focused heavily on rote learning and neglected creativity, individual growth, and cultural connection.

• Tagore advocated for an educational system that would integrate Indian culture and traditions while fostering creativity and nurturing the holistic development of students.

• He founded Visva-Bharati University in 1921 at Shantiniketan to embody his vision of education that emphasized creativity, global harmony, and cultural exchange.

• Tagore believed that education should be in harmony with nature and criticized the British method for its focus on rigid classroom settings and neglect of practical knowledge.

Additional Information

• Charles Wood:

• He was a British administrator who authored the Wood's Dispatch in 1854, which laid the foundation for the modern education system in India.

• Wood's Dispatch emphasized English language education and sought to create a class of Indians educated in British traditions to serve as intermediaries between the British government and Indian society.

• While it introduced structured education, it was criticized for ignoring Indian culture and traditions.

• Raja Rammohan Roy:
• He was a prominent Indian reformer and social activist, often referred to as the “Father of Modern India.”
• Rammohan Roy supported Western education in India but also advocated for the integration of science and progressive values.
• He founded the Hindu College in 1817, which later became Presidency College, Kolkata.
• Macaulay:
• Thomas Babington Macaulay was a British politician and historian, famous for the Macaulay Minute of 1835.
• He promoted English-language education, believing that it would create a class of Indians “Indian in blood and color but English in taste, opinions, morals, and intellect.”
• His approach was criticized for its disregard for Indian languages and cultural heritage.
• Visva-Bharati University:
• Founded by Rabindranath Tagore, this institution aimed to bridge the gap between Eastern and Western cultures.
• It emphasized education in harmony with nature and promoted creativity, music, art, and cultural exchange.
• Tagore’s philosophy of education shaped the institution, aiming to make it a center of global learning.

Important Points

• Criticism of British Education:
• Many Indian intellectuals, including Rabindranath Tagore, criticized British education for its emphasis on Western culture and neglect of Indian traditions.
• Education during British rule primarily aimed at creating a class of Indians to serve in administrative roles.
• Tagore’s Philosophy:
• Tagore’s vision was deeply rooted in the belief that education should develop creativity, harmony, and cultural awareness.
• His ideas emphasized the importance of connecting education to nature and practical life.

Q29. Answer: (d) 100 GW

The correct answer is 100 GW.

Key Points

• The Nuclear Energy Mission for Viksit Bharat is a government initiative aimed at enhancing India's nuclear energy capacity for sustainable development.
• Under this mission, India aims to achieve 100 GW of nuclear energy capacity by 2047, aligning with the goal of becoming a developed nation by its centenary year of independence.
• Nuclear energy is seen as a critical component of India's energy mix due to its ability to provide clean and reliable power, reducing dependence on fossil fuels.
• The initiative focuses on expanding the existing nuclear power infrastructure, including the commissioning of new reactors and the adoption of advanced technologies.
• India's nuclear energy development is facilitated by agencies such as the Department of Atomic Energy (DAE) and Nuclear Power Corporation of India Limited (NPCIL).

Additional Information

• Nuclear Energy in India:
• India currently has a total installed nuclear power capacity of approximately 7,000 MW as of 2023.
• The country operates 22 nuclear reactors across different states, including Tamil Nadu, Gujarat, and Rajasthan.
• Key nuclear plants include Kudankulam Nuclear Power Plant, Tarapur Atomic Power Station, and Rajasthan Atomic Power Station.
• Advantages of Nuclear Energy:
• It provides a consistent and reliable source of energy, unaffected by weather conditions.
• Nuclear power generation emits no greenhouse gases, making it a clean energy option.
• High energy density allows nuclear plants to produce large amounts of power with minimal fuel consumption.
• Global Nuclear Energy Trends:
• The United States and France are among the largest producers of nuclear energy globally.
• Countries such as China and Russia are rapidly expanding their nuclear power capabilities.
• India ranks as one of the emerging nuclear energy producers, with ambitious goals outlined in its energy policy.
• Challenges in Nuclear Energy Development:
• High initial investment costs for building nuclear power plants.
• Issues related to waste management and ensuring safe disposal of radioactive materials.
• Public concerns regarding safety and potential risks of nuclear accidents.

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Important Points

• India's Energy Policy:

• India aims to meet 50% of its energy requirements from non-fossil fuel sources by 2030.

• The Integrated Energy Policy emphasizes the role of nuclear energy in achieving sustainable development goals.

• The government is working on collaborative agreements with countries such as Russia and France for advanced nuclear technology.

• Technological Innovations:

• India is exploring advanced nuclear reactor technologies such as Fast Breeder Reactors (FBR) and Thorium-based reactors.

• Research and development in nuclear fuel recycling are being prioritized to minimize waste.

• Indigenous development of nuclear reactors is being spearheaded by organizations like Bhabha Atomic Research Centre (BARC).

Q30. Answer: (c) Antialkidas

The correct answer is Antialkidas.

Key Points

• Antialkidas was an Indo-Greek ruler who sent his envoy Heliodorus to the court of the Shunga king in India.

• Heliodorus, the Greek ambassador, installed the Heliodorus pillar in Vidisha (modern-day Madhya Pradesh), which is also called the Garuda Pillar.

• The pillar is significant because it mentions Heliodorus as a Bhagavata, a devotee of Lord Krishna, highlighting the influence of Vaishnavism during that era.

• The inscriptions on the pillar are one of the earliest examples of Vaishnavite devotion and emphasize the integration of Greek and Indian cultures.

• The pillar stands as evidence of the religious syncretism and cultural exchange that occurred during the Indo-Greek period in India.

Additional Information

• Indo-Greek Influence:

• The Indo-Greek rulers ruled parts of the Indian subcontinent from around 180 BCE to 10 CE.

• They are known for spreading Hellenistic culture, which combined Greek and local Indian traditions.

• Their coins often featured Greek gods as well as Indian deities, showcasing cultural integration.

• Heliodorus Pillar:

• The Heliodorus Pillar, located in Vidisha, is made of stone and stands as an example of early Indian architecture.

• The inscription on the pillar is written in the Brahmi script and refers to Heliodorus as a devotee of Lord Krishna.

• The pillar also mentions the term "Bhagavata," which refers to a follower of Vishnu or Krishna.

• Cultural Exchange:

• The Indo-Greek interaction introduced elements of Greek art, architecture, and religion into India, which later influenced the Gandhara school of art.

• Religious exchanges like the devotion of Heliodorus to Krishna highlight the acceptance of Indian philosophies by foreign rulers.

• Other Indo-Greek Rulers:

• Demetrius: Known for his conquests in India, he established the Indo-Greek kingdom but had no known association with the Heliodorus Pillar.

• Menander: Another famous Indo-Greek king, he embraced Indian culture and is associated with Buddhist texts like Milindapanha.

Important Points

• Religious Syncretism: The Heliodorus Pillar is one of the earliest examples of cross-cultural religious influence, where a Greek envoy adopted and promoted Indian religious practices.

• Vaishnavism: The mention of the Bhagavata tradition in the Heliodorus inscription is significant in understanding the early spread and prominence of Vaishnavism in Indian history.

• Historical Importance: The inscription on the pillar is a valuable source of information about the interaction between Indo-Greeks and Indian rulers during the 2nd century BCE.

Q31. Answer: (b) red limestone

The correct answer is red limestone.

Key Points

• The famous male torso from Harappa is made of red limestone, showcasing the artistic prowess of the Indus Valley Civilization.

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• This artifact is remarkable for its naturalistic pose, indicating advanced sculptural techniques used during the Harappan period.

• The sculpture is chiselled in the round, meaning it is a three-dimensional artwork that can be viewed from all sides.

• The male torso exemplifies the use of red limestone, a material commonly used for sculptures and artifacts in Harappan culture.

• This iconic artifact reflects the Harappans' emphasis on realistic human representation and their mastery in carving durable materials.

Additional Information

• The Harappan Civilization:

• The Harappan civilization, also known as the Indus Valley Civilization, flourished between 2500 BCE and 1500 BCE.

• It was known for its urban planning, advanced drainage systems, and remarkable craftsmanship in pottery, seals, and sculptures.

• Material Use in Harappan Art:

• The Harappans used various materials like red limestone, bronze, steatite, and terracotta for their artworks.

• Steatite was commonly used for seals, while bronze was employed for casting sculptures such as the famous "Dancing Girl." Terracotta was used for figurines and toys.

• Features of Harappan Sculptures:

• Harappan sculptures often depicted realistic human and animal forms with attention to detail.

• They showcased advanced techniques such as chiselling, engraving, and moulding.

• Significance of the Male Torso:

• The male torso is a prime example of Harappan artistry, emphasizing the civilization's focus on human anatomy and aesthetics.

• Its naturalistic posture indicates an understanding of human proportions and movement.

Important Points

• Artifacts and Their Importance:

• Harappan artifacts like the male torso, seals, and pottery provide valuable insights into the social, cultural, and economic aspects of the civilization.

• The use of durable materials such as red limestone underscores the Harappans' technological expertise.

• Artifacts serve as evidence of the artistic and cultural achievements of ancient civilizations.

Q32. Answer: (a) Punjab National Bank

The correct answer is Punjab National Bank.

Key Points

• Ashok Chandra assumed charge as the Managing Director and Chief Executive Officer of Punjab National Bank on 16th January 2025. This marks a significant leadership change in one of India’s largest public sector banks.

• Punjab National Bank (PNB) is one of India’s oldest and largest banks, established in 1894. It serves millions of customers across the country with a diverse range of financial services.

• The appointment of the Managing Director and CEO in Indian public sector banks is governed by the Ministry of Finance and the Reserve Bank of India (RBI). The process ensures experienced leadership to drive banking operations and development.

• PNB has played a critical role in the Indian banking sector, especially post its merger with United Bank of India and Oriental Bank of Commerce in 2020, making it the second-largest public sector bank in India.

• The new CEO’s appointment reflects the bank’s focus on strengthening governance, improving operational efficiency, and enhancing customer satisfaction.

Additional Information

• Punjab National Bank (PNB):

• Founded in 1894 by Lala Lajpat Rai and headquartered in New Delhi.

• PNB has a vast network of over 10,000 branches and ATMs, serving millions of customers in urban and rural areas.

• It offers services like retail banking, corporate banking, insurance, and asset management.

• The bank is known for its efforts in financial inclusion and promoting government schemes such as Jan Dhan Yojana and Atal Pension Yojana.

• Post-merger in 2020, PNB became the second-largest public sector bank in India, with a significant customer base and asset portfolio.

• Central Bank of India:

• Established in 1911, it is one of India’s oldest and largest commercial banks.

• Headquartered in Mumbai, it is known for its contribution to financial inclusion and rural development.

• Offers various banking services, including personal loans, home loans, and agricultural financing.

• Canara Bank:

• Founded in 1906 and headquartered in Bangalore.

• It is one of India's leading public sector banks with a large network of branches and ATMs.

• Canara Bank merged with Syndicate Bank in 2020, further expanding its operations.

• Union Bank of India:

• Established in 1919, headquartered in Mumbai.

• Known for its innovative banking solutions and customer-focused services.

• In 2020, Union Bank merged with Andhra Bank and Corporation Bank, increasing its market presence.

Important Points

• Banking Leadership: The appointment of CEOs and MDs in public sector banks is crucial for implementing financial reforms and maintaining stability in the banking sector.

• Government Schemes: Public sector banks like PNB actively contribute to the success of government schemes such as Pradhan Mantri Mudra Yojana, PM-KISAN, and Stand-Up India.

• Post-Merger Scenario: Mergers in the banking sector aim to create stronger institutions, improve efficiency, and enhance customer service.

• Challenges: Public sector banks face challenges like non-performing assets (NPAs), technological upgrades, and competition from private sector banks.

Q33. Answer: (b) $20 billion

The correct answer is $20 billion.

Key Points

• India's satellite communication (satcom) market is projected to achieve a valuation of $20 billion by 2028, reflecting its rapid growth and increasing demand for advanced communication services.

• The growth is largely driven by the rising adoption of satellite-based broadband services, especially in remote and rural areas where conventional terrestrial services are limited.

• Advancements in space technology, including the deployment of next-generation satellites and Low Earth Orbit (LEO) satellite systems, have significantly contributed to this projected valuation.

• Government initiatives such as Digital India and collaboration with private players like SpaceX and OneWeb have further accelerated the market's expansion.

• The satcom sector also plays a crucial role in enabling critical applications, such as disaster management, defense communication, telemedicine, and education, adding to its growing importance.

Additional Information

• Satellite Communication (Satcom):

• Satcom refers to the use of satellites to provide communication services, including internet access, television broadcasting, and data transmission.

• It is especially vital for remote areas where terrestrial communication infrastructure, such as fiber optics, is lacking.

• Technologies such as High Throughput Satellites (HTS) and Low Earth Orbit (LEO) satellites have significantly enhanced the efficiency and speed of satcom services.

• Global Trends in Satcom:

• The global satcom market is expanding rapidly, with key players like SpaceX, Amazon (Project Kuiper), and OneWeb investing heavily in satellite networks.

• LEO satellites are revolutionizing the industry by offering low latency and high-speed internet, making them ideal for applications like video conferencing and online gaming.

• Countries like the United States, China, and European nations are leading the satcom industry in terms of innovation and deployment.

• Indian Space Research Organisation (ISRO):

• ISRO has been a major contributor to India's satcom sector, with successful missions like GSAT series satellites and communication payloads.

• The agency is actively working on next-generation satellite technologies to cater to the growing demand for broadband and communication services.

• ISRO's collaboration with private players under the space sector reforms has further boosted the satcom market.

• Applications of Satcom in India:

• Satcom is extensively used for telemedicine, education, agriculture, disaster management, and defense purposes.

• It plays a key role in facilitating e-Governance and connectivity in remote areas under initiatives like Digital India.

• Private sector involvement, including companies like Tata Communications and Bharti Airtel, has enhanced the satcom ecosystem in India.

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Important Points

• Government Initiatives:

• The Government of India has introduced various policies to promote the satcom industry, including liberalization of the space sector and allowing FDI in satellite communication.

• Programs like Digital India aim to enhance connectivity through satellite-based broadband services.

• ISRO's Commercial Arm - Antrix Corporation, and the newly established Indian National Space Promotion and Authorization Center (IN-SPACe) aim to boost private participation in the satcom domain.

• Low Earth Orbit Satellites:

• LEO satellites operate at an altitude of 500-2000 km, offering low latency and high-speed internet services.

• They are widely used in applications like telecommunication, IoT, and remote sensing.

• Major players like SpaceX (Starlink) and OneWeb are deploying thousands of LEO satellites to meet global communication demands.

Q34. Answer: (c) River basins and flat lands

The correct answer is River basins and flat lands.

Key Points

• Canal irrigation is most effective in river basins and flat lands because the terrain allows for easy construction and maintenance of canals, ensuring efficient water distribution across agricultural fields.

• Flat lands provide a natural gradient that facilitates the flow of water through canals without requiring extensive engineering or pumping mechanisms.

• Regions with river basins have a consistent water source, making them ideal for canal irrigation systems as they can channel river water directly to agricultural lands.

• Canal irrigation is widely used in areas like the Indo-Gangetic plains in India, which are characterized by fertile soil and a flat topography conducive to agriculture.

• Compared to other geographical regions such as mountain regions, rocky plateaus, or deserts, river basins and flat lands have the advantage of ample water availability and ease of construction of canal networks.

Additional Information

• High mountain regions:

• Not suitable for canal irrigation due to uneven terrain and steep slopes.

• Mountain regions often rely on natural springs, streams, and rainfall for irrigation.

• Constructing canals in mountainous areas is technically challenging and not cost-effective.

• Rocky plateaus:

• Characterized by hard, impermeable surfaces that make canal construction difficult.

• These regions often rely on groundwater extraction or tanks for irrigation.

• Limited water availability and lack of fertile soil are other constraints for canal irrigation in rocky plateaus.

• Desert regions:

• Deserts are arid zones with very scarce water resources.

• Canal irrigation can be implemented in deserts only when water is brought from distant sources, as seen in projects like the Indira Gandhi Canal in Rajasthan.

• The high evaporation rates and sandy soil in deserts further limit the efficiency of canal irrigation.

• River basins and flat lands:

• These regions are ideal for canal irrigation due to fertile alluvial soil and abundant water availability.

• The flat terrain ensures efficient distribution of water across large agricultural fields.

• Examples include the Indo-Gangetic plains and Brahmaputra valley in India.

• These areas contribute significantly to food production due to the availability of canal irrigation systems.

Important Points

• Canal irrigation in India:

• India has one of the largest canal irrigation systems in the world, especially in states like Punjab, Haryana, and Uttar Pradesh.

• The Indira Gandhi Canal is one of the largest canal projects in India, providing water to arid regions of Rajasthan.

• Canal irrigation is critical for the cultivation of crops like rice, wheat, and sugarcane, which require large quantities of water.

• Challenges in canal irrigation:

• Waterlogging and soil salinity are common issues caused by improper management of canal systems.

• High maintenance costs and loss of water due to evaporation are major concerns.

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• Efforts like micro-irrigation techniques are being promoted to address inefficiencies in canal irrigation systems.

Q35. Answer: (a) When the Rajya Sabha passes a resolution.

The correct answer is When the Rajya Sabha passes a resolution.

Key Points

• Article 249 of the Constitution of India empowers the Parliament to legislate on matters in the State List if the Rajya Sabha passes a resolution by a two-thirds majority.

• The resolution must declare that it is necessary for the Parliament to make laws on a matter in the State List in the national interest.

• Such legislation can remain in effect for one year and can be renewed for an additional year as long as the resolution is passed again.

• This provision ensures that the Parliament can act in circumstances where the subject matter is of significant importance to the nation, even though it primarily falls under the purview of the states.

• It should be noted that this does not automatically shift the matter from the State List to the Union List; it only allows Parliament to temporarily legislate on it. Hence, the statement is correct.

Additional Information

• Article 352: National Emergency

• National Emergency (Article 352) → allows Parliament to legislate, but it is a different constitutional route, not the condition asked here in single-correct framing.

• This emergency can be declared in cases of war, external aggression, or armed rebellion.

• However, this provision applies only during the emergency period and ceases once the emergency is revoked. Hence, the statement is incorrect.

• Article 250:

• During a proclamation of emergency, Parliament has the authority to legislate on any matter in the State List.

• This power is temporary and is limited to the duration of the emergency.

• Financial Emergency (Article 360):

• In case of a financial emergency declared under Article 360, the President can direct the states to adhere to specific financial policies.

• However, Parliament does not directly acquire the power to legislate on matters in the State List under this provision. Hence, the statement is incorrect.

• Role of the Governor:

• A Governor does not have the authority to request Parliament to legislate on State List matters due to financial emergencies or any other reason.

• Such provisions would violate the federal structure and autonomy of the states. Hence, the statement is incorrect.

Important Points

• Federal Structure:

• The Indian Constitution establishes a federal structure with clear demarcation between the Union and State Lists.

• Parliament can legislate on State List matters only in exceptional circumstances as defined by specific constitutional provisions.

• State List:

• The State List includes subjects such as police, public order, public health, and agriculture, which are reserved for the states.

• Parliamentary intervention is limited and regulated to preserve the autonomy of states.

• Judicial Review:

• Any law passed by Parliament on State List matters during emergencies or under Article 249 is subject to judicial review.

• The judiciary ensures that such actions are in line with the Constitution and national interest.

Q36. Answer: (b) 2029

The correct answer is 2029.

Key Points

• India has set an ambitious goal to achieve a defence production target of Rs. 3 lakh crore by the year 2029. This initiative aims to strengthen India's position as a global defence manufacturing hub.

• The target includes achieving Rs. 1 lakh crore in defence exports, showcasing India's focus on becoming a major exporter of defence equipment.

• As part of this vision, the government is working towards enhancing self-reliance in defence production, reducing imports of defence equipment, and promoting domestic manufacturing capabilities.

• India’s Ministry of Defence has introduced several policies like the Defence Production and Export Promotion Policy (DPEPP)

2020 to achieve this goal.

• The initiatives under this plan include boosting indigenous design and development of defence equipment, promoting private sector participation, and increasing foreign direct investment (FDI) in the defence sector.

Additional Information

• Defence Production and Export Promotion Policy (DPEPP) 2020:

• The DPEPP 2020 outlines a clear roadmap to boost the defence manufacturing ecosystem in India.

• It focuses on achieving self-reliance by indigenizing 5000 defence items and promoting the domestic defence industry.

• It also aims to enhance collaboration between public and private sector companies in defence production.

• Make in India Initiative:

• The Make in India initiative is at the core of India's defence production strategy, emphasizing the importance of domestic manufacturing.

• India has been focusing on reducing its dependency on imported defence equipment by encouraging local manufacturing units.

• Defence Corridors:

• The government has established two defence corridors in Uttar Pradesh and Tamil Nadu to facilitate defence production and attract foreign investments.

• These corridors aim to enhance connectivity, reduce logistics costs, and boost exports.

• Key Policy Reforms:

• Foreign Direct Investment (FDI) in the defence sector has been increased to 74% under the automatic route to attract investments.

• Innovative initiatives like iDEX (Innovations for Defence Excellence) aim to promote startups and MSMEs in the defence sector.

Important Points

• Current Scenario: India is already ranked among the largest arms importers globally but is working towards becoming a major exporter of defence equipment.

• Recent Export Achievements: India exported defence equipment worth Rs. 13,000 crore in 2021-22, reflecting a steady increase in export capacity.

• Defence PSUs: Public Sector Undertakings like Hindustan Aeronautics Limited (HAL) and Bharat Electronics Limited (BEL) play a crucial role in achieving India's defence production goals.

• Significant Projects: Indigenous projects like Tejas Light Combat Aircraft (LCA) and INS Vikrant are milestones in India's defence manufacturing capabilities.

Q37. Answer: (c) Saubhagya Scheme

The correct answer is Saubhagya Scheme.

Key Points

• The Saubhagya Scheme, also known as the Pradhan Mantri Sahaj Bijli Har Ghar Yojana, was launched by the Government of India on September 25, 2017, under the leadership of Prime Minister Narendra Modi.

• The primary aim of the scheme is to provide universal household electrification across the country, particularly focusing on rural areas and economically weaker sections.

• Under this scheme, households without electricity connections, especially in rural and urban poor households, are identified and provided with free electricity connections.

• The Rural Electrification Corporation (REC) has been designated as the nodal agency for implementing the Saubhagya scheme.

• As per official data, the scheme has contributed to electrifying 99.99% of households in India, ensuring that reliable electricity is accessible to all.

Additional Information

• Features of the Saubhagya Scheme:

• The scheme provides free electricity connections to households under Below Poverty Line (BPL) and ensures subsidized connections for others.

• The cost of last-mile connectivity, including the installation of service cables, meters, and wiring, is borne by the government.

• The scheme also ensures the distribution of LED lights, fans, and power plugs to support basic electricity use.

• Funding and Implementation:

• The scheme is centrally sponsored, with funding shared between the Central Government and State Governments.

• The Rural Electrification Corporation (REC) is responsible for monitoring and implementation, ensuring quality and timely completion of projects.

• Impact:

• The Saubhagya scheme has been instrumental in achieving 24x7 Power for All, a commitment made by the government to provide reliable and sustainable electricity to all citizens.

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• It has significantly boosted the socio-economic condition of rural India by enabling access to electricity for households, schools, and small businesses.

• Comparison with Other Schemes:

• The UJALA Scheme focuses on energy efficiency by distributing LED bulbs, while Saubhagya emphasizes household electrification.

• The Shakti Scheme primarily targets the coal sector for power generation, and the GARV Dashboard monitors village electrification data.

Important Points

• The total budget allocated for the Saubhagya scheme was approximately Rs. 16,320 crores, with the aim of achieving universal electrification by the end of March 2019.

• The scheme also uses innovative technologies such as mobile apps for real-time tracking of household electrification status.

• The initiative aligns with India's global commitment to achieving Sustainable Development Goal 7 (SDG 7), which ensures access to affordable, reliable, sustainable, and modern energy for all.

Q38. Answer: (a) Lord Curzon

The correct answer is Lord Curzon.

Key Points

• In 1898, Lord Curzon passed an Act that made it an offence to provoke people against the British rulers, reflecting his administration's control measures in colonial India.

• The Act was part of the broader repressive policies introduced during Lord Curzon’s tenure as the Governor-General and Viceroy of India (1899–1905).

• Lord Curzon focused on maintaining law and order and strengthening the British administration in India, often by suppressing dissent and nationalist movements.

• He introduced several controversial measures, including the partition of Bengal in 1905, which sparked widespread protests and was eventually annulled in 1911.

• This Act highlighted the growing unrest in India due to colonial exploitation and the increasing role of leaders and freedom fighters in mobilizing public sentiment against British rule.

Additional Information

• Lord Curzon’s tenure:

• Lord Curzon served as the Viceroy of India from 1899 to 1905.

• He is known for his administrative reforms, including the establishment of the Archaeological Survey of India to preserve Indian heritage.

• His repressive policies, such as the Partition of Bengal, were aimed at curbing the nationalist movement but had the opposite effect, strengthening the Indian freedom struggle.

• The Partition of Bengal (1905):

• Lord Curzon divided Bengal into East Bengal and West Bengal, citing administrative efficiency, but the real motive was to weaken the growing nationalist movement.

• The partition led to widespread protests, including the Swadeshi Movement, which encouraged Indians to boycott British goods and promote indigenous industries.

• Repressive Acts under British Rule:

• The British government passed several laws to suppress dissent, such as the Vernacular Press Act (1878), the Arms Act (1878), and the Rowlatt Act (1919).

• These laws restricted freedoms, including freedom of speech and expression, and allowed the colonial government to arrest individuals without trial.

• Lord Curzon’s reforms:

• He introduced reforms in irrigation, railways, and police to improve British control over India’s administration.

• He also focused on education, establishing institutions such as the Indian Universities Act (1904).

Important Points

• Colonial response to nationalism:

• As nationalist sentiments grew in India, British authorities implemented laws to suppress movements and maintain control over the population.

• The repressive measures often led to greater resistance, strengthening the resolve of Indian leaders and activists to fight for independence.

• Legacy of Lord Curzon:

• While Lord Curzon contributed to preserving Indian heritage and improving administration, his policies were largely unpopular

among Indians.

• His tenure is remembered for the divide-and-rule strategy, which aimed to fragment Indian society but ultimately united Indians in their struggle for freedom.

Q39. Answer: (d) Accretion

The correct answer is Accretion.

Key Points

• Accretion refers to the process where small celestial bodies, such as dust and gas particles in space, collide and stick together, gradually forming larger bodies like planets, moons, and asteroids.

• This process is fundamental in the formation of planetary systems, starting from microscopic particles to massive planetary bodies over millions of years.

• Accretion occurs predominantly in the early stages of a star system's formation, within the protoplanetary disk surrounding a newly formed star.

• The gravitational pull of growing celestial bodies causes surrounding particles to aggregate, further accelerating their growth and shaping their structure.

• Accretion disks are regions of dust and gas around stars where this process is most active, leading to the eventual creation of planets and other celestial objects. Hence, this term accurately describes the process mentioned in the question.

Additional Information

• Fragmentation:

• Fragmentation refers to the breaking up of larger celestial bodies into smaller pieces due to collisions, explosions, or other forces.

• This process does not contribute to the formation of planets but rather results in the creation of smaller debris like meteoroids or asteroids.

• It is the opposite of accretion in terms of celestial body dynamics.

• Example: The asteroid belt between Mars and Jupiter contains fragments created through such processes.

• Degassing:

• Degassing involves the release of gases trapped within a planet's interior, often through volcanic activity.

• This process plays a significant role in shaping a planet's atmosphere but is unrelated to the initial formation of planets.

• Example: Earth's early atmosphere was formed through degassing, releasing gases like water vapor, carbon dioxide, and nitrogen.

• Differentiation:

• Differentiation refers to the process by which heavier elements, like iron, sink to a planet's core while lighter elements, like silicates, rise to form its crust.

• This occurs after a planet has formed and is essential in determining its internal structure.

• Example: Earth's iron core and silicate mantle were formed through differentiation.

• Accretion:

• Accretion is the most critical process in planet formation, beginning with microscopic dust particles colliding and gradually forming larger bodies.

• This process is responsible for creating not only planets but also moons, asteroids, and other celestial objects.

• Example: The planets in our solar system formed through accretion approximately 4.6 billion years ago.

• Protoplanetary Disks:

• These are regions of dust and gas around young stars where accretion takes place.

• The material in these disks provides the building blocks for planets and other celestial objects.

• Observations of such disks have been made using telescopes like the Hubble Space Telescope.

Important Points

• Planet Formation Timeline: The process of accretion and subsequent planet formation typically spans millions to billions of years.

• Role of Gravity: Gravity is the primary force driving accretion, pulling particles together and enabling the growth of celestial bodies.

• Observational Evidence: Modern telescopes, like ALMA (Atacama Large Millimeter/submillimeter Array), have captured images of protoplanetary disks, providing direct evidence of accretion processes.

• Solar System Formation: Our solar system was formed approximately 4.6 billion years ago through the accretion process within a protoplanetary disk surrounding the Sun.

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Q40. Answer: (c) The Legal Services Authorities Act, 1987

The correct answer is The Legal Services Authorities Act, 1987.

Key Points

• Lok Adalats are alternative dispute resolution forums in India that aim to provide speedy justice and reduce the burden on regular courts.

• The Legal Services Authorities Act, 1987 provides statutory status to Lok Adalats and governs their functioning across the country.

• Under this Act, Lok Adalats are empowered to settle disputes by mutual agreement, ensuring fairness and efficiency in the resolution process.

• The Act specifies that awards made by Lok Adalats are binding and possess the status of a decree of a civil court.

• Lok Adalats deal with cases such as civil matters, family disputes, motor accident claims, and public utility services issues, among others.

Additional Information

• Legal Services Authorities Act, 1987:

• The Act was enacted to provide free and competent legal services to weaker sections of society to ensure justice for all.

• It established the National Legal Services Authority (NALSA), State Legal Services Authorities, and District Legal Services Authorities to implement legal aid programs.

• The Act encourages the resolution of disputes outside traditional courts, minimizing procedural delays and financial burdens.

• History and Evolution of Lok Adalats:

• Lok Adalats were first introduced in India in 1982 in Gujarat as a mechanism to resolve disputes amicably.

• They gained prominence with the enactment of the Legal Services Authorities Act, 1987, providing statutory recognition.

• The concept is based on compromise and reconciliation, drawing inspiration from traditional dispute resolution practices in rural India.

• Features of Lok Adalats:

• Lok Adalats do not follow strict procedural laws, making them cost-effective and fast.

• They emphasize consensual settlement; parties must agree to resolve their dispute.

• These forums have jurisdiction over civil cases, compoundable criminal cases, and cases related to public utility services.

• Comparison with Regular Courts:

• Unlike traditional courts, Lok Adalats do not involve lengthy trials or legal formalities.

• Decisions made by Lok Adalats are final and cannot be appealed, ensuring faster resolution.

• They are particularly beneficial for small disputes where parties seek a quick and amicable solution.

Important Points

• Statutory Framework:

• The Legal Services Authorities Act, 1987 provides the statutory backing for Lok Adalats.

• Section 22 of the Act defines the jurisdiction and powers of Lok Adalats.

• The Act ensures that awards made by Lok Adalats are treated as final and binding decrees of the court.

• Types of Lok Adalats:

• Regular Lok Adalats: Organized periodically to resolve disputes amicably.

• Mobile Lok Adalats: Conducted in remote areas to increase access to justice.

• Permanent Lok Adalats: Established for issues related to public utility services, such as transport, telecommunication, and power supply.

• Benefits of Lok Adalats:

• Provide speedy justice at minimal cost.

• Encourage mutual understanding and reconciliation between parties.

• Reduce the burden on regular courts, enabling efficient judicial functioning.

Q41. Answer: (c) 13/50

Shortcut Trick

Part of work completed by A in 6 days = 6/12 = 1/2

Part of work completed by B in 6 days = 6/25

Total work completed together in 6 days = 1/2 + 6/25 = (25 + 12)/50 = 37/50

Fraction of work left = 1 − 37/50 = 13/50

Therefore The correct answer is 13/50.

Alternate Method

Given:

Time taken by A = 12 days

Time taken by B = 25 days

Number of days worked together = 6 days

Concept Used:

Total Work = LCM of given days

Efficiency = Total Work ÷ Days

Person	Days	Total Work	Efficiency
A	12	300	300 ÷ 12 = 25
B	25	300 ÷ 25 = 12	

Calculations:

=> Total efficiency of A and B = 25 + 12 = 37 units/day

=> Total work done in 6 days = 37 × 6 = 222 units

=> Remaining work = Total work − Work done

=> Remaining work = 300 − 222 = 78 units

=> Fraction of work left = Remaining work ÷ Total work

=> Fraction of work left = 78 ÷ 300 = 13/50

Therefore The correct answer is 13/50.

Additional Information

Total Work Formula

Total Work = Efficiency × Time taken. Efficiency represents the amount of work an individual can complete in a single unit of time (e.g., 1 day or 1 hour).

Unitary Method for Time & Work

If a person completes a task in 'n' days, the fraction of the work completed in 1 day is simply 1/n. The entire task is always considered as 1 whole unit of work.

Pipes & Cisterns Analogy

Filling a tank is exactly equivalent to positive work efficiency, whereas an emptying pipe or leak acts as negative efficiency that destroys the work done.

Q42. Answer: (a) -42

Shortcut Trick

Expression: (-9) − (-60) ÷ (-10) + (-3) × 9

Apply BODMAS directly: Compute division first, then multiplication.

=> (-9) − (6) + (-27)

=> -9 − 6 − 27

=> -42

Therefore The correct answer is -42.

Alternate Method

Given:

Expression: (-9) − (-60) ÷ (-10) + (-3) × 9

Concept Used:

BODMAS Rule: Brackets, Orders, Division, Multiplication, Addition, and Subtraction.

Calculations:

=> Step 1: Perform Division

=> (-60) ÷ (-10) = 6

=> The expression becomes: (-9) − 6 + (-3) × 9

=> Step 2: Perform Multiplication

=> (-3) × 9 = -27

=> The expression becomes: (-9) − 6 + (-27)

=> Step 3: Perform Addition and Subtraction from left to right

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=> -9 − 6 − 27

=> -15 − 27

=> -42

Therefore The correct answer is -42.

Additional Information

BODMAS Rule

It dictates the order of operations for solving arithmetic expressions: Brackets, Orders (powers/roots), Division, Multiplication, Addition, and Subtraction.

Sign Rules for Multiplication & Division

Negative × Negative = Positive, and Negative × Positive = Negative. The exact same rules apply when dividing numbers.

Sign Rules for Addition & Subtraction

When both numbers are negative, you add their numerical values together and keep the negative sign attached to the result (e.g., -5 − 3 = -8).

Q43. Answer: (c) 54

Shortcut Trick

We know the direct relation: First Number × Second Number = HCF × LCM

Second Number = (18 × 216) ÷ 72

Second Number = 18 × 3 = 54

Therefore The correct answer is 54.

Alternate Method

Given:

HCF of two numbers = 18

LCM of two numbers = 216

First number = 72

Formula Used:

Product of two numbers = HCF × LCM

Calculation:

=> First number × Second number = HCF × LCM

=> 72 × Second number = 18 × 216

=> Second number = (18 × 216) ÷ 72

=> Second number = 18 × (216 ÷ 72)

=> Second number = 18 × 3

=> Second number = 54

Therefore The correct answer is 54.

Additional Information

Product Rule for Two Numbers

For any two numbers a and b, their product is equal to the product of their HCF and LCM. Formula: a × b = HCF(a, b) × LCM(a, b). This applies strictly to exactly two numbers.

Co-prime Numbers

Two numbers are considered co-prime if their HCF is 1. In such cases, the LCM of these numbers is always equal to their direct product.

HCF and LCM of Fractions

HCF of fractions = (HCF of numerators) ÷ (LCM of denominators). LCM of fractions = (LCM of numerators) ÷ (HCF of denominators).

Q44. Answer: (b) M - N = 3

Shortcut Trick

For divisibility by 11, the difference of the sum of alternating digits must be 0 or 11k.

=> (N + 6 + 7) − (3 + M + 7) = 0

=> N + 13 − M − 10 = 0

=> N − M + 3 = 0

=> M − N = 3

Therefore The correct answer is M − N = 3.

Alternate Method

Given:

A 6-digit number N36M77 is divisible by 11.

Formula Used:

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

Calculations:

=> Sum of digits at odd places (1st, 3rd, and 5th digits from the left) = N + 6 + 7 = N + 13

=> Sum of digits at even places (2nd, 4th, and 6th digits from the left) = 3 + M + 7 = M + 10

=> Difference = (Sum of digits at odd places) − (Sum of digits at even places)

=> Difference = (N + 13) − (M + 10)

=> Difference = N − M + 3

For the number to be divisible by 11, the difference must be equal to 0, 11, or −11.

Since M and N are single digits, equating the difference to 0 gives a valid relation:

=> N − M + 3 = 0

=> M − N = 3

This matches one of our given options perfectly.

Therefore The correct answer is M − N = 3.

Additional Information

Divisibility Rule of 3 and 9

A number is divisible by 3 or 9 if the sum of all its digits is a multiple of 3 or 9 respectively.

Divisibility Rule of 4 and 8

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

Divisibility Rule of 7, 11 and 13 combined

A large number is divisible by 7, 11, or 13 if the difference between the number formed by its last three digits and the number formed by the rest of the digits is divisible by 7, 11, or 13 respectively.

Q45. Answer: (d) 42

Shortcut Trick

Ratio of the two numbers is 5 : 1.

Product in ratio terms = 5 × 1 = 5 parts².

5 parts² = 245 => 1 part² = 49 => 1 part = 7.

Sum of the numbers = 5 parts + 1 part = 6 parts.

Required sum = 6 × 7 = 42.

Therefore The correct answer is 42.

Alternate Method

Given:

Product of two positive numbers = 245

First number = 5 × Second number

5 parts (5x)

First

1 part (x)

Second

Product = 5x × x = 245

Calculations:

Let the second number be x.

=> First number = 5x

According to the given condition:

=> x × 5x = 245

=> 5x² = 245

=> $x^2 = 245 \div 5$

=> $x^2 = 49$

=> $x = \sqrt{49} = 7$ (taking only the positive value as given)

=> The second number = 7

=> The first number = $5 \times 7 = 35$

=> Sum of the numbers = 35 + 7 = 42

Therefore The correct answer is 42.

Additional Information

Ratio & Product Property

When two numbers are in the ratio a : b, their product is always $a \times b \times x^2$ (where x is the common multiplier), not simply $a \times b \times x$. This squaring effect is crucial and easily missed in product-related ratio problems.

Quadratic Roots Selection

For a pure quadratic equation of the form $x^2 = k$, the possible roots are always $x = +\sqrt{k}$ and $x = -\sqrt{k}$. Word problems often state positive numbers or lengths to intentionally eliminate the negative root.

Q46. Answer: (b) 12:40 PM

Shortcut Trick

Let Total Distance = LCM(7, 5) = 35 units. Speed of A = 35 ÷ 7 = 5 u/hr and Speed of B = 35 ÷ 5 = 7 u/hr.

Distance covered by A in 2 hrs (8:35 AM to 10:35 AM) = 5 × 2 = 10 units.

Remaining distance = 35 − 10 = 25 units.

Time to meet = Remaining Distance ÷ Relative Speed = 25 ÷ (5 + 7) = 25/12 hours.

25/12 hours = 2 hours and 5 minutes.

Meeting time = 10:35 AM + 2 hr 5 min = 12:40 PM.

Therefore The correct answer is 12:40 PM.

Alternate Method

Given:

Train A starts from station M at 8:35 AM and reaches station N at 3:35 PM (Time taken = 7 hours).

Train B starts from station N at 10:35 AM and reaches station M at 3:35 PM (Time taken = 5 hours).

M

N

10:35 AM

Meeting Point

Train A

8:35 AM

7 hrs

Train B

10:35 AM

5 hrs

A alone (2h)

Relative Speed Phase

Formula Used:

Speed = Distance ÷ Time

Time to meet = Distance between them ÷ Relative Speed

Calculations:

=> Let total distance between station M and N be D.

=> Speed of Train A = D/7

=> Speed of Train B = D/5

=> Distance covered by Train A from 8:35 AM to 10:35 AM (2 hours) = 2 × (D/7) = 2D/7

=> Remaining distance to be covered at 10:35 AM = D − 2D/7 = 5D/7

=> After 10:35 AM, both trains are travelling towards each other. Therefore, relative speed = Speed of A + Speed of B

=> Relative speed = (D/7) + (D/5) = (5D + 7D)/35 = 12D/35

=> Time taken to meet = Remaining Distance ÷ Relative speed

=> Time taken to meet = (5D/7) ÷ (12D/35) = (5D/7) × (35/12D) = 25/12 hours

=> 25/12 hours = 2 hours + (1/12 × 60) minutes = 2 hours 5 minutes

=> Thus, the trains meet 2 hours and 5 minutes after 10:35 AM.

=> Meeting time = 10:35 AM + 2 hours 5 minutes = 12:40 PM

Therefore The correct answer is 12:40 PM.

Additional Information

Relative Speed

When two objects move in opposite directions towards each other, their relative speed is the sum of their individual speeds: S_R = S1 + S2.

Meeting Time Concept

If two moving bodies begin their journey at the exact same time towards each other, the duration until they meet is uniformly calculated as the total initial distance divided by their relative speed.

Different Departure Times

If the starting times are unequal, always calculate the distance travelled by the first body before the second body starts. The relative speed formula only applies to the remaining distance from the moment both bodies are in motion simultaneously.

Q47. Answer: (c) 32

Shortcut Trick

For any two numbers a and b, the third proportional x is calculated using the formula $x = b^2 \div a$.

Given the values a = 8 and b = 16.

=> x = (16 × 16) ÷ 8

=> x = 256 ÷ 8 = 32

Therefore The correct answer is 32.

Alternate Method

Given:

First number (a) = 8

Second number (b) = 16

Let the third proportional be x.

Formula Used:

If three numbers are in continued proportion, then a : b :: b : x

=> a ÷ b = b ÷ x

8 1st Term (a) × 2 16 2nd Term (b) × 2 x = 32 3rd Term (x) 8 : 16 :: 16 : 32

Calculations:

=> 8 : 16 :: 16 : x

=> 8 ÷ 16 = 16 ÷ x

=> 1 ÷ 2 = 16 ÷ x

=> x = 16 × 2

=> x = 32

Therefore The correct answer is 32.

Additional Information

Mean Proportional

The mean proportional between two numbers a and b is calculated using the formula √(ab).

Fourth Proportional

For three given numbers a, b, and c, the fourth proportional x satisfies the condition a : b :: c : x, meaning x = (b × c) ÷ a.

Duplicate Ratio

The duplicate ratio of a : b is $a^2 : b^2$, which means squaring the corresponding terms of the original ratio.

Continued Proportion

Three numbers a, b, and c are said to be in continued proportion if the ratio of the first to the second is equal to the ratio of the second to the third (a ÷ b = b ÷ c).

Q48. Answer: (c) 20 km/hr

Shortcut Trick

When distance is constant, speed is inversely proportional to time.

Since the time taken is halved (from 16 hours to 8 hours).

The speed must be doubled to cover the same distance.

New Speed = 10 × 2 = 20 km/hr.

Therefore The correct answer is 20 km/hr.

Alternate Method

Given:

Initial speed (S1) = 10 km/hr

Initial time (T1) = 16 hours

New time (T2) = 8 hours

Formula Used:

Distance = Speed × Time

Speed = Distance ÷ Time

Total Distance = 160 km

Time = 16 hrs, Speed = 10 km/hr

Time = 8 hrs, Speed = ?

Calculations:

=> Distance covered initially = 10 × 16

=> Total Distance = 160 km

Now, the bus has to cover 160 km in 8 hours.

=> New Speed = 160 ÷ 8

=> New Speed = 20 km/hr

Therefore The correct answer is 20 km/hr.

Additional Information

Unit Conversion

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

Average Speed

Average Speed = Total Distance Covered ÷ Total Time Taken. If two equal distances are covered at speeds a and b, the average speed is given by 2ab ÷ (a + b).

Relative Speed

If two objects move in the same direction, Relative Speed = Difference of their speeds. If they move in opposite directions, Relative Speed = Sum of their speeds.

Q49. Answer: (a) Rs. 1,56,000

Shortcut Trick

Praveen's profit share = (5440 + 1360) ÷ 2 = &x20B9;3400

Hemant's profit share = 5440 − 3400 = &x20B9;2040

Profit ratio (Praveen : Hemant) = 3400 : 2040 = 5 : 3

Capital ratio = Profit ratio ÷ Time ratio = (5 ÷ 5) : (3 ÷ 6) = 1 : 0.5 = 2 : 1

Difference in capital ratio = 2 − 1 = 1 part = &x20B9;78,000

Praveen's capital = 2 parts = 2 × 78,000 = &x20B9;1,56,000

Therefore The correct answer is &x20B9;1,56,000.

Alternate Method

Given:

Total profit = &x20B9;5,440

Praveen's share − Hemant's share = &x20B9;1,360

Time invested by Praveen = 5 months

Time invested by Hemant = 6 months

Formula Used:

Profit Ratio = (Capital of A × Time of A) : (Capital of B × Time of B)

Praveen

Profit: Rs. 3400 (5 parts)

Time: 5 months

Capital Ratio = 5 ÷ 5 = 1

Hemant

Profit: Rs. 2040 (3 parts)

Time: 6 months

Capital Ratio = 3 ÷ 6 = 0.5

Capital Ratio (Praveen : Hemant) = 1 : 0.5 = 2 : 1

Praveen's Capital = 2 × Rs. 78,000 = Rs. 1,56,000

Calculations:

=> Let Hemant's profit be H and Praveen's profit be P.

=> P + H = 5440

=> P − H = 1360

=> Adding both equations: 2P = 6800 => P = &x20B9;3400

=> H = 5440 − 3400 = &x20B9;2040

=> Ratio of Profit = 3400 : 2040 = 5 : 3

=> Let Hemant's capital be x, then Praveen's capital = x + 78000

=> [(x + 78000) × 5] / [x × 6] = 5 / 3

=> (x + 78000) / x = (5 / 3) × (6 / 5)

=> (x + 78000) / x = 2

=> x + 78000 = 2x

=> x = 78000

=> Praveen's capital = x + 78000 = 78000 + 78000 = &x20B9;1,56,000

Therefore The correct answer is &x20B9;1,56,000.

Additional Information

Simple Partnership

When partners invest their capital for the same period of time, the profit is distributed in the direct ratio of their invested capitals.

Compound Partnership

When partners invest capital for different time periods, their profit ratio is calculated as the product of their capital and the respective time period (C1T1 : C2T2).

Working vs Sleeping Partner

A working partner manages the business and usually receives a fixed salary or percentage of profit before the remaining profit is distributed. A sleeping partner only invests capital.

Q50. Answer: (b) 15,675

Shortcut Trick

When Simple Interest is equal for two parts over the same time period, the ratio of principal amounts is P1 : P2 = R2 : R1.

Ratio of sum invested at 5% to 11% = 11 : 5

Total parts = 11 + 5 = 16 parts => 16 parts = Rs. 22,800

1 part = 22,800 ÷ 16 = Rs. 1,425

Sum invested at 5% (11 parts) = 11 × 1,425 = Rs. 15,675

Therefore The correct answer is Rs. 15,675.

Alternate Method

Given:

Total Investment = Rs. 22,800

Rate 1 (R1) = 5% p.a., Rate 2 (R2) = 11% p.a.

Time (T) = 4 years for both investments.

Simple Interest earned from both parts is equal.

Formula Used:

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

Total: Rs. 22,800

Part 1 (P1)

5% for 4 years

Part 2 (P2)

11% for 4 years

Equal Interest

Calculations:

Let the sum invested at 5% be P1 and at 11% be P2.

=> P1 + P2 = 22,800

Since the simple interest from both investments is equal:

=> (P1 × 5 × 4) ÷ 100 = (P2 × 11 × 4) ÷ 100

Canceling out common terms (4 and 100) from both sides:

=> 5 × P1 = 11 × P2

=> P1 ÷ P2 = 11 ÷ 5

This means P1 is 11 units and P2 is 5 units.

=> Total units = 11 + 5 = 16 units

=> 16 units = Rs. 22,800

=> 1 unit = 22,800 ÷ 16 = Rs. 1,425

We need the sum invested at 5% p.a. which is P1 (11 units):

=> P1 = 11 × 1,425 = 15,675

Therefore The correct answer is Rs. 15,675.

Additional Information

Case of Equal Interest

If a given sum is divided into multiple parts such that their simple interests are equal, the ratio of the principal parts will always be 1/(R1T1) : 1/(R2T2) : 1/(R3T3).

Case of Equal Amount

If a sum is divided into parts such that the final amount after simple interest is equal, the ratio of the parts is 1/(100 + R1T1) : 1/(100 + R2T2).

Simple vs Compound Interest Difference

For 2 years, the difference between Compound Interest and Simple Interest on a principal P is given by D = P(R ÷ 100)². For 3 years, the formula is D = P(R ÷ 100)² × (3 + R ÷ 100).

Q51. Answer: (a) csc θ + sec θ

Shortcut Trick

Put θ = 45° in the given expression. Since sin 45° = cos 45° = 1/√2, the first term completely becomes 0.

=> Expression = 0 + (1/√2) / (1 + 1/√2) + (1 + 1/√2) / (1/√2)

=> Expression = 1 / (√2 + 1) + (√2 + 1) / 1 = (√2 − 1) + √2 + 1 = 2√2.

Now check the options for θ = 45°:

=> Option 1: csc 45° + sec 45° = √2 + √2 = 2√2 (Matches!)

Therefore The correct answer is cscθ + secθ.

Alternate Method

Given:

[(sinθ − cosθ)(1 + tanθ + cotθ) / (1 + sinθcosθ)] + [sinθ / (1 + cosθ)] + [(1 + cosθ) / sinθ]

Calculations:

Solving the first part of the expression:

=> 1 + tanθ + cotθ = 1 + (sinθ / cosθ) + (cosθ / sinθ)

=> 1 + tanθ + cotθ = (sinθcosθ + sin²θ + cos²θ) / (sinθcosθ)

=> 1 + tanθ + cotθ = (sinθcosθ + 1) / (sinθcosθ) ... (Since sin²θ + cos²θ = 1)

=> First part = (sinθ − cosθ) × [(1 + sinθcosθ) / (sinθcosθ)] / (1 + sinθcosθ)

=> First part = (sinθ − cosθ) / (sinθcosθ) = (1 / cosθ) − (1 / sinθ) = secθ − cscθ

Solving the second part of the expression:

=> [sinθ / (1 + cosθ)] + [(1 + cosθ) / sinθ]

=> [sin²θ + (1 + cosθ)²] / [sinθ(1 + cosθ)]

=> [sin²θ + 1 + 2cosθ + cos²θ] / [sinθ(1 + cosθ)]

=> [(sin²θ + cos²θ) + 1 + 2cosθ] / [sinθ(1 + cosθ)]

=> [1 + 1 + 2cosθ] / [sinθ(1 + cosθ)]

=> [2 + 2cosθ] / [sinθ(1 + cosθ)] = 2(1 + cosθ) / [sinθ(1 + cosθ)]

=> Second part = 2 / sinθ = 2cscθ

Adding both parts:

=> Total = (secθ − cscθ) + 2cscθ

=> Total = cscθ + secθ

Therefore The correct answer is cscθ + secθ.

Additional Information

Core Trigonometric Identities

The foundational Pythagorean identities are: $\sin^2\theta + \cos^2\theta = 1$, $\sec^2\theta - \tan^2\theta = 1$, and $\csc^2\theta - \cot^2\theta = 1$.

Value Substitution Method

For multiple-choice trigonometric simplifications, substituting standard angles like 30°, 45° or 60° directly gives the numerical value. Choose angles that avoid undefined values like division by zero.

Base Conversion Technique

Converting complex ratios (tan, cot, sec, csc) to their base components (sin, cos) usually simplifies the expression and reveals hidden cancellations automatically.

Q52. Answer: (c) 13/9

Shortcut Trick

Solve the fraction inside the bracket: 1 + 2/7 = 9/7

Take the reciprocal for the middle term: 1 ÷ 9/7 = 7/9

Subtract the similar terms: 4/3 − 2/3 = 2/3

Add the remaining terms: 2/3 + 7/9 = 6/9 + 7/9 = 13/9

Therefore The correct answer is 13/9.

Alternate Method

Given:

Expression: 4/3 + [1 ÷ (1 + 2/7)] − 2/3

Method Used:

Follow the BODMAS rule to solve the brackets first, simplify the fraction, and then perform addition and subtraction.

Calculations:

=> Step 1: Simplify the term in the innermost denominator.

=> 1 + 2/7 = (7 + 2) / 7 = 9/7

=> Step 2: Substitute and simplify the middle term.

=> 1 ÷ (9/7) = 7/9

=> Step 3: Write the updated expression.

=> 4/3 + 7/9 − 2/3

=> Step 4: Group the fractions with the denominator 3.

=> (4/3 − 2/3) + 7/9

=> 2/3 + 7/9

=> Step 5: Make the denominators equal by finding the LCM of 3 and 9 (which is 9).

=> (2 × 3) / 9 + 7/9

=> 6/9 + 7/9 = 13/9

Therefore The correct answer is 13/9.

Additional Information

BODMAS Rule

BODMAS defines the mathematical order of operations: Brackets, Orders (powers/roots), Division, Multiplication, Addition, and Subtraction.

Reciprocal of a Fraction

The reciprocal of a fraction a/b is b/a. When 1 is divided by a fraction, the result is its reciprocal (1 ÷ a/b = b/a).

Addition and Subtraction of Fractions

Fractions can only be added or subtracted when they have a common denominator. The Least Common Multiple (LCM) of the denominators is used to find it.

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Q53. Answer: (d) 160

Shortcut Trick

The average of the first n even numbers is directly given by the formula: (n + 1).

Here, the total number of terms given is n = 159.

=> Average = 159 + 1 = 160.

Therefore The correct answer is 160.

Alternate Method

Given:

The sequence of the first 159 even numbers.

Formula Used:

Average of an Arithmetic Progression (AP) = (First Term + Last Term) ÷ 2

n^(th) term of an AP = a + (n − 1) × d

2

1st

4

2nd

6

3rd

...

318

159th

Average = (2 + 318) ÷ 2 = 160

Average of First 159 Even Numbers

Calculations:

=> The series of even numbers begins as: 2, 4, 6, 8,... up to 159 terms.

=> This forms an Arithmetic Progression where the first term (a) = 2 and common difference (d) = 2.

=> Let's find the 159^(th) term (which is the last term, l):

=> l = 2 + (159 − 1) × 2

=> l = 2 + 158 × 2

=> l = 2 + 316 = 318

=> Now, substitute the values into the AP average formula:

=> Average = (2 + 318) ÷ 2

=> Average = 320 ÷ 2 = 160

Therefore The correct answer is 160.

Additional Information

Average of First n Natural Numbers

The average of the first n natural numbers is mathematically given by (n + 1) ÷ 2.

Average of First n Odd Numbers

The average of the first n consecutive odd numbers starting from 1 is strictly equal to n.

Average of Consecutive Numbers

For any given sequence of consecutive numbers or terms in an Arithmetic Progression, Average = (First term + Last term) ÷ 2.

Average of Squares of First n Natural Numbers

The average of the squares is calculated using the formula (n + 1) × (2n + 1) ÷ 6.

Q54. Answer: (d) 8.42

Shortcut Trick

Using the power rule of indices directly:

(112^(0.57))^z = (112^(0.8))^6

0.57 × z = 0.8 × 6

0.57z = 4.8

z = 4.8 ÷ 0.57 = 480 ÷ 57 ≈ 8.42

Therefore The correct answer is 8.42.

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Alternate Method
Given:
x = 112^(0.57)
y = 112^(0.8)
x^z = y^6
Formula Used:
(a^m)^n = a^(mn)
If a^m = a^n, then m = n
Calculations:
=> Substitute the values of x and y into the third equation:
=> (112^(0.57))^z = (112^(0.8))^6
=> 112^(0.57z) = 112^(0.8 × 6)
=> 112^(0.57z) = 112^(4.8)
=> Since the bases are equal, the exponents must be equal:
=> 0.57z = 4.8
=> z = 4.8 ÷ 0.57
=> z = 480 ÷ 57
=> z = 160 ÷ 19
=> z ≈ 8.42
Therefore The correct answer is 8.42.
Additional Information
Product Rule of Indices
When multiplying expressions with the same base, add their exponents: a^m × a^n = a^(m+n).
Quotient Rule of Indices
When dividing expressions with the same base, subtract their exponents: a^m ÷ a^n = a^(m−n).
Power of a Power Rule
When raising a power to another power, multiply the exponents: (a^m)^n = a^(mn).
Equality Rule of Exponents
If two terms with the same base are equal, their exponents must also be equal: If a^m = a^n, then m = n.

Q55. Answer: (c) 40%

Shortcut Trick
For a Buy X get Y free scheme, the effective discount percentage is given directly by the formula:
Discount % = [Free Items ÷ Total Items] × 100
=> Discount % = [8 ÷ (12 + 8)] × 100
=> Discount % = (8 ÷ 20) × 100 = 40%
Therefore The correct answer is 40%.
Alternate Method
Given:
Items paid for = 12
Items received free = 8
Formula Used:
Effective Discount % = (Discount ÷ Marked Price) × 100
Total 20 Items
Paid Items (12)
SP = Rs. 12
Free Items (8)
Discount = Rs. 8
Total Marked Price (MP) = Rs. 20
Effective Discount = (8 ÷ 20) × 100 = 40%
Calculations:
=> Let the Marked Price (MP) of 1 item be Rs. 1.

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=> Total items taken by the customer = 12 + 8 = 20 items.

=> Total MP of 20 items = 20 × 1 = Rs. 20.

=> The customer pays only for 12 items.

=> Total Selling Price (SP) = 12 × 1 = Rs. 12.

=> Discount given = Total MP − SP = 20 − 12 = Rs. 8.

=> Effective Discount % = (8 ÷ 20) × 100

=> Effective Discount % = 40%

Therefore The correct answer is 40%.

Additional Information

Buy X Get Y Free Scheme

The total number of articles the customer gets is X + Y. The discount is essentially the marked price of the Y free articles. Effective Discount % = [Y ÷ (X + Y)] × 100.

Successive Discounts

When two discounts of a% and b% are given consecutively, the single equivalent discount is calculated using the formula: [a + b − (a × b ÷ 100)]%.

Marked Price & Cost Price Relation

The direct relationship between Cost Price (CP), Marked Price (MP), Profit (P%), and Discount (D%) is given by: MP ÷ CP = (100 + P) ÷ (100 − D).

Q56. Answer: (d) 32 hours

Shortcut Trick

Total time for P = 30 × (8/3) = 80 hrs, and for Q = 16 × (5/4) = 20 hrs.

Total capacity = LCM(80, 20) = 80 units => Eff(P) = +1, Eff(Q) = +4.

Work done by P and Q in 4 hours = 4 × (1 + 4) = 20 units.

R empties 20 units in 8 hrs => Eff(R) = −20 / 8 = −2.5 units/hr.

Combined efficiency (P + Q + R) = 1 + 4 − 2.5 = +2.5 units/hr.

Time taken by P, Q, and R together = 80 / 2.5 = 32 hours.

Therefore The correct answer is 32 hours.

Alternate Method

Given:

Pipe P fills 3/8 part in 30 hours.

Pipe Q fills 4/5 part in 16 hours.

Both P and Q were kept open for 4 hours.

Pipe R empties the filled water in 8 hours.

Formula Used:

Total Work = Efficiency × Time

Net Efficiency = Total Work ÷ Total Time

Calculations:

=> Total time taken by P to fill the empty tank = 30 × (8/3) = 80 hours.

=> Total time taken by Q to fill the empty tank = 16 × (5/4) = 20 hours.

Pipe	Hours	Total Work	Efficiency
P	80	80	1
Q	20	4	

=> Combined efficiency of P and Q = 1 + 4 = 5 units/hr.

=> Total units filled by P and Q in 4 hours = 4 × 5 = 20 units.

=> Pipe R empties these 20 units of water in 8 hours.

=> Efficiency of pipe R = −(20 ÷ 8) = −2.5 units/hr.

=> Net combined efficiency of P, Q, and R together = 1 + 4 − 2.5 = 2.5 units/hr.

=> Time taken to fill the empty tank by all three pipes = Total Work ÷ Net Efficiency

=> Time = 80 ÷ 2.5 = 32 hours.

Therefore The correct answer is 32 hours.

Additional Information

Pipes and Cisterns Basics

Filling pipes contribute positive work to the tank, whereas emptying pipes (or leaks) contribute negative work.

Combined Work Rule

The total capacity of a tank is generally taken as the LCM of the individual times. Time taken together = Total Capacity ÷ Net Efficiency.

Fractions in Work

If a pipe fills a/b part of a tank in T hours, it will fill the entire tank in T × (b/a) hours.

Q57. Answer: (d) 30

Shortcut Trick

For such age questions, verifying the options directly is the fastest method.

Let's test Option 4: Assume Father's age = 30 years.

Condition 1: 4 × Son + 30 = 46 => 4 × Son = 16 => Son = 4 years.

Condition 2: 2.8 × Father + Son = 2.8 × 30 + 4 = 84 + 4 = 88.

Since both conditions are perfectly satisfied, the assumption is correct.

Therefore The correct answer is 30 years.

Alternate Method

Given:

Let the son's age be S and the father's age be F.

Equation 1: 4S + F = 46

Equation 2: S + 2.8F = 88

Father's Age = 30

Son's Age = 4

Condition 1 (Sum = 46)

4 × 4 + 30 = 16 + 30 = 46

Condition 2 (Sum = 88)

2.8 × 30 + 4 = 84 + 4 = 88

Age Verification Diagram

Calculations:

=> From Equation 1, express F in terms of S: F = 46 − 4S

=> Substitute the value of F in Equation 2:

=> S + 2.8(46 − 4S) = 88

=> S + 128.8 − 11.2S = 88

=> 128.8 − 88 = 11.2S − S

=> 40.8 = 10.2S

=> S = 40.8 ÷ 10.2 = 4 years

=> Now, substitute the value of S back into F = 46 − 4S:

=> F = 46 − 4(4)

=> F = 46 − 16 = 30 years

Therefore The correct answer is 30 years.

Additional Information

Linear Equations in Two Variables

A system of two linear equations of the form ax + by = c and px + qy = r can be effectively solved using substitution or elimination methods.

Problems on Ages

In age-related problems, establish the present ages with variables. Relate conditions linearly to quickly form accurate equations.

Checking by Options

When options are provided for a specific variable, testing them in the given conditions is often significantly faster than performing lengthy algebraic steps.

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Q58. Answer: (a) 5%

Shortcut Trick

Volume of cylinder depends directly on $R^2 \times H$.

Multiplying factor for radius = 1 − 0.46 = 0.54 | Multiplying factor for height = 1 + 2.61 = 3.61

Overall multiplying factor for volume = $(0.54)^2 \times 3.61 = 0.2916 \times 3.61 = 1.052676$

Percentage increase = (1.052676 − 1) × 100% = 5.2676% ≈ 5%

Therefore The correct answer is 5%.

Alternate Method

Given:

Decrease in the radius of the base = 46%

Increase in the height = 261%

Formula Used:

Volume of a right circular cylinder $V = \pi r^2 h$

Original

Radius = r

Height = h

→

Change

New

r' = 0.54r

h' = 3.61h

Calculations:

=> Let the original radius be r and the original height be h.

=> Original Volume $V = \pi r^2 h$

=> New radius r' = r − (46 ÷ 100)r = 0.54r

=> New height h' = h + (261 ÷ 100)h = 3.61h

=> New Volume $V' = \pi(0.54r)^2(3.61h)$

=> $V' = \pi \times 0.2916r^2 \times 3.61h$

=> $V' = 1.052676\ \pi r^2 h = 1.052676\ V$

=> Percentage increase = [(V' − V) ÷ V] × 100

=> Percentage increase = [(1.052676 V − 1 V) ÷ 1 V] × 100

=> Percentage increase = 0.052676 × 100 = 5.2676%

=> Rounding to the closest integer, we get 5%.

Therefore The correct answer is 5%.

Additional Information

Successive Percentage Change

When a value undergoes multiple sequential percentage changes, the net percentage change for two successive changes A% and B% is given by the formula: A + B + (A × B) ÷ 100.

Volume Change Dependence

For any solid where Volume prop. to r^2h, the effect of percentage change in the radius is squared. Thus, a change in radius acts as two identical successive changes, followed by the change in height.

Curved Surface Area (CSA)

The CSA of a cylinder is $2\pi rh$. The percentage change in the CSA is obtained by a single successive combination of the percentage changes in radius and height.

Q59. Answer: (c) Rs. 1,16,000

Shortcut Trick

Net percentage increase = a + b + (a × b) ÷ 100

Net increase = 4 + 25 + (4 × 25) ÷ 100 = 29 + 1 = 30%

This means the current sales are 130% of the initial sales.

Initial sales = 1,50,800 × (100 ÷ 130) = 1,16,000

Therefore The correct answer is Rs. 1,16,000.

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Alternate Method

Given:

Increase in 1^(st) year = 4%

Increase in 2^(nd) year = 25%

Current sales (Final Value) = Rs. 1,50,800

Initial (x)

• 4%

1.04x

• 25%

1,50,800

Formula Used:

Final Value = Initial Value × (1 + R1/100) × (1 + R2/100)

Calculation:

=> Let the initial sales two years ago be x.

=> 1,50,800 = x × (1 + 4/100) × (1 + 25/100)

=> 1,50,800 = x × (104/100) × (125/100)

=> 1,50,800 = x × (26/25) × (5/4)

=> 1,50,800 = x × (130/100)

=> 1,50,800 = x × (13/10)

=> x = (1,50,800 × 10) ÷ 13

=> x = 11,600 × 10

=> x = 1,16,000

Therefore The correct answer is Rs. 1,16,000.

Additional Information

Successive Percentage Change

When a value is changed by a% and then by b%, the net percentage change is given by the formula: Net Change = a + b + (a × b) ÷ 100.

Population Growth

If the population increases by R% per year, the population after n years is given by: $P_n = P0 \times (1 + R/100)^n$.

Depreciation

If the value of an asset decreases by R% per year, its value after n years is given by: $V_n = V0 \times (1 - R/100)^n$.

Q60. Answer: (c) 16

Shortcut Trick

The mode is simply the value that appears most frequently in the dataset.

In the given data: 20, 16, 16, 19, 16, 12, 19, 10, 14, 18

The number 16 appears 3 times, which is the highest frequency among all the numbers.

Therefore The correct answer is 16 marks.

Alternate Method

Given:

Marks of 10 students: 20, 16, 16, 19, 16, 12, 19, 10, 14, 18

Formula Used:

Mode = The observation with the highest frequency in a given set of data.

Calculations:

=> Let us arrange the given marks in ascending order to easily count their frequencies.

=> Sorted data: 10, 12, 14, 16, 16, 16, 18, 19, 19, 20

=> Frequency of 10 = 1

=> Frequency of 12 = 1

=> Frequency of 14 = 1

=> Frequency of 16 = 3

=> Frequency of 18 = 1

=> Frequency of 19 = 2

=> Frequency of 20 = 1

=> The mark 16 has the maximum frequency of 3.

Therefore The correct answer is 16 marks.

Additional Information

Mean

The mean is the average of the dataset. Formula: Mean = Sum of all observations ÷ Total number of observations.

Median

The median is the middlemost value of the sorted data. If n is even, Median = Average of (n/2)^(th) and (n/2 + 1)^(th) terms.

Empirical Relationship

The statistical relationship between the three measures of central tendency is: Mode = 3 × Median − 2 × Mean.

Bimodal and Multimodal Data

A dataset with exactly two modes is called bimodal, while a dataset with more than two modes is called multimodal.

Q61. Answer: (b) 20.88%

Shortcut Trick

When two successive discounts of x% and y% are given, the total equivalent discount percentage can be found directly using the successive discount formula:

Equivalent Discount = x + y − (x × y) ÷ 100

Substitute the given values (x = 14 and y = 8):

Equivalent Discount = 14 + 8 − (14 × 8) ÷ 100

Equivalent Discount = 22 − 1.12 = 20.88%

Therefore The correct answer is 20.88%.

Alternate Method

Given:

First discount = 14%

Second discount = 8%

Note: The total percentage discount is independent of the actual Marked Price (Rs. 78,000).

Successive Discount Equivalent

MP = 100

SP1 = 86

SP2 = 79.12

− 14%

− 8%

Total Equivalent Discount = 20.88%

Calculations:

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

=> The first discount of 14% is applied on the base of 100.

=> Selling Price after 1st discount (SP1) = 100 − (14% of 100) = 100 − 14 = 86

=> The second discount of 8% is applied on the new price of 86.

=> Selling Price after 2nd discount (SP2) = 86 − (8% of 86)

=> SP2 = 86 − 6.88 = 79.12

=> Total Discount Amount = Initial MP − Final Selling Price

=> Total Discount Amount = 100 − 79.12 = 20.88 units

=> Since our base Marked Price is 100, the discount percentage is equal to the discount units directly.

=> Total Discount Percentage = 20.88%

Therefore The correct answer is 20.88%.

Additional Information

Successive Discounts Concept

When multiple discounts are applied one after another on the marked price, they are called successive discounts. The equivalent single discount is always less than the simple sum of individual discounts because subsequent percentages are applied on a reduced base price.

Base Independence

Whenever a question asks for a percentage change or an equivalent discount percentage, the initial actual value (like Rs. 78,000) does not need to be used. Assuming the initial value as 100 always makes the calculations faster and less error-prone.

Multiplier Method for Successive Changes

The final value after applying successive discounts can be found using multiplying factors in a single chain: Final Value = Initial Value × (1 − x/100) × (1 − y/100).

Q62. Answer: (b) 22.5°

Shortcut Trick

Sum of interior angles of a regular polygon = (n − 2) × 180°

=> 180° × (n − 2) = 2520° => n − 2 = 14 => n = 16

Each exterior angle = 360° ÷ n

=> Exterior angle = 360° ÷ 16 = 22.5°

Therefore The correct answer is 22.5°.

Alternate Method

Given:

The sum of the measures of all interior angles of a regular polygon = 2520°

Formula Used:

Sum of interior angles of a polygon = (n − 2) × 180°

Each exterior angle of a regular polygon = 360° ÷ n

Interior Angle

157.5°

Exterior Angle

22.5°

Polygon Vertex

Exterior Angle + Interior Angle = 180°

Calculations:

=> (n − 2) × 180° = 2520°

=> n − 2 = 2520 ÷ 180

=> n − 2 = 14

=> n = 16

So, the regular polygon has 16 sides.

Now, calculate the exterior angle:

=> Exterior angle = 360° ÷ n

=> Exterior angle = 360° ÷ 16

=> Exterior angle = 22.5°

Therefore The correct answer is 22.5°.

Additional Information

Interior and Exterior Angles Relation

For any convex polygon, the sum of an interior angle and its adjacent exterior angle on the same vertex is exactly 180°.

Sum of Exterior Angles

The sum of all exterior angles of any simple convex polygon is always equal to 360°, regardless of how many sides the polygon has.

Number of Diagonals

The total number of diagonals in a polygon with n sides can be calculated using the direct formula: n(n − 3) ÷ 2.

Q63. Answer: (b) 228

Shortcut Trick

Total ratio parts = 2 + 12 + 11 = 25 parts.

Value of 25 parts = Rs. 570.

Required ratio difference (Largest − Smallest) = 12 − 2 = 10 parts.

Difference in amount = (570 ÷ 25) × 10 = 22.8 × 10 = 228.

Therefore The correct answer is Rs. 228.

Alternate Method

Given:

Total amount to be distributed = Rs. 570

Ratio of distribution = 2 : 12 : 11

Total Amount = Rs. 570 (25x)

2x

12x

11x

Largest Share = 12x | Smallest Share = 2x

Difference = 12x − 2x = 10x

Required Difference = 10 × (570 ÷ 25) = Rs. 228

Calculations:

Let the shares of the three persons be 2x, 12x, and 11x respectively.

=> Total amount = 2x + 12x + 11x = 25x

=> 25x = 570

=> x = 570 ÷ 25 = 22.8

=> Largest share = 12x

=> Smallest share = 2x

=> Difference = 12x − 2x = 10x

=> Required Difference = 10 × 22.8 = 228

Therefore The correct answer is Rs. 228.

Additional Information

Dividing a Quantity

If a given quantity Q is divided into multiple parts in the ratio a : b : c, then the individual portions are (a/T)×Q, (b/T)×Q, and (c/T)×Q respectively, where T is the total ratio sum (a + b + c).

Proportion Rule

When two ratios are strictly equal, they form a proportion (a : b = c : d). A key property of proportions is that the product of extremes equals the product of means (ad = bc).

Compound Ratio

The compound ratio of two individual given ratios a : b and c : d is calculated by multiplying the antecedents and consequents respectively, resulting in ac : bd.

Q64. Answer: (d) 314 cm²

Shortcut Trick

Surface Area of a sphere = 4 × π × r²

Here, r = 5 cm, which gives r² = 25.

By pairing numbers logically, we see that 4 × 25 = 100.

Surface Area = 100 × 3.14 = 314.

Therefore The correct answer is 314 cm².

Alternate Method

Given:

Radius of the sphere (r) = 5 cm

Value of π = 3.14

r = 5 cm

Sphere Surface Area = 4πr²

Formula Used:

Surface Area of a sphere = 4 × π × r²

Calculations:

=> Surface Area = 4 × 3.14 × (5)²

=> Surface Area = 4 × 3.14 × 25

=> Surface Area = (4 × 25) × 3.14

=> Surface Area = 100 × 3.14

=> Surface Area = 314 cm²

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Therefore The correct answer is 314 cm².

Additional Information

Volume of a Sphere

The total 3D space enclosed by a sphere is given by Volume = (4 ÷ 3) × π × r³.

Curved Surface Area of a Hemisphere

When a sphere is cut exactly in half, the curved (bowl) surface area is exactly half of the sphere's total area: CSA = 2 × π × r².

Total Surface Area of a Hemisphere

The total surface area of a hemisphere includes both the curved part and the flat circular base: TSA = 3 × π × r².

Q65. Answer: (b) 45 years

Shortcut Trick

If a sum becomes x times in T years at compound interest, it becomes x^n times in n × T years.

Given: The sum becomes 3 times in 15 years.

We need the sum to become 27 times, which is 3^3 times of itself.

Comparing the powers, we get n = 3.

Required time = 3 × 15 = 45 years.

Therefore The correct answer is 45 years.

Alternate Method

Given:

Time (T1) = 15 years

Amount (A1) = 3P (where P is the Principal)

Target Amount (A2) = 27P

Formula Used:

Amount = P(1 + R/100)^T

0 yrs

P

15 yrs

3P

30 yrs

9P

45 yrs

27P

×3

×3

×3

Total Time = 15 + 15 + 15 = 45 years

Calculation:

=> 3P = P(1 + R/100)^(15)

=> 3 = (1 + R/100)^(15) --- (Equation 1)

Let the time taken to amount to 27 times be T years.

=> 27P = P(1 + R/100)^T

=> 27 = (1 + R/100)^T

=> 3^3 = (1 + R/100)^T

Substituting the value of 3 from Equation 1 into the above expression:

=> [(1 + R/100)^(15)]³ = (1 + R/100)^T

=> (1 + R/100)^(45) = (1 + R/100)^T

Comparing the exponents on both sides, we get:

=> T = 45

Therefore The correct answer is 45 years.

Additional Information

Simple Interest Rule of Multiples

If a sum becomes 'x' times in T years at simple interest, it will become 'y' times in T × (y − 1) ÷ (x − 1) years. (Notice how this

differs from compound interest).

Effective Compound Interest Rate

For a 2-year period at rate R%, the effective compound interest rate can be calculated using successive percentage change: 2R + (R² ÷ 100)%.

Half-Yearly & Quarterly Compounding

If interest is compounded half-yearly, the Rate becomes R/2 and Time becomes 2T. If it is compounded quarterly, the Rate becomes R/4 and Time becomes 4T.

Q66. Answer: (b) 500

Shortcut Trick

Let original CP = 100%, then original SP = 157% (for 57% profit).

New CP = 100% + 20

New SP = 157% − 18

New SP = New CP × 1.475 (for 47.5% new profit)

157% − 18 = 147.5% + 29.5 => 9.5% = 47.5 => 1% = 5 => 100% = 500

Therefore The correct answer is Rs. 500.

Alternate Method

Given:

Initial profit = 57%

Increase in Cost Price = Rs. 20

Decrease in Selling Price = Rs. 18

New profit = 47.5%

Formula Used:

Selling Price (SP) = Cost Price (CP) × (100 + Profit%) ÷ 100

CP = 100x SP = 157x 57% Profit New CP = 100x + 20 New SP = 157x - 18 47.5% Profit +20 -18

Calculations:

=> Let the original cost price be 100x.

=> Original selling price = 100x × 1.57 = 157x

=> New cost price = 100x + 20

=> New selling price = 157x − 18

=> Given new profit is 47.5%, so New SP = New CP × 1.475

=> 157x − 18 = (100x + 20) × 1.475

=> 157x − 18 = 147.5x + 29.5

=> 157x − 147.5x = 29.5 + 18

=> 9.5x = 47.5

=> x = 47.5 ÷ 9.5 = 5

=> Original cost price = 100x = 100 × 5 = 500

Therefore The correct answer is Rs. 500.

Additional Information

Profit and Loss Basics

Profit occurs when Selling Price (SP) > Cost Price (CP). Formula: Profit = SP − CP. Loss occurs when CP > SP. Formula: Loss = CP − SP.

Profit Percentage

Profit percentage is always calculated on the Cost Price (CP) unless stated otherwise. Formula: Profit % = (Profit ÷ CP) × 100.

Marked Price and Discount

Discount is offered on the Marked Price (MP). Formula: Selling Price (SP) = MP − Discount. Discount % = (Discount ÷ MP) × 100.

Q67. Answer: (a) 2256.25

Shortcut Trick

If a number is increased by 60%, it becomes 160% of itself.

Given that 160% of the number = 3610

Original Number = 3610 × (100 / 160)

Original Number = 36100 ÷ 16 = 2256.25

Therefore The correct answer is 2256.25.

Alternate Method

Original Number (100%)

Increase (+60%)

Final Value (160%) = 3610

? (To Find)

Given:

A number, when increased by 60%, gives 3610.

Formula Used:

Final Value = Original Number × (1 + Percentage Increase / 100)

Calculations:

=> Let the original number be x.

=> Final Value = x + 60% of x

=> 3610 = x × (1 + 60 / 100)

=> 3610 = x × (160 / 100)

=> 3610 = x × (8 / 5)

=> x = (3610 × 5) ÷ 8

=> x = 18050 ÷ 8

=> x = 2256.25

Therefore The correct answer is 2256.25.

Additional Information

Percentage Change

Percentage change is always calculated as: ((New Value − Original Value) ÷ Original Value) × 100.

Base of Percentage

When a specific quantity is systematically increased or decreased, the original unknown quantity is always considered as the base value (100%).

Multiplying Factor Method

For a direct percentage increase of R%, the multiplying factor is directly written as (1 + R/100). Similarly, for a decrease of R%, it is (1 − R/100).

Q68. Answer: (c) Rs. 42.20

Shortcut Trick

Total cost price (CP) of the tube lights = Rs. 88

Remaining tube lights to be sold = 88 − 46 = 42

Total selling price (SP) of remaining lights = 42 × 3.10 = Rs. 130.20

Profit = SP − CP = 130.20 − 88 = Rs. 42.20

Therefore The correct answer is Rs. 42.20.

Alternate Method

Given:

Total tube lights purchased = 88

Total Cost Price (CP) = Rs. 88

Number of broken tube lights = 46

Selling Price (SP) of 1 remaining tube light = Rs. 3.10

Formula Used:

Profit = Total Selling Price (SP) − Total Cost Price (CP)

CP = Rs. 88

42 remaining

@ Rs. 3.10 each

(46 broken)

SP = Rs. 130.20

Profit = Rs. 42.20

Calculations:

=> Number of tube lights left for sale = 88 − 46 = 42

=> Total SP = 42 × 3.10

=> Total SP = Rs. 130.20

=> Profit = 130.20 − 88

=> Profit = Rs. 42.20

Therefore The correct answer is Rs. 42.20.

Additional Information

Profit

Profit occurs when the Selling Price (SP) of an item is greater than its Cost Price (CP). The formula is Profit = SP − CP.

Loss

Loss occurs when the Cost Price (CP) is greater than the Selling Price (SP). The formula is Loss = CP − SP.

Profit / Loss Percentage

Profit or loss percentage is always calculated based on the total Cost Price. Formula: Profit% = (Profit ÷ CP) × 100.

Q69. Answer: (c) −61x + 79

Shortcut Trick

Solve term by term mentally to save time.

x^2 terms: 2 × (3/2) − 3 × 1 = 3 − 3 = 0

x terms: 2 × (−20) − 3 × 7 = −40 − 21 = −61x

Constants: 2 × 17 − 3 × (−15) = 34 + 45 = 79

Combining the results gives the simplified expression: −61x + 79

Therefore The correct answer is −61x + 79.

Alternate Method

Given:

$2((3/2)x^2 − 20x + 17) − 3(x^2 + 7x − 15)$

Calculations:

=> Expand the brackets by distributing the numbers outside:

=> $[2 × (3/2)x^2 − 2 × 20x + 2 × 17] − [3 × x^2 + 3 × 7x − 3 × 15]$

=> $(3x^2 − 40x + 34) − (3x^2 + 21x − 45)$

=> Remove the brackets and change the signs for the second part:

=> $3x^2 − 40x + 34 − 3x^2 − 21x + 45$

=> Group the like terms together:

=> $(3x^2 − 3x^2) + (−40x − 21x) + (34 + 45)$

=> $0x^2 − 61x + 79$

=> −61x + 79

Therefore The correct answer is −61x + 79.

Additional Information

Distributive Property

The rule a(b + c) = ab + ac allows us to expand brackets correctly by multiplying each inner term by the outer term.

Like Terms in Algebra

Terms that have the exact same variables and exponents can be combined through addition or subtraction (e.g., $3x^2$ and $−3x^2$).

BODMAS Rule

It stands for Brackets, Orders, Division, Multiplication, Addition, and Subtraction. It dictates the correct sequence for simplifying expressions to avoid calculation errors.

Q70. Answer: (a) 11

Shortcut Trick

The unit digit of the given number 393064111 is 1.

A number ending in 1 is odd, so it cannot be divided by an even number like 10 or 14.

Also, it cannot be divided by 15, as that strictly requires a unit digit of 0 or 5.

Thus, by simple elimination of options, the number must be divisible by 11.

Therefore The correct answer is 11.

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Alternate Method

Given:

Number = 393064111

Formula Used:

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

Calculations:

=> Let's find the sum of digits at odd places (from right to left):

=> Sum = 1 + 1 + 6 + 3 + 3 = 14

=> Let's find the sum of digits at even places (from right to left):

=> Sum = 1 + 4 + 0 + 9 = 14

=> Difference = Sum of odd places − Sum of even places

=> Difference = 14 − 14 = 0

=> Since the difference is 0, the number 393064111 is exactly divisible by 11.

=> Verifying other options:

=> 10: Fails, as the last digit is not 0.

=> 14: Fails, as the number is odd and not divisible by 2.

=> 15: Fails, as the last digit is neither 0 nor 5.

Therefore The correct answer is 11.

Additional Information

Combined Divisibility Rule of 7, 11, and 13

Make blocks of 3 digits from right to left. Find the difference between the sum of alternate blocks. If the resulting difference is divisible by 7, 11, or 13, the entire number is divisible by that respective number.

Divisibility Rule of 9

A number is divisible by 9 if the sum of all its digits is a multiple of 9.

Divisibility Rule of 12

A number is divisible by 12 if it satisfies the divisibility rules for both 3 and 4.

Q71. Answer: (c) Neither conclusion (I) nor (II) follows.

Given Statements:

All bricks are spoons.

No brick is a game.

The least possible Venn diagram for the given statement is:

Conclusions:

I) Some games are spoons:

Statement 1 and Statement 2 do not provide any direct information about the relationship between games and spoons.

There is no guarantee that some spoons are games. The statements do not suggest any connection between games and spoons.

Therefore, Conclusion (I) does not logically follow.

II) All spoons are games:

From Statement 1, we know all bricks are spoons. But from Statement 2, we know that no brick is a game. This means that not all spoons can be games because bricks, which are a subset of spoons, are not games.

Hence, Conclusion (II) does not logically follow either.

Thus, Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 3".

Q72. Answer: (d) Both conclusions (I) and (II) follow

Given Statements:

Some orchids are cacti.

No cactus is a marigold.

The least possible Venn diagram for the given statement is:

Conclusions:

(I) No marigold is a cactus:

From Statement 2, it is explicitly stated that no cactus is a marigold. This directly supports Conclusion (I).

Therefore, Conclusion (I) logically follows.

(II) Some cacti are orchids:

From Statement 1, it is clearly stated that some orchids are cacti. This means that there is an overlap between orchids and cacti.

Therefore, Conclusion (II) logically follows.

Thus, Both conclusions (I) and (II) follow

Hence, the correct answer is "Option 4".

Q73. Answer: (c) 41 D 13 B 3 C 35 A 5

BODMAS Table:

Given: Symbol meanings: A = ÷ and B = × and C = + and D = −then:

Option 1) 41 C 13 B 3 A 35 D 5

= 41 + 13 × 3 ÷ 35 − 5

Step 1 (× and ÷ first):

13 × 3 = 39

39 ÷ 35 = 1.114…

Expression becomes:

41 + 1.114 − 5 = 37.114 (not 9)

Option 2) 41 B 13 C 3 D 35 A 5

= 41 × 13 + 3 − 35 ÷ 5

Step 1:

41 × 13 = 533

35 ÷ 5 = 7

Expression becomes:

533 + 3 − 7 = 529 (not 9)

Option 3) 1 D 13 B 3 C 35 A 5

= 41 − 13 × 3 + 35 ÷ 5

Step 1:

13 × 3 = 39

35 ÷ 5 = 7

Expression becomes:

41 − 39 + 7

Now left to right:

41 − 39 = 2

2 + 7 = 9

Option 4) 41 A 13 C 3 B 35 D 5

= 41 ÷ 13 + 3 × 35 − 5

Step 1:

41 ÷ 13 = 3.153…

3 × 35 = 105

Expression becomes:

3.153 + 105 − 5 = 103.153 (not 9)

Hence, the correct answer is "Option 3".

Q74. Answer: (b) E

Given: Seven boxes, A, B, C, D, E, F and G, are kept one over the other but not necessarily in the same order.

1) Only two boxes are kept below B.

2) Only one box is kept above F.

3) Only one box is kept between F and D.

4) A is kept immediately above G.

5) C is kept at some place below E.

E

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F
C
D
B
A
G

So, 'E' is kept at the top.

Hence, the correct answer is "Option 1".

Q75. Answer: (a) One

Given: H, I, J, P, Q, R and S are sitting around a circular table facing the centre of the table.

1) Q sits to the immediate right of J.

2) Only three people sit between Q and S when counted from the left of Q.

3) Only three people sit between J and H.

4) P sits to the immediate right of R.

Here, One person sit between J and R when counted from the right of R.

Hence, the correct answer is "Option 1".

Q76. Answer: (a) 10

Given numbers: 9823415

Digits: 9, 8, 2, 3, 4, 1, 5

Sorted → 1, 2, 3, 4, 5, 8, 9

Second from the left: 2

Second from the right: 8

So, Sum = 2 + 8 = 10

Hence, the correct answer is 'Option 1'.

Q77. Answer: (b) 7

The logic followed here is:

‘GETS’ is coded as ‘8106’

G	E	T	S
8	1	0	6

‘EGIS’ is coded as ‘0167’

E	G	I	S
0	1	6	7

The third letter in EGIS is I, and the third digit in 0167 is 6.

So, I = 6.

Hence, the correct answer is 'Option 2'.

Q78. Answer: (c) Husband's brother's wife

Family Chart:

Decoding the Symbols:

Symbol	#	%	=	¥
Meaning	Brother	Daughter	Wife	Father

Given: D = O # M ¥ E % S

It means:

D is the Wife of O.

O is the Brother of M.

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M is the Father of E.
E is the Daughter of S.
So, D is the 'Husband's brother's wife' of S.
Hence, the correct answer is "Option 3".

Q79. Answer: (b) KAL

The logic followed here is:
So, 'KAL' will replace the question mark in the given series.
Hence, the correct answer is "Option 2".

Q80. Answer: (a) BANG - BGNA - GNAB

Now,
LOPE - LEPO - EPOL
QUIT - QTIU - TIUQ
Let's check each Option One by One.
Option 1) BANG - BGNA - GNAB

B	A	N	G
1	2	3	4
B	G	N	A
1	4	3	2
G	N	A	B
4	3	2	1

Option 2) SLOP - SLPO - LOPS

S	L	O	P
1	2	3	4
S	L	P	O
1	2	4	3
L	O	P	S
2	3	4	1

Option 3) FILE - IFLE - EILF

F	I	L	E
1	2	3	4
I	F	L	E
2	1	3	4
E	I	L	F
4	2	3	1

Option 4) WAST - WSAT - TSAW

W	A	S	T
1	2	3	4
W	S	A	T
1	3	2	4
T	S	A	W
4	3	2	1

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So, Only BANG - BGNA - GNAB follows the pattern of given letter cluster.
Hence, the correct answer is 'Option 1'.

Q81. Answer: (d) 159

The logic followed here is:
thus, "159" will replace the question mark in the given series.
Hence, the correct option is "Option 4".

Q82. Answer: (d) LQN

The logic followed here is:
Option 1) GLH
Option 2) EJF
Option 3) NSO
Option 4) LQN
Here, 'LQN' is odd among the given options.
Hence, the correct answer is "Option 4".

Q83. Answer: (d) Two

Given numbers: 4268953
If 1 is added to each even digit and 2 is subtracted from each odd digit in the number, we get
New number: 5, 3, 7, 9, 7, 3, 1
Digits that appear more than once: 3 and 7 (each appears twice) — that's 2 digits.
Hence, the correct answer is 'Option 4'.

Q84. Answer: (d) 99

The logic followed here is:
thus, "99" will replace the question mark in the given series.
Hence, the correct option is "Option 4".

Q85. Answer: (d) 15 km

Given:
Sunil starts from Point A and travels 8 km towards north,
turns left and travels 6 km,
and then turns right and covers another 7 km.
He then turns right and travels another 6 km.
So, He is at 15 km distance from Point A.
Hence, the correct answer is "Option 4".

Q86. Answer: (a) East

Given:
Ramu ran 60 km towards the west,
turned left and ran 15 km.
He then turned left and ran 40 km.
So, Ramu is facing East at the end.
Hence, the correct answer is "Option 1".

Q87. Answer: (a) GE−BC

The logic followed here is:
Option 1) GE−BC
Option 2) TR−PN
Option 3) RP−NL
Option 4) WU−SQ
Here, 'GE−BC' is odd among the given options.
Hence, the correct answer is "Option 1".

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Q88. Answer: (c) 1

Given: (Left) & 8 5 @ 1 £ 3 % 6 2 Ω # * 4 7 + $ 9 (Right)
Now,
Remove symbols — digits left to right: 8, 5, 1, 3, 6, 2, 4, 7, 9.
Counting from the right:
1st = 9, 2nd = 7, 3rd = 4, 4th = 2, 5th = 6, 6th = 3, 7th = 1.
So, the 7th from the right is 1.
Hence, the correct answer is 'Option 1'.

Q89. Answer: (b) 1

Given: (Left) 9 # % 2 ^ @ 3 & 1 $ 5 Ω 7 % # 6 * £ 5 (Right)
Now,
Drop all symbols — the digit sequence (left to right) is: 9, 2, 3, 1, 5, 7, 6, 5.
Count fifth from the right:
Rightmost → 5 (1st), 6 (2nd), 7 (3rd), 5 (4th), 1 (5th).
Thus, 1 is fifth from the right.
Hence, the correct answer is 'Option 2'.

Q90. Answer: (c) MRU59

The logic followed here is:
So, 'MRU59' will replace the question mark in the given series.
Hence, the correct answer is "Option 3".

Q91. Answer: (d) NU-PW-SV

Now,
HO-JQ-MP
H(8)→J(10) : +2, J(10)→M(13) : +3 → first-letter shifts are +2 then +3
O(15)→Q(17) : +2, Q(17)→P(16) : −1 → second-letter shifts are +2 then −1
KR-MT-PS
K(11)→M(13) : +2, M(13)→P(16) : +3
R(18)→T(20) : +2, T(20)→S(19) : −1
Let's check each Option One by One.
Option 1) NU-PW-RV
N(14) → P(16) : +2
P(16) → R(18) : +2 (expected +3)
Second letters: U(21) → W(23) : +2
W(23) → V(22) : −1
Result: first-letter steps are +2 then +2, not +2 then +3 → does not match.
Option 2) MU-PW-RV
M(13) → P(16) : +3 (expected +2 first)
P(16) → R(18) : +2 (expected +3 second)
Second letters: U(21) → W(23) : +2
W(23) → V(22) : −1
Result: first-letter increments are +3 then +2 (wrong order) → does not match.
Option 3) MU-OW-SV
M(13) → O(15) : +2
O(15) → S(19) : +4 (expected +3)
Second letters: U(21) → W(23) : +2
W(23) → V(22) : −1
Result: first-letter second step is +4 instead of +3 → does not match.
Option 4) NU-PW-SV
N(14) → P(16) : +2
P(16) → S(19) : +3

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Second letters: U(21) → W(23) : +2
W(23) → V(22) : −1
Result: matches both required patterns exactly.
So, Only NU-PW-SV follows the pattern of given letter cluster.
Hence, the correct answer is 'Option 4'.

Q92. Answer: (a) 82

The logic followed here is:
thus, "82" will replace the question mark in the given series.
Hence, the correct option is "Option 1".

Q93. Answer: (d) 24^(th)

The logic followed here is:
Given: Total number of people = 59
Bela sits 20th from the left end.
Ajeet sits 16th to the right of Bela.
Ajeet sits 16th to the right of Bela, so his position from the left is:
20 + 16 = 36th from the left.
To find his position from the right:
Position from right = 59 − 36 + 1 = 24
So, Ajeet is 24th from the right end of the line.
Hence, the correct answer is 'Option 4'.

Q94. Answer: (b) ni

The logic followed here is:
‘she has guts’ is coded as ‘bs kr ni’
‘packet has gone’ is coded as ‘ud ni gy’
Common word in both phrases is has.
Common code in both code-strings is ni.
Therefore, has = ni.
Hence, the correct answer is 'Option 2'.

Q95. Answer: (d) 29

BODMAS Table:
Given equation: 11 − 2 × 48 + 6 ÷ 15 = ?
Now, if ‘+’ and ‘-‘ and ‘×' and '÷’ are interchanged, then:
=> 11 × 2 − 48 ÷ 6 + 15 = ?
=> 22 − 8 + 15 = ?
=>14 + 15 = 29
Hence, the correct answer is "Option 4".

Q96. Answer: (b) FROG - RFOG - GRFO

Now,
JUNE - UJNE - EUJN
LAPS - ALPS - SALP
Let's check each Option One by One.
Option 1) BUGS - UBGS - SUGB

B	U	G	S
1	2	3	4
U	B	G	S
2	1	3	4
S	U	G	B

4	2	3	1

Option 2) FROG - RFOG - GRFO

F	R	O	G
1	2	3	4
R	F	O	G
2	1	3	4
G	R	F	O
4	2	1	3

Option 3) LOST - OLST - OSTL

L	O	S	T
1	2	3	4
O	L	S	T
2	1	3	4
O	S	T	L
2	3	4	1

Option 4) MOVE - MVOE - EVOM

M	O	V	E
1	2	3	4
M	V	O	E
1	3	2	4
E	V	O	M
4	3	2	1

So, Only FROG - RFOG - GRFO follows the pattern of given letter cluster.

Hence, the correct answer is 'Option 2'.

Q97. Answer: (c) 43

The logic followed here is:

Kunal's rank from the top = 29th

Kunal's rank from the bottom = 15th

Total students = Rank from top + Rank from bottom − 1

So, Total students = 29 + 15 − 1 = 43

Hence, the correct answer is 'Option 3'.

Q98. Answer: (c) Two

The Correct Ans is C

Q99. Answer: (d) (24, 84, 18)

The logic followed here is:

Logic: 3rd number = (2nd number ÷ 1st number) x 6.

(26, 96, 22)

=> 96 ÷ 26 ≈ 3.69

3.69 × 6 ≈ 22

(46, 108, 8)

=> 108 ÷ 46 ≈ 2.35

2.35 × 6 ≈ 8

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Now, checking the options:
Option 1) (7, 15, 1)
=> 15 ÷ 7 × 6 ≈ 12.85 ≠ 1
Option 2) (1, 39, 19)
=> 39 ÷ 1 × 6 = 234 ≠ 19
Option 3) (30, 63, 2)
=> 63 ÷ 30 × 6 = 12.6 ≠ 2
Option 4) (24, 84, 18)
=> 84 ÷ 24 × 6 = 21 which is nearest to 18
Hence, the correct option is "Option 4"

Q100. Answer: (c) KM-NO

The logic followed here is:
Option 1) CE-FH
Option 2) SU-VX
Option 3) KM-NO
Option 4)AC-DF
Here, 'KM-NO' is odd among the given options.
Hence, the correct answer is "Option 3".

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