RRB NTPC (UG) CBT-I Official Paper (Held On 17 Jun, 2026 Shift 1) (Previous Year Paper)

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

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MATHEMATICS

Q1. The diagonals of a rhombus are in the ratio 3 : 4. If the length of each side of the rhombus is 12.5 units, what is the length of the shorter diagonal?

(a) 15 units
(b) 20 units
(c) 12 units
(d) 18 units

Q2. The value of {18 + [24 ÷ (3 of 2)] × 4} − 10 is equal to:

(a) 24
(b) 28
(c) 72
(d) 40

Q3. If 2cotA = 4, find the value of $(\text{cosec}^2 A + 1)/(\text{cosec}^2 A - 1)$

(a) 4
(b) 1.5
(c) 2.5
(d) 1

Q4. In a class, the ratio of students who passed to those who failed is 11:2. If 44 students failed, what is the total number of students in the class?

(a) 286
(b) 280
(c) 284
(d) 282

Q5. If the ratio of two numbers is 3 : 8, and their HCF is 6, then their LCM is:

(a) 155
(b) 189
(c) 148
(d) 144

Q6. If a trapezium has bases of lengths 8 cm and 12 cm, and height of 5 cm, what is its area?

(a) 60 cm^2
(b) 50 cm^2
(c) 40 cm^2
(d) 45 cm^2

Q7. Simplify: (19/18÷ 19/6)÷ (5/18× 16/15+4/6)+6/8÷ 24/25 of 25/8

(a) 3/4
(b) 1
(c) 31/52
(d) 31/54

Q8. A trader buys an article, spends Rs. 50 on its repair, and sells it for Rs. 600, making a 25% profit. What was the original purchase price?

(a) Rs. 430
(b) Rs. 400
(c) Rs. 480
(d) Rs. 450

Q9. A car travels 120 km at 40 km/h, 180 km at 60 km/h, and 100 km at 50 km/h. What is the average speed of the car for the entire journey?

(a) 50 km/h
(b) 48 km/h
(c) 55 km/h
(d) 45 km/h

Q10. If the third proportional to 0.8 and 5.6 is n, then what is the value of n?

(a) 4.48
(b) 31.36
(c) 0.84
(d) 39.2

Q11. The marked price of a machine is Rs. 16,000. The shopkeeper gives two successive discounts of 15% and N% to the customer. If the customer paid Rs. 12,240 for the machine, the value of N is:

(a) 10%
(b) 13.5%
(c) 15%
(d) 12.5%

Q12. A trader buys 20 kg of rice for Rs. 1,000 and sells it at Rs. 55 per kg. What is the profit percentage?

(a) 10%
(b) 8%
(c) 12%
(d) 15%

Q13. What is the mode of the following data: 12, 15, 18, 18, 20, 18, 22, 22, 25, 28, 22, 15, 18, 12?

(a) 15
(b) 12
(c) 22
(d) 18

Q14. A sum of Rs. 12,000 is invested at 10% per annum, compound interest, compounded half-yearly. What is the amount after 1.5 years?

(a) Rs. 13,891.50
(b) Rs. 14,200
(c) Rs. 13,965.75
(d) Rs. 14,000

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Q15. The sum of two positive numbers is 31 and their product is 220. The positive difference between them is:

(a) 9
(b) 13
(c) 25
(d) 26

Q16. A local library purchased several biography books and mystery novels for their new collection. The library spent exactly Rs. 4,800 on biography books and Rs. 4,800 on mystery novels. Each biography book costs Rs. 40 more than a mystery novel. The library was able to buy 10 more mystery novels than biography books. Find the number of biography books purchased.

(a) 18
(b) 24
(c) 21
(d) 30

Q17. Two successive price increases of 15% and 15% on an article are equivalent to a single percentage increase of:

(a) 31.5%
(b) 31%
(c) 32.25%
(d) 30%

Q18. The price of a trouser is first increased by 20% and then decreased by 25%. What is the net percentage change in the price?

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

Q19. The present age of Mohit is three times the present age of his son Rahul. After 12 years from now, Mohit's age will be twice Rahul's age. What is the sum of their present ages (in years)?

(a) 44
(b) 46
(c) 48
(d) 50

Q20. If a car travels 120 km using 8 liters of petrol, how much petrol will be required to travel 225 km?

(a) 15 liters
(b) 18 liters
(c) 17 liters
(d) 16 liters

Q21. Simplify [8.16/2.4+(3.64× 1.5)] to two decimal places.

(a) 8.76
(b) 8.86
(c) 8.56
(d) 9.26

Q22. In a batch of 50 managers and supervisors, the average monthly salary of managers is Rs. 48,000 and that of supervisors is Rs. 42,000. If the overall monthly average salary of the batch is Rs. 44,400, find the number of supervisors in the batch.

(a) 33
(b) 24
(c) 30
(d) 27

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Q23. A mobile phone is marked at Rs. 8,000. If two successive discounts of 15% and 10% are given, what is the selling price?

(a) Rs. 6,200
(b) Rs. 6,160
(c) Rs. 6,180
(d) Rs. 6,120

Q24. A two-digit number is such that four times the sum of its digits is equal to the number formed by reversing its digits. If the difference between the digits is 3, find the original number.

(a) 96
(b) 69
(c) 36
(d) 63

Q25. Three friends, Amit, Bharat, and Chitra, can individually complete a painting project in 12 hours, 18 hours, and 24 hours, respectively. If they all work together for 4 hours and then Amit leaves, how many hours will Bharat and Chitra take to finish the remaining work?

(a) 2 6/7 hours
(b) 3 6/7 hours
(c) 3 5/7 hours
(d) 2 5/7 hours

Q26. The sides of a triangle are in the ratio 5:6:7 and its perimeter is 90 cm. What is the area of this triangle (in square cm)?

(a) $150\sqrt{6}$ cm²
(b) $140\sqrt{6}$ cm²
(c) $150\sqrt{3}$ cm²
(d) $150\sqrt{7}$ cm²

Q27. A person covers a certain distance. If he reduces his speed by 25%, by what percentage does the time taken to cover the same distance increase? (Rounded off to two decimal places)

(a) 20.33%
(b) 33.33%
(c) 30.67%
(d) 25.67%

Q28. A and B can do a piece of work in 12 days and 28 days, respectively. Both work for 3 days and then A leaves. How long (in days) will B take to complete the remaining work?

(a) 18
(b) 17
(c) 20
(d) 19

Q29. The ratio of the heights of Shyam and Manish is 7 : 8. If Shyam's height is 140 cm, who is taller and by how much?

(a) Manish is taller by 10 cm
(b) Shyam is taller by 20 cm
(c) Manish is taller by 20 cm
(d) Shyam is taller by 10 cm

Q30. An investment triples in 6 years under compound interest. After how many years will it become 27 times?

(a) 24 years
(b) 21 years
(c) 15 years
(d) 18 years

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GENERAL AWARENESS

Q31. Under how many broad categories are the Fundamental Rights guaranteed by the Constitution of India?

(a) Nine
(b) Five
(c) Six
(d) Eleven

Q32. Which of the following tree species sustains the famous handicrafts of Kashmir and grows mainly in the Himalayan region?

(a) Walnut
(b) Deodar
(c) Sal
(d) Chir Pine

Q33. A quantity is measured in meters per second squared (m/s^2). What is this quantity?

(a) force
(b) acceleration
(c) velocity
(d) energy

Q34. The excessive presence of _____ mainly causes eutrophication in lakes.

(a) Iron and copper
(b) Calcium carbonate
(c) Silica
(d) Nitrogen and phosphorus

Q35. Which of the following is a common symptom of diabetes mellitus?

(a) Increased hair growth
(b) Loss of hearing
(c) Frequent urination
(d) Decreased thirst

Q36. As per Haj Policy 2025, out of the total number of quota allocated to the Government of India (GoI), what percentage of Haj Seats are allocated to the Haj Committee of India (HCoI) and Haj Group Organisers (HGOs), respectively?

(a) 40% and 60%
(b) 50% and 50%
(c) 70% and 30%
(d) 60% and 40%

Q37. Which key national challenge served as the primary focus of the National Agricultural Policy (NAP) introduced in 2000?

(a) Feeding 1.4 billion people while improving farmers' incomes
(b) Accelerating urban infrastructure projects
(c) Cutting down reliance on renewable energy sources
(d) Expansion of industrial export zones

Q38. During the 17^(th) BRICS Summit held in 2025, which country officially joined the bloc as a full member?

(a) Pakistan
(b) Indonesia
(c) Türkiye
(d) Mexico

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Q39. Which Indian author was shortlisted for the 2025 Booker Prize for the novel 'The Loneliness of Sonia and Sunny'?

(a) Amish Tripathi
(b) Vikram Sampath
(c) Kiran Desai
(d) Arundhati Roy

Q40. The People's Plan Campaign, introduced nationwide in 2018, aimed to strengthen rural governance through which of the following approaches?

(a) Centralized expenditure control
(b) Uniform national budgeting templates
(c) Corporate-led rural investments
(d) Participatory Gram Sabha-based planning

Q41. Which dynasty of the Delhi Sultanate is known for introducing the "Iqta system"?

(a) Khilji dynasty
(b) Mamluk dynasty
(c) Sayyid dynasty
(d) Tughlaq dynasty

Q42. Pragati Maidan in Delhi is most closely associated with which form of communication?

(a) Digital communication
(b) Satellite-based broadcasting
(c) Trade and exhibition-based communication
(d) Mass communication

Q43. 'Bihu' is considered the festival of the _____ state/UT.

(a) Andaman Nicobar Islands
(b) Chattisgarh
(c) Assam
(d) Lakshadweep

Q44. Which function is primarily handled by system software in a computer system?

(a) Playing audio and video files
(b) Managing user-created documents
(c) Coordinating hardware and running core system processes
(d) Designing presentations and spreadsheets

Q45. According to the Natyashastra, which of the following is characterised by body movements to music without expressions (Abhinay)?

(a) Natya
(b) Nritya
(c) Nritta
(d) Kuchipudi

Q46. Which resolution is the Preamble of the Constitution based on, drafted by Pandit Jawaharlal Nehru?

(a) Directive Principles
(b) Fundamental Rights
(c) Directive Resolution
(d) Objectives Resolution

Q47. Which event directly triggered the British–Bengal confrontation that culminated in the Battle of Plassey (1757)?

(a) Abuse of duty-free trade privileges granted by imperial farmans
(b) Expansion of Mughal administrative reforms affecting coastal trade
(c) Capture of Calcutta and attack on British factories by Siraj-ud-Daulah
(d) Refusal of the English Company to conduct inland trade in Bengal

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Q48. Which of the following footballers was awarded a Guinness World Record in 2025 for the most wins in international football?

(a) Cristiano Ronaldo
(b) Lionel Messi
(c) Robert Lewandowsk
(d) Sergio Ramos

Q49. As of September 2025, according to the structure of the Central Administrative Tribunal, how many benches are there across India?

(a) 19
(b) 10
(c) 22
(d) 15

Q50. Which statement is True or False about the first and second generations of computers?

(i) The First Generation used Vacuum Tubes, which were bulky and heat-generating.

(ii) The Transistor, which defined the Second Generation, made computers larger, slower, and more expensive.

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

Q51. What were the volunteer groups of the Prati Sarkar called?

(a) Gram dals and satyagrah dals
(b) Seva dals and tufan dals
(c) Swaraj dals and azad dals
(d) Lok dals and rajya dals

Q52. In which of the following ways is the Speaker of the Vidhan Sabha elected?

(a) By the Governor
(b) By the members of the Vidhan Sabha
(c) By the Chief Minister
(d) Directly by the public

Q53. Who among the following won the Australian Open in 2025?

(a) Alexander Zverev
(b) Taylor Fritz
(c) Jack Draper
(d) Jannik Sinner

Q54. In January 2025, India became the fourth nation to achieve autonomous satellite docking in orbit. What was the name of this mission?

(a) NISAR
(b) Gaganyaan-1
(c) SpaDeX
(d) Chandrayaan-4

Q55. Which of the following Articles of the Constitution of India states that, until Parliament by law otherwise provides, the quorum to constitute a meeting of either House of Parliament shall be one-tenth of the total number of members of the House?

(a) Article 96
(b) Article 102
(c) Article 100
(d) Article 99

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Q56. The Ikshvakus ruled Krishna-Godavari delta in Eastern Deccan after the decline of which dynasty?

(a) Kadambas Dynasty
(b) Guptas Dynasty
(c) Mauryas Dynasty
(d) Satavahanas Dynasty

Q57. What is the term used for the first matra in Hindustani music's tala system?

(a) Khali
(b) Tali
(c) Laya
(d) Sam

Q58. The assassination attempt on Viceroy Lord Hardinge in Delhi in 1912 was organised by revolutionaries led by:

(a) Madanlal Dhingra and VD Savarkar
(b) Rasbehari Bose and Sachindranath Sanyal
(c) Khudiram Bose and Prafulla Chaki
(d) Surya Sen and Jatin Mukherjee

Q59. The component inside the CPU responsible for arithmetic operations and logical comparisons is the _____.

(a) Motherboard
(b) Random Access Memory
(c) Arithmetic Logic Unit
(d) Control Unit

Q60. The statement "A computer can work tirelessly and consistently for long periods without losing concentration" represents which characteristics of the computer?

(a) Versatility
(b) Diligence
(c) Accuracy
(d) Speed

Q61. Two isotopes of an element have 17 protons with 18 neutrons and 20 neutrons, respectively. Which of the following is the correct representation of these isotopes?

(a) ^(35)17Cl and ^(37)17Cl
(b) ^(17)18Cl and ^(17)20Cl
(c) ^(18)17Cl and ^(20)17Cl
(d) ^(35)18Cl and ^(37)20Cl

Q62. Which Dravidian language is spoken outside India in Baluchistan?

(a) Brahui
(b) Kannada
(c) Malayalam
(d) Tamil

Q63. Which type of agriculture is commonly practiced in densely populated monsoon regions of Asia?

(a) Shifting cultivation
(b) Nomadic herding
(c) Mediterranean agriculture
(d) Intensive subsistence farming

Q64. After gaining Independence, what type of economic system did India implement as its development strategy?

(a) Free market capitalism with minimal state intervention
(b) Socialist system eliminating private ownership
(c) Mixed economy combining public and private sectors
(d) Traditional agrarian structure without structural reforms

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Q65. Tropical cyclones form mainly due to:

(a) Low-pressure systems over warm ocean water
(b) High-pressure systems over land
(c) Rising continental winds
(d) Fast-moving cold fronts

Q66. Which type of Emergency could be implemented due to 'internal disturbance' before the 44^(th) Amendment of the Indian Constitution?

(a) National Emergency
(b) President's Rule
(c) Martial Law
(d) Financial Emergency

Q67. Which statement best explains why transport and communication infrastructure are vital for India’s economic growth?

(a) It primarily serves elite passenger travel without influencing economic output
(b) It increases regional isolation by reducing interaction among different areas
(c) It links production centres with markets, enhancing trade and economic activity
(d) It limits industrial expansion by diverting funds from core economic sectors

Q68. In December 2025, which state government allotted 480 acres of land to Adani Infra (India) Pvt. Ltd., a notified partner of Google-owned Raiden Infotech India, for establishing 1 GW AI Data Centres in the state?

(a) Gujarat
(b) Andhra Pradesh
(c) Rajasthan
(d) Tamil Nadu

Q69. Which of the following properties is responsible for the bending of light when it moves from air into water?

(a) Change in direction due to gravity
(b) Change in color of light
(c) Change in temperature
(d) Change in speed of light

Q70. In December 2025, which of the following cybersecurity solutions providers introduced an advanced tenant control feature for ChatGPT?

(a) Bitdefender
(b) Kaspersky
(c) Quick Heal
(d) eScan

GENERAL INTELLIGENCE AND REASONING

Q71. Seven boxes B, C, D, E, Q, R and S are kept one over the other but not necessarily in the same order. No box is kept below C. Only two boxes are kept between E and C. Only Q is kept above D. S is kept at some place below B but at some place above R. Which box is kept immediately above S?

(a) R
(b) B
(c) E
(d) D

Q72. Seven boxes A, B, C, D, E, F and G are kept one over the other but not necessarily in the same order. No box is kept above G. Only three boxes are kept between G and D. Only one box is kept between E and B. B is kept immediately above D. Only four boxes are kept between E and C. F is kept at some place above A. Which box is kept immediately below D?

(a) F
(b) B

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(c) A
(d) G

Q73. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

GNI JRL MVO PZR ?

(a) TEU
(b) SDU
(c) RDV
(d) TCV

Q74. Each of the digits in the number 4317856 is arranged in ascending order from left to right. What will be the sum of the digits that are second from the left and second from the right in the new number thus formed?

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

Q75. In a certain code language,

A % B means ‘A is the father of B’,

A € B means ‘A is the wife of B’,

A = B means ‘A is the mother of B’, and

A ? B means ‘A is the daughter of B’.

Based on the above, how is B related to X if 'B = C ? O % P € X'?

(a) Sister
(b) Wife's mother
(c) Wife
(d) Brother's wife

Q76. Read the given statement(s) and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statement(s).

Statements: All kings are mountains. All mountains are arrows.

Conclusion (I): Some mountains are kings.

Conclusion (II): All kings are arrows.

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

Q77. Refer to the given number series and answer the question that follows. All numbers are single-digit numbers only. Counting to be done from left to right only.

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

How many such odd digits are there which are immediately preceded by a perfect square and immediately followed by an odd digit?

(NOTE: 1 is also a perfect square.)

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

Q78. Each letter in the word COMPLEX is changed to the letter immediately preceding it in the English alphabetical order and then all the letters thus formed are arranged in alphabetical order. Which of the following letters will be fourth from the right in the new group of letters thus formed?

(a) N

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(b) L
(c) K
(d) D

Q79. Based on the alphabetical order, three of the following four are alike in a certain way and thus form a group. Which is the one that does not belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)
(a) HKJ
(b) NQU
(c) PSW
(d) KNR

Q80. Each vowel in the word ANTIQUE is changed to the letter immediately following it in the English alphabetical order and each consonant is changed to the letter immediately preceding it in the English alphabetical order. Which of the following letters will be second from the left in the new group of letters thus formed?
(a) M
(b) S
(c) J
(d) P

Q81. What should come in place of the question mark (?) in the given series based on the English alphabetical order?
ACE HJL OQS VXZ ?
(a) CEG
(b) CFF
(c) CDG
(d) CDF

Q82. What should come in place of '?' in the given series?
71 68 ? 53 41 26
(a) 64
(b) 62
(c) 61
(d) 63

Q83. What will come in place of '?' in the following equation, if '+' and '-' are interchanged and 'x' and '÷' are interchanged?
14 x 2 - 12 ÷ 4 + 8 = ?
(a) 22
(b) 47
(c) 18
(d) 16

Q84. Select the pair that follows the same pattern as that followed by the two pairs given below. Both pairs follow the same pattern.
ROD : UKF
OLF : RHH
(a) KFK : NBM
(b) JQS : MMV
(c) UIL : QFO
(d) PUD : SRH

Q85. What should come in place of '?' in the given series?
372 321 277 240 210 187 ?
(a) 173
(b) 168

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(c) 171
(d) 165

Q86. In a certain code language, ‘CANE’ is coded as ‘5731’ and ‘RACE’ is coded as ‘7435’. What is the code for ‘R’ in the given code language?
(a) 3
(b) 7
(c) 5
(d) 4

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 is the one that does not belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster pairs.)
(a) YG-RO
(b) OW – HF
(c) AI-TQ
(d) SA – LI

Q88. Each of the digits in the number 7543168 is arranged in ascending order from left to right. What will be the sum of the digits which are second from the left and third from the right in the new number thus formed?
(a) 9
(b) 10
(c) 6
(d) 5

Q89. Seven boxes, G, H, I, L, M, N and O, are kept one over the other, but not necessarily in the same order.
No box is kept above M. Only two boxes are kept between L and H. Only three boxes are kept between M and H. N is kept immediately above H. Only four boxes are kept between L and I. G is kept at some place above O.
Which box is kept second above G?
(a) M
(b) H
(c) O
(d) L

Q90. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group.
Which is the one that does not belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)
(a) HV - KT
(b) YT - BR
(c) OA - RY
(d) SZ - VW

Q91. In a certain code language, ‘LEST’ is coded as ‘7453’ and ‘LOTS’ is coded as ‘2735’.What is the code for ‘O’ in the given code language?
(a) 7
(b) 2
(c) 3
(d) 5

Q92. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Select the set in which the numbers are related in the same way as are the numbers of the following sets.
(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into their constituent digits. E.g. 13 – Operations on 13 such as adding / subtracting /multiplying etc. to 13 can be performed.

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Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)

123, 116

102, 95

(a) 604, 596
(b) 541, 534
(c) 365, 357
(d) 413, 402

Q93. Bhavesh starts from Point A and drives 19 km towards the east. He then takes a left turn, drives 16 km, turns left and drives 23 km. He then takes a left turn and drives 18 km. He takes a final left turn, drives 4 km and stops at Point P. How far (shortest distance) and towards which direction should he drive in order to reach Point A again? (All turns are 90-degree turns only unless specified.)

(a) 3 km to the south
(b) 3 km to the north
(c) 2 km to the north
(d) 2 km to the south

Q94. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

DIXC 6 JNBF 12 PSFI 18 VXJL 24 BCNO 30 ?

(a) IISS 34
(b) HHRR 36
(c) IHSR 36
(d) HIRS 34

Q95. Read the given statement(s) and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statement(s).

Statements:

All brooms are rings.

No broom is a lamp.

Conclusions:

(I) Some lamps are rings.

(II) All rings are lamps.

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

Q96. Seven people A, B, D, J, O, T and Z are sitting in a row, facing north. Only three people sit to the left of B. Only Z sits to the right of T. Only three people sit between T and O. J sits at some place to the left of A but at some place to the right of D. Who sits immediately to the right of B?

(a) Z
(b) A
(c) T
(d) O

Q97. LOQK is related to SVXR in a certain way based on the English alphabetical order. In the same way, ILNH is related to PSUO. To which of the following is FIKE related, following the same logic?

(a) PMLR
(b) MPRL
(c) PMRL
(d) MPLR

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Q98. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

JM - NQ - RU

BE - FI - JM

(a) NE - QK - XQ
(b) MP - QT - UX
(c) EB - IG - NL
(d) HI - MP - SU

Q99. Seven people F, G, H, L, M, O and Q are sitting around a circular table, facing the centre of the table. O sits to the immediate right of G. F sits to the immediate right of H. Only two people sit between Q and O when counted from the right of Q. Only three people sit between M and G when counted from the right of G. How many people sit between F and L when counted from the right of F?

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

Q100. In a certain code language,

A @ B means ‘A is the sister of B’,

A $ B means ‘A is the father of B’,

A # B means ‘A is the wife of B’ and

A & B means ‘A is the brother of B’.

How is E related to Y if ‘E $ N @ T # R & Y’?

(a) Brother's daughter's husband
(b) Mother's brother
(c) Brother's wife's sister
(d) Brother's wife's father

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) 15 units

Shortcut Trick

The ratio of diagonals is 3 : 4, so the ratio of half-diagonals is also 3 : 4.

In a rhombus, half-diagonals and the side form a right-angled triangle.

Using the Pythagorean triplet (3, 4, 5), the side corresponds to ratio 5.

Given side length 5 units → 12.5, so 1 unit → 2.5.

Shorter diagonal ratio is 3 × 2 = 6 units → 6 × 2.5 = 15 units.
Therefore The correct answer is 15 units.
Alternate Method
Given:
Ratio of diagonals (d1 : d2) = 3 : 4
Length of each side (a) = 12.5 units
Formula Used:
In a rhombus, the relation between side and diagonals is: $a^2 = (d1/2)^2 + (d2/2)^2$
Calculations:
=> Let the diagonals be d1 = 3x and d2 = 4x.
=> $(12.5)^2 = (3x/2)^2 + (4x/2)^2$
=> $156.25 = (1.5x)^2 + (2x)^2$
=> $156.25 = 2.25x^2 + 4x^2$
=> $156.25 = 6.25x^2$
=> $x^2 = 156.25 \div 6.25 = 25$
=> $x = \sqrt{25} = 5$
=> Length of shorter diagonal (d1) = 3 × 5 = 15 units.
Therefore The correct answer is 15 units.
Additional Information
Properties of Rhombus Diagonals
The diagonals of a rhombus bisect each other at right angles (90°).
Area of a Rhombus
The area can be calculated using diagonals: Area = 1/2 × d1 × d2.
Perimeter of a Rhombus
Since all sides are equal, the perimeter = 4 × side.

Q2. Answer: (a) 24

Given:
{18 + [24 ÷ (3 of 2)] × 4} − 10
Formula used:
BODMAS rule (Brackets, Of, Division, Multiplication, Addition, Subtraction)
Calculations:
{18 + [24 ÷ (3 of 2)] × 4} − 10
=> {18 + [24 ÷ (3 × 2)] × 4} − 10
=> {18 + [24 ÷ 6] × 4} − 10
=> {18 + 4 × 4} − 10
=> {18 + 16} − 10
=> 34 − 10
=> 24
Therefore The correct answer is option (1).

Q3. Answer: (b) 1.5

Shortcut Trick
Given: 2 cot A = 4 → cot A = 2.
Using the Trigonometric Identity: $\text{cosec}^2 A = 1 + \cot^2 A$.
Substituting the value: $\text{cosec}^2 A = 1 + (2)^2 = 1 + 4 = 5$.
Expression value: (5 + 1) ÷ (5 − 1) = 6 ÷ 4 = 1.5.
Therefore The correct answer is 1.5.
Alternate Method
Given:
2 cot A = 4
=> cot A = 4 ÷ 2 = 2

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Formula Used:

1. cot A = Base ÷ Perpendicular

2. Pythagoras Theorem: $H^2 = P^2 + B^2$

3. cosec A = Hypotenuse ÷ Perpendicular

Calculations:

Let Perpendicular (P) = 1, then Base (B) = 2 (since cot A = B/P = 2/1).

=> $H^2 = 1^2 + 2^2 = 1 + 4 = 5$

=> $H = \sqrt{5}$

=> cosec A = H ÷ P = $\sqrt{5} \div 1 = \sqrt{5}$

=> $\text{cosec}^2 A = (\sqrt{5})^2 = 5$

Required Expression = $(\text{cosec}^2 A + 1) \div (\text{cosec}^2 A - 1)$

=> $(5 + 1) \div (5 - 1)$

=> $6 \div 4$

=> 1.5

Therefore The correct answer is 1.5.

Additional Information

Fundamental Trigonometric Identities

There are three main identities: $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Reciprocal Ratios

Cosecant is the reciprocal of sine ($\text{cosec}\ \theta = 1/\sin\theta$) and cotangent is the reciprocal of tangent ($\cot\theta = 1/\tan\theta$).

Pythagoras Theorem in Trigonometry

For any right-angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides ($H^2 = P^2 + B^2$).

Q4. Answer: (a) 286

Shortcut Trick

Ratio of Passed students to Failed students = 11 : 2

Total units in the class = 11 + 2 = 13 units

Given, Failed students (2 units) = 44

=> 1 unit = 44 ÷ 2 = 22

Total students = 13 units × 22 = 286

Therefore The correct answer is 286 students.

Alternate Method

Given:

Ratio (Passed : Failed) = 11 : 2

Number of Failed students = 44

Formula:

Total Students = Passed Students + Failed Students

=> Let the number of passed students be 11x and failed students be 2x.

=> According to the question, 2x = 44

=> x = 44 ÷ 2 = 22

=> Number of passed students = 11 × 22 = 242

=> Total number of students = Passed + Failed = 242 + 44 = 286

Therefore The correct answer is 286 students.

Additional Information

Ratio and Total Value

If two quantities are in the ratio a:b, the total quantity can be represented as (a + b)k, where k is a constant multiplier.

Unitary Method in Ratios

To find the total, first divide the given numerical value by its corresponding ratio parts to find the value of 1 unit, then multiply by the total ratio parts.

Percentage Conversion

The fail percentage in this class is (Failed parts ÷ Total parts) × 100 = (2 ÷ 13) × 100 ≈ 15.38%.

Q5. Answer: (d) 144

Shortcut Trick

If the ratio of two numbers is a : b and their HCF is H, then their LCM is given by the formula:

LCM = H × a × b (provided a and b are coprime)

Given a = 3, b = 8, and H = 6.

=> LCM = 6 × 3 × 8 = 144.

Therefore The correct answer is 144.

Alternate Method

Given:

Ratio of numbers = 3 : 8

Highest Common Factor (HCF) = 6

Formula Used:

Number = Ratio part × HCF

Product of two numbers = HCF × LCM

Calculations:

=> Let the two numbers be 3x and 8x.

=> The HCF of 3x and 8x is x (since 3 and 8 are coprime).

=> Given x = 6.

=> Number1 = 3 × 6 = 18

=> Number2 = 8 × 6 = 48

=> Using the product rule: 18 × 48 = 6 × LCM

=> LCM = (18 × 48) ÷ 6

=> LCM = 3 × 48 = 144

Therefore The correct answer is 144.

Additional Information

HCF and LCM Relation

For any two numbers A and B, the product of the numbers is equal to the product of their HCF and LCM: A × B = HCF × LCM.

Co-prime Numbers

Two numbers are called co-prime if their HCF is 1. If the terms of a ratio are co-prime, the HCF of the actual numbers is the common multiplier.

LCM of Ratios

If the ratio of two numbers is x : y and their HCF is H, then their LCM = H × x × y and the numbers are Hx and Hy.

Q6. Answer: (b) 50 cm²

Shortcut Trick

Area of Trapezium = Average of bases × Height

Average of bases = (8 + 12) ÷ 2 = 10 cm

Area = 10 × 5 = 50 cm²

Therefore, the Area of the trapezium is 50 cm².

Therefore The correct answer is 50 cm².

Alternate Method

Given:

Length of first base (a) = 8 cm

Length of second base (b) = 12 cm

Height (h) = 5 cm

Formula Used:

Area of Trapezium = 1/2 × (a + b) × h

Calculations:

=> Area = 1/2 × (8 + 12) × 5

=> Area = 1/2 × 20 × 5

=> Area = 10 × 5

=> Area = 50 cm²

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Thus, the area of the trapezium is 50 cm², which corresponds to Option (2).

Therefore The correct answer is 50 cm².

Additional Information

Properties of a Trapezium

A quadrilateral with at least one pair of parallel sides. If the non-parallel sides are equal, it is called an isosceles trapezium.

Median of a Trapezium

The line segment joining the midpoints of the non-parallel sides is the median. Length = (Base1 + Base2) ÷ 2.

Area of a Rhombus

Area = 1/2 × d1 × d2, where d1 and d2 are the lengths of its diagonals.

Q7. Answer: (c) 31/52

Given:

Expression: ((19/18) ÷ (19/6)) ÷ ((5/18) × (16/15) + (4/6)) + (6/8) ÷ (24/25) of (25/8)

Formula used:

The BODMAS rule is used to solve this expression, which stands for Brackets, Of, Division, Multiplication, Addition, and Subtraction.

Calculations:

((19/18) ÷ (19/6)) ÷ ((5/18) × (16/15) + (4/6)) + (6/8) ÷ (24/25) of (25/8)

=> (19/18 × 6/19) ÷ (8/27 + 4/6) + (6/8) ÷ (24/25 × 25/8)

=> (1/3) ÷ (8/27 + 2/3) + (6/8) ÷ 3

=> (1/3) ÷ (8/27 + 18/27) + (6/8 × 1/3)

=> (1/3) ÷ (26/27) + 1/4

=> (1/3 × 27/26) + 1/4

=> 9/26 + 1/4

=> (18 + 13)/52

=> 31/52

Therefore The correct answer is option (3).

Q8. Answer: (a) Rs. 430

Shortcut Trick

Profit = 25% = 1/4 => Ratio of CP : SP = 4 : 5

Given SP = 5 units = Rs. 600 => 1 unit = Rs. 120

Total CP = 4 units = 4 × 120 = Rs. 480

Original Purchase Price = Total CP − Repair = 480 − 50 = Rs. 430

Therefore The correct answer is Rs. 430.

Alternate Method

Given: Selling Price (SP) = Rs. 600, Profit Percentage = 25%, Repair Cost = Rs. 50.

Formula Used: Total Cost Price (CP) = Selling Price × [100 / (100 + Profit%)]

=> Total CP = 600 × [100 / (100 + 25)]

=> Total CP = 600 × (100 / 125)

=> Total CP = 600 × (4 / 5)

=> Total CP = 120 × 4 = Rs. 480

=> Original Purchase Price = Total CP − Repair Expenses

=> Original Purchase Price = 480 − 50 = Rs. 430

Therefore The correct answer is Rs. 430.

Additional Information

Concept of Total Cost Price

The Total Cost Price includes the Original Purchase Price plus all overheads like repair, transportation, and taxes. Profit or Loss is always calculated on this final sum.

Profit Percentage Formula

Profit % = [(SP − Total CP) / Total CP] × 100. This measures the gain relative to the entire investment.

Effective Selling Price

If a profit of P% is made, then SP = Total CP × [(100 + P)/100]. Conversely, Total CP = SP × [100/(100 + P)].

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Q9. Answer: (a) 50 km/h

Shortcut Trick

Average Speed = Total Distance ÷ Total Time

Total Distance = 120 + 180 + 100 = 400 km

Total Time = (120 ÷ 40) + (180 ÷ 60) + (100 ÷ 50) = 3 + 3 + 2 = 8 hours

Average Speed = 400 ÷ 8 = 50 km/h

Therefore The correct answer is 50 km/h.

Alternate Method

Given:

Distance1 = 120 km, Speed1 = 40 km/h

Distance2 = 180 km, Speed2 = 60 km/h

Distance3 = 100 km, Speed3 = 50 km/h

Formula Used:

Time = Distance ÷ Speed

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

Calculations:

=> Time taken for first part (t1) = 120 ÷ 40 = 3 hours

=> Time taken for second part (t2) = 180 ÷ 60 = 3 hours

=> Time taken for third part (t3) = 100 ÷ 50 = 2 hours

=> Total Time (T) = 3 + 3 + 2 = 8 hours

=> Total Distance (D) = 120 + 180 + 100 = 400 km

=> Average Speed = 400 ÷ 8 = 50 km/h

Therefore The correct answer is 50 km/h.

Additional Information

Average Speed for Equal Distances

If a car travels two equal distances at speeds x and y, the Average Speed is given by the Harmonic Mean: 2xy ÷ (x + y).

Unit Conversion

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

Relative Speed

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

Q10. Answer: (d) 39.2

Shortcut Trick

Find the scaling factor between the first two terms: 5.6 ÷ 0.8 = 7.

Apply the same scaling factor to the second term to find the third proportional (n).

n = 5.6 × 7 = 39.2.

Therefore The correct answer is 39.2.

Alternate Method

Given: First term (a) = 0.8, Second term (b) = 5.6, Third proportional = n.

Formula Used: If a, b, and n are in continued proportion, then a : b :: b : n, which implies $n = b^2 \div a$.

=> a : b :: b : n

=> 0.8 : 5.6 :: 5.6 : n

=> 0.8 ÷ 5.6 = 5.6 ÷ n

=> n = (5.6 × 5.6) ÷ 0.8

=> n = 31.36 ÷ 0.8

=> n = 39.2

Therefore The correct answer is 39.2.

Additional Information

Mean Proportional

The mean proportional between two numbers a and b is given by $x = \sqrt{(a \times b)}$. It is the value that satisfies a : x = x : b.

Fourth Proportional

For three numbers a, b, and c, the fourth proportional d satisfies a : b = c : d. It is calculated as d = (b × c) ÷ a.

Continued Proportion

A series of numbers a, b, c, d... are in continued proportion if the ratio between successive terms is constant: a/b = b/c = c/d.

Q11. Answer: (a) 10%

Shortcut Trick

Price after 1^(st) discount = 16000 × 0.85 = 13600

2^(nd) discount amount = 13600 − 12240 = 1360

N% = (1360 ÷ 13600) × 100 = 10%

Therefore The correct answer is 10%.

Alternate Method

Given:

Marked Price (MP) = Rs. 16,000

First Discount = 15%

Second Discount = N%

Final Selling Price (SP) = Rs. 12,240

Formula Used:

SP = MP × (100 − d1)/100 × (100 − d2)/100

Calculations:

=> 12,240 = 16,000 × (100 − 15)/100 × (100 − N)/100

=> 12,240 = 16,000 × 85/100 × (100 − N)/100

=> 12,240 = 160 × 85 × (100 − N)/100

=> 12,240 = 13,600 × (100 − N)/100

=> 12,240 ÷ 136 = 100 − N

=> 90 = 100 − N

=> N = 100 − 90

=> N = 10%

Therefore The correct answer is 10%.

Additional Information

Net Successive Discount Formula

The single equivalent discount for two successive discounts a% and b% is given by: [a + b − (a × b)/100]%.

Relationship between MP and CP

MP/CP = (100 + Profit%)/(100 − Discount%). This is useful when both discount and profit percentages are known.

Marked Price (List Price)

The price printed on an item is the Marked Price. Discounts are always calculated on this value to arrive at the Selling Price.

Q12. Answer: (a) 10%

Shortcut Trick

Calculate Cost Price (CP) per unit: 1000 ÷ 20 = Rs. 50.

Given Selling Price (SP) per unit = Rs. 55.

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

Profit % = [(55 − 50) ÷ 50] × 100 = (5 ÷ 50) × 100 = 10%.

Therefore The correct answer is 10%.

Alternate Method

Given:

Total Quantity of rice = 20 kg

Total Cost Price (CP) = Rs. 1,000

Selling Price (SP) per kg = Rs. 55

Formula Used:

Total SP = SP per unit × Total Quantity

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

Calculations:

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=> Total Selling Price (SP) = 55 × 20 = Rs. 1,100

=> Total Profit = 1,100 − 1,000 = Rs. 100

=> Profit Percentage = (100 ÷ 1,000) × 100

=> Profit % = 10%

Therefore The correct answer is 10%.

Additional Information

Loss Percentage

When CP is greater than SP, Loss % = [(CP − SP) ÷ CP] × 100.

Marked Price and Discount

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

Relation between CP and SP

SP = CP × [1 + (Profit % ÷ 100)] or SP = CP × [1 − (Loss % ÷ 100)].

Q13. Answer: (d) 18

Shortcut Trick

Mode is defined as the value that appears most frequently in a given data set.

By scanning the data: 12, 15, 18, 18, 20, 18, 22, 22, 25, 28, 22, 15, 18, 12

The number 18 is repeated 4 times, which is higher than any other number.

Therefore The correct answer is 18.

Alternate Method

Given Data: 12, 15, 18, 18, 20, 18, 22, 22, 25, 28, 22, 15, 18, 12

Formula Used: Mode = Value with the maximum frequency.

Let us count the frequency of each distinct number in the dataset:

=> Number 12 occurs 2 times.

=> Number 15 occurs 2 times.

=> Number 18 occurs 4 times.

=> Number 20 occurs 1 time.

=> Number 22 occurs 3 times.

=> Number 25 occurs 1 time.

=> Number 28 occurs 1 time.

=> Comparing frequencies: 4 > 3 > 2 > 1.

=> Since 18 has the highest frequency of 4, it is the mode.

Therefore The correct answer is 18.

Additional Information

Empirical Relationship

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

Types of Mode

A distribution with one mode is Unimodal, two modes is Bimodal, and more than two modes is Multimodal.

Mean and Median

Mean is the average of all values (Sum ÷ Count), while Median is the middle value when data is arranged in ascending or descending order.

Q14. Answer: (a) Rs. 13,891.50

Shortcut Trick

For half-yearly compounding, the rate becomes 5% (10% ÷ 2) and the time periods become 3 (1.5 × 2).

Successive percentage for 3 periods of 5% = 15.7625%.

Compound Interest = 12,000 × 15.7625 / 100 = Rs. 1,891.50.

Total Amount = 12,000 + 1,891.50 = Rs. 13,891.50.

Therefore The correct answer is Rs. 13,891.50.

Alternate Method

Given:

Principal (P) = Rs. 12,000

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Annual Rate (R) = 10%

Time (T) = 1.5 years

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

Since the interest is compounded half-yearly:

=> Half-yearly rate (r) = 10% / 2 = 5%

=> Number of half-years (n) = 1.5 × 2 = 3

=> $A = 12000 \times (1 + 5/100)^3$

=> $A = 12000 \times (105/100)^3$

=> $A = 12000 \times (21/20) \times (21/20) \times (21/20)$

=> $A = 12000 \times 9261 / 8000$

=> $A = 1.5 \times 9261$

=> A = Rs. 13,891.50

Therefore The correct answer is Rs. 13,891.50.

Additional Information

Effective Rate for Half-Yearly Compounding

When interest is compounded half-yearly, the effective annual rate is slightly higher than the nominal rate. For a nominal rate R, the effective rate is $[(1 + (R/2)/100)^2 - 1] \times 100$.

Difference between CI and SI

For 2 years, the difference between Compound Interest and Simple Interest is given by $D = P \times (R/100)^2$.

Compounding Frequencies

If compounded quarterly, the rate is divided by 4 (R/4) and the time is multiplied by 4 (4T). If compounded monthly, divide rate by 12 and multiply time by 12.

Q15. Answer: (a) 9

Shortcut Trick

Find two factors of the product 220 that sum to 31.

220 → 20 × 11

Check Sum: 20 + 11 = 31 (Matches given sum)

Required Difference: 20 − 11 = 9

Therefore The correct answer is 9.

Alternate Method

Given:

Sum of numbers (x + y) = 31

Product of numbers (xy) = 220

Formula Used:

The algebraic identity relating sum, product, and difference is:

$(x - y)^2 = (x + y)^2 - 4xy$

Calculations:

=> $(x - y)^2 = (31)^2 - 4 \times (220)$

=> $(x - y)^2 = 961 - 880$

=> $(x - y)^2 = 81$

=> $(x - y) = \sqrt{81}$

=> x − y = 9

Therefore The correct answer is 9.

Additional Information

Quadratic Relation

If sum (S) and product (P) of two numbers are known, the numbers are roots of the equation $x^2 - Sx + P = 0$.

Identity for Sum of Squares

The sum of the squares of the numbers is given by $x^2 + y^2 = (x + y)^2 - 2xy$.

Combined Identity

$(x + y)^2 + (x - y)^2 = 2(x^2 + y^2)$, which relates the sum, difference, and squares of two numbers.

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Q16. Answer: (d) 30

Shortcut Trick

Total expenditure for each type is Rs. 4,800.

Difference in Price × Difference in Quantity = 40 × 10 = 400.

Product of the number of items and the price per item for biographies must be 4800.

Trial with factors: If Biography books = 30, Price = 4800 ÷ 30 = Rs. 160.

Then Mystery novels = 40, Price = 4800 ÷ 40 = Rs. 120. (Price difference 160 − 120 = Rs. 40, matches!)

Therefore The correct answer is 30.

Alternate Method

Given:

Total spend on Biography books = Rs. 4,800

Total spend on Mystery novels = Rs. 4,800

Price difference = Rs. 40 per book

Quantity difference = 10 books

Formula Used:

Expenditure = Price per item × Quantity

Calculations:

Let the number of biography books be x.

Then, the number of mystery novels is x + 10.

=> 4800 ÷ x − 4800 ÷ (x + 10) = 40

=> 120 ÷ x − 120 ÷ (x + 10) = 1

=> 120 × [(x + 10 − x) ÷ (x(x + 10))] = 1

=> 120 × 10 = x^2 + 10x

=> x^2 + 10x − 1200 = 0

=> x^2 + 40x − 30x − 1200 = 0

=> x(x + 40) − 30(x + 40) = 0

=> (x − 30)(x + 40) = 0

=> x = 30 (since quantity cannot be negative)

Therefore The correct answer is 30.

Additional Information

Inverse Proportion Logic

When Total Expenditure is constant, the Price per unit is inversely proportional to the Quantity purchased (P prop. to 1/Q).

Quadratic Roots Property

For the equation $ax^2 + bx + c = 0$, if c is negative, one root will be positive and one will be negative. In physical contexts like quantity, only the positive root is valid.

Middle Term Splitting

To solve $x^2 + 10x − 1200 = 0$, find two numbers whose product is −1200 and sum is 10. The numbers are 40 and −30.

Q17. Answer: (c) 32.25%

Shortcut Trick

Net percentage change formula for successive increases: x + y + (x × y)/100

Given: x = 15% and y = 15%

Net Increase = 15 + 15 + (15 × 15)/100

Net Increase = 30 + 225/100 = 30 + 2.25 = 32.25%

Therefore The correct answer is 32.25%.

Alternate Method

Given:

First percentage increase = 15%

Second percentage increase = 15%

Calculations:

=> Let the initial price of the article be 100.

=> Price after first 15% increase = 100 + (15% of 100) = 115.

=> Price after second 15% increase = 115 + (15% of 115).

=> 15% of 115 = (15 × 115) / 100 = 1725 / 100 = 17.25.

=> Final Price = 115 + 17.25 = 132.25.

=> Net Percentage Increase = Final Price − Initial Price = 132.25 − 100 = 32.25%.

Therefore The correct answer is 32.25%.

Additional Information

Successive Percentage Change

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

Successive Discount Formula

If two successive discounts of x% and y% are given, the equivalent single discount is: [x + y − (xy/100)]%.

Fraction Multiplying Factor

For an increase of 15%, the multiplying factor is (1 + 15/100) = 1.15. For two such increases, Net Factor = 1.15 × 1.15 = 1.3225.

Q18. Answer: (d) 10% decrease

Shortcut Trick

Apply the successive percentage change formula: Net Change = a + b + (a × b / 100)

Given: a = +20 (increase) and b = −25 (decrease)

Net % Change = 20 − 25 + [20 × (−25) / 100]

Net % Change = −5 − 5 = −10%

Negative result indicates a percentage decrease.

Therefore The correct answer is 10% decrease.

Alternate Method

Given:

First change = 20% increase

Second change = 25% decrease

=> Let the initial price of the trouser be 100 units.

=> Price after 20% increase = 100 + (20% of 100) = 100 + 20 = 120 units.

=> Price after 25% decrease = 120 − (25% of 120)

=> Price after decrease = 120 − (1/4 × 120) = 120 − 30 = 90 units.

=> Net change in price = Final Price − Initial Price = 90 − 100 = −10 units.

=> Net percentage change = (Net Change / Initial Price) × 100

=> Net percentage change = (−10 / 100) × 100 = −10%.

Therefore The correct answer is 10% decrease.

Additional Information

Net Percentage Change Formula

For two successive changes of x% and y%, the net change is given by [x + y + (xy/100)]%. Always use a negative sign for a percentage decrease.

Fractional Multiplier Method

Convert percentages to fractions: 20% increase = 6/5 and 25% decrease = 3/4. Net effect = (6/5) × (3/4) = 18/20 = 9/10. A ratio of 10:9 implies a 1/10 reduction, which is 10%.

Successive vs. Simple Change

Successive changes are calculated on the updated value, not the original base, making them different from a single cumulative arithmetic sum of percentages.

Q19. Answer: (c) 48

Shortcut Trick

Ratio of Mohit : Rahul (Present) = 3 : 1 (Difference = 2 parts)

Ratio (After 12 years) = 2 : 1 → Multiply by 2 to equate difference → 4 : 2

Increase in units (4 − 3 or 2 − 1) = 1 unit → 12 years

Sum of present age ratios = 3 + 1 = 4 units

Sum of ages = 4 × 12 = 48 years

Therefore The correct answer is 48 years.

Alternate Method

Given:

Present age of Mohit = 3 × Present age of Rahul

After 12 years, Mohit age = 2 × Rahul age

Let the present age of Rahul be x years.

=> Present age of Mohit = 3x years.

After 12 years:

=> Age of Rahul = x + 12

=> Age of Mohit = 3x + 12

As per the condition:

=> 3x + 12 = 2(x + 12)

=> 3x + 12 = 2x + 24

=> 3x − 2x = 24 − 12

=> x = 12

Present age of Rahul = 12 years.

Present age of Mohit = 3 × 12 = 36 years.

=> Sum of their present ages = 12 + 36 = 48 years.

Therefore, the correct answer corresponds to Option (3).

Therefore The correct answer is 48 years.

Additional Information

Constant Age Difference

The mathematical difference between the ages of two individuals never changes with time. If A is 5 years older than B today, he will remain 5 years older forever.

Ratio Adjustment Rule

To solve age problems using ratios, ensure the difference between the ratio parts of the two people is the same for both time periods by multiplying the ratios with suitable integers.

Sum of Ages

If the sum of ages of 2 people is S, then after n years, the new sum will be S + 2n.

Therefore The correct answer is 48 years.

Q20. Answer: (a) 15 liters

Shortcut Trick

Apply the Ratio-Unitary method for direct variation:

Distance ratio = 120 : 225 => 8 : 15

Since Petrol prop. to Distance, the petrol ratio is also 8 : 15.

Given 8 units = 8 liters, then 15 units = 15 liters.

Therefore The correct answer is 15 liters.

Alternate Method

Given:

Distance1 = 120 km, Petrol1 = 8 liters

Distance2 = 225 km

Formula Used:

Petrol required = (Petrol1 ÷ Distance1) × Distance2

Calculations:

=> Petrol required for 1 km = 8 ÷ 120

=> Petrol required for 1 km = 1/15 liters

=> Petrol required for 225 km = (1/15) × 225

=> Petrol required = 15 liters

Therefore The correct answer is 15 liters.

Additional Information

Direct Proportion

Two quantities x and y are in direct proportion if the ratio x/y remains constant. In this case, Distance/Petrol = Constant.

Fuel Efficiency (Mileage)

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Mileage is the distance covered per unit of fuel. Mileage = Total Distance ÷ Total Fuel. Here, 120 ÷ 8 = 15 km/liter.

Unitary Method

The method of finding the value of a single unit first and then multiplying to find the required value for multiple units.

Q21. Answer: (b) 8.86

Given:

Expression = [(8.16 ÷ 2.4) + (3.64 × 1.5)]

Formula used:

Simplify using the BODMAS rule (Division, Multiplication, Addition).

Calculations:

[(8.16 ÷ 2.4) + (3.64 × 1.5)]

=> First, perform division: 8.16 ÷ 2.4 = 3.4

=> Next, perform multiplication: 3.64 × 1.5 = 5.46

=> Finally, perform addition: 3.4 + 5.46 = 8.86

=> The result to two decimal places is 8.86.

Therefore The correct answer is option (2).

Q22. Answer: (c) 30

Shortcut Trick

Apply Alligation: Managers (48000) and Supervisors (42000) with mean (44400).

Ratio of M : S = (44400 − 42000) : (48000 − 44400) = 2400 : 3600 = 2 : 3.

Total units = 2 + 3 = 5 units → 50 people.

1 unit = 10 people.

Number of Supervisors (3 units) = 3 × 10 = 30.

Therefore The correct answer is 30.

Alternate Method

Given: Total strength = 50, Average salary of Managers = Rs. 48,000, Average salary of Supervisors = Rs. 42,000, Overall average = Rs. 44,400.

Formula: n1(A1 − A_(avg)) = n2(A_(avg) − A2)

=> Let number of Managers be 2x and Supervisors be 3x.

=> 2x + 3x = 50

=> 5x = 50

=> x = 10

=> Number of Supervisors = 3 × 10 = 30.

Therefore The correct answer is 30.

Additional Information

Weighted Average Formula

It is used to find the mean of groups with different sizes: A_(avg) = (n1a1 + n2a2) ÷ (n1 + n2).

Alligation Rule

Quantity of cheaper ÷ Quantity of dearer = (Rate of dearer − Mean rate) ÷ (Mean rate − Rate of cheaper).

Ratio Application

If a total quantity Q is divided in ratio a : b, the first part is (a ÷ (a+b)) × Q and the second part is (b ÷ (a+b)) × Q.

Q23. Answer: (d) Rs. 6,120

Shortcut Trick

Net Selling Price can be calculated directly using the multiplying factors for each discount.

Successive multipliers: 15% discount → 0.85 and 10% discount → 0.90

SP = 8000 × 0.85 × 0.90

SP = 6800 × 0.9 = 6120

Therefore The correct answer is Rs. 6,120.

Alternate Method

Given:

Marked Price (MP) = Rs. 8,000

First Discount (d1) = 15%
Second Discount (d2) = 10%
Calculations:
=> Price after the first discount = 8000 − (15% of 8000)
=> 8000 − (15/100 × 8000) = 8000 − 1200 = 6800
=> Final Selling Price after second discount = 6800 − (10% of 6800)
=> 6800 − (10/100 × 6800) = 6800 − 680 = 6120
Therefore The correct answer is Rs. 6,120.
Additional Information
Equivalent Discount Formula
For two successive discounts d1 and d2, the single equivalent discount is given by: d1 + d2 − (d1 × d2)/100.
Successive Discount Property
The order in which successive discounts are applied does not change the final Selling Price.
Marked Price & Profit Relationship
CP × (100 + P)% = MP × (100 − D)%, where P is profit percentage and D is discount percentage.

Q24. Answer: (d) 63

Shortcut Trick
Test the conditions using the given options.
Condition: 4 × (Sum of digits) = Reversed Number.
Check 63: Sum of digits = 6 + 3 = 9. Then, 4 × 9 = 36.
The reversed number of 63 is 36. The condition matches perfectly.
Difference between digits = 6 − 3 = 3. This also matches.
Therefore The correct answer is 63.
Alternate Method
Given: A two-digit number where 4 × (Sum of digits) = Reversed number and Digit difference = 3.
Formula: A two-digit number with tens digit x and units digit y is represented as 10x + y.
=> Let the tens digit be x and units digit be y.
=> According to the first condition: 4(x + y) = 10y + x
=> 4x + 4y = 10y + x
=> 3x = 6y => x = 2y
=> According to the second condition: |x − y| = 3
=> Substituting x = 2y: 2y − y = 3 => y = 3
=> Then, x = 2 × 3 = 6
=> Original Number = 10x + y = 10(6) + 3 = 63
Therefore The correct answer is 63.
Additional Information
Two-Digit Number Representation
Any two-digit number with digits a and b can be expressed as 10a + b. When digits are interchanged, the new number is 10b + a.
Difference between Original and Reversed Number
The difference between a 2-digit number and its reverse is always divisible by 9 and is equal to 9 × (a − b).
Sum of Original and Reversed Number
The sum of a 2-digit number and its reverse is always divisible by 11 and is equal to 11 × (a + b).

Q25. Answer: (a) 2 6/7 hours

Shortcut Trick
Total work (LCM of 12, 18, 24) = 72 units.
Efficiencies: Amit = 6, Bharat = 4, Chitra = 3.
Total efficiency = 6 + 4 + 3 = 13 units/hr.
Work done in 4 hr = 13 × 4 = 52 units.
Remaining work = 72 − 52 = 20 units.
Time for Bharat and Chitra = 20 ÷ (4 + 3) = 20 ÷ 7 = 2 6/7 hr.

Therefore The correct answer is 2 6/7 hr.

Alternate Method

Given:

Time taken by Amit = 12 hr

Time taken by Bharat = 18 hr

Time taken by Chitra = 24 hr

Time they worked together = 4 hr

Method: LCM Efficiency Table

Person	Days (hr)	Total Work	Efficiency (units/hr)
Amit	12	72 units	6
Bharat	18	4	
Chitra	24	3	

Calculations:

=> Total Efficiency of Amit, Bharat, and Chitra = 6 + 4 + 3 = 13 units/hr

=> Work completed in 4 hr = 13 × 4 = 52 units

=> Remaining work to be done = 72 − 52 = 20 units

=> Combined Efficiency of Bharat and Chitra = 4 + 3 = 7 units/hr

=> Time taken by Bharat and Chitra = Remaining Work ÷ Efficiency (B + C)

=> Time = 20 ÷ 7 = 2 6/7 hr

Therefore The correct answer is 2 6/7 hr.

Additional Information

Time and Efficiency Relationship

The time taken to complete a work is inversely proportional to the efficiency. If a person can do a work in 'n' days, their one day's work is 1/n.

Work and Wages

Wages are distributed among workers based on the ratio of the total work they have individually performed, which often simplifies to the ratio of their efficiencies if they work for the same duration.

Pipes and Cisterns

Concept similar to Time & Work, where an inlet pipe does positive work and an outlet/leakage pipe does negative work.

Q26. Answer: (a) 150√6 cm²

Shortcut Trick

Total ratio units = 5 + 6 + 7 = 18 units.

Given 18 units = 90 cm => 1 unit = 5 cm.

Sides of the triangle are 25 cm, 30 cm, and 35 cm.

Semi-perimeter (s) = 90 ÷ 2 = 45 cm.

Area = √[45 × (45−25) × (45−30) × (45−35)] = √[45 × 20 × 15 × 10] = 150√6 cm².

Therefore The correct answer is 150√6 cm².

Alternate Method

Given:

Ratio of sides = 5 : 6 : 7

Perimeter = 90 cm

Formula Used:

Heron's Formula: Area = √[s(s − a)(s − b)(s − c)]

Where s = (a + b + c) ÷ 2

Calculations:

=> Let the sides be 5x, 6x, and 7x.

=> 5x + 6x + 7x = 90

=> 18x = 90 => x = 5

=> Sides are: a = 25 cm, b = 30 cm, c = 35 cm

=> Semi-perimeter (s) = 90 ÷ 2 = 45 cm

=> Area = √[45 × (45 − 25) × (45 − 30) × (45 − 35)]

=> Area = √[45 × 20 × 15 × 10]

=> Area = √[9 × 5 × 4 × 5 × 3 × 5 × 2 × 5]

=> Area = √[9 × 4 × 25 × 25 × 6]

=> Area = 3 × 2 × 25 × √6

=> Area = 150√6 cm²

Therefore The correct answer is 150√6 cm².

Additional Information

Heron's Formula

It is used to find the area of any triangle when all three sides are known: Area = √[s(s−a)(s−b)(s−c)].

Semi-perimeter

The semi-perimeter (s) is half the perimeter of the triangle: s = (a + b + c) ÷ 2.

Types of Triangles

A triangle with all three sides of different lengths is called a Scalene Triangle.

Q27. Answer: (b) 33.33%

Shortcut Trick

Speed ratio (Original : Reduced) = 100 : 75 = 4 : 3.

Since distance is constant, Time ratio = Inverse of Speed ratio = 3 : 4.

Increase in time taken = 4 − 3 = 1 unit.

Percentage increase in time = (Increase ÷ Original Time) × 100 = (1 ÷ 3) × 100 = 33.33%.

Therefore The correct answer is 33.33%.

Alternate Method

Given:

Reduction in speed = 25%

Formula Used:

Distance = Speed × Time

When distance is constant, Speed1 × Time1 = Speed2 × Time2

Calculations:

=> Let the original speed be S and original time be T.

=> New speed (S') = S − (25% of S) = 0.75S.

=> Since distance (D) remains same: S × T = S' × T'

=> S × T = 0.75S × T'

=> T' = T ÷ 0.75 = T ÷ (3/4) = 4T ÷ 3

=> Increase in time taken = T' − T = (4T ÷ 3) − T = T ÷ 3

=> Percentage increase = ((T ÷ 3) ÷ T) × 100

=> Percentage increase = (1 ÷ 3) × 100 = 33.333...% ≈ 33.33%

Therefore The correct answer is 33.33%.

Additional Information

Inverse Variation

When one quantity is inversely proportional to another (like speed and time for a fixed distance), a decrease of x/(y+x) in one leads to an increase of x/y in the other.

Percentage Change Formula

Percentage change = ((Final Value − Initial Value) ÷ Initial Value) × 100. This applies to any metric like speed, time, or distance.

Constant Product Rule

If Speed × Time = Distance (Constant), then if speed is multiplied by a factor k, time must be multiplied by 1/k to keep the product constant.

Q28. Answer: (a) 18

Shortcut Trick

Total work = LCM(12, 28) = 84 units

Efficiency: A = 7, B = 3 (Total = 10 units/day)

Work done in 3 days = 10 × 3 = 30 units
Remaining work = 84 − 30 = 54 units
Time for B = 54 ÷ 3 = 18 days
Therefore The correct answer is 18 days.
Alternate Method
Given:
Time taken by A = 12 days
Time taken by B = 28 days
Both work together for = 3 days

Person	Days	Total Work	Efficiency
A	12	84	7
B	28	3	

Calculations:
=> Combined efficiency of A and B = 7 + 3 = 10 units/day
=> Work completed in 3 days = 10 × 3 = 30 units
=> Remaining work = Total Work − Work Done
=> Remaining work = 84 − 30 = 54 units
=> Time taken by B to complete remaining work = Remaining Work ÷ Efficiency of B
=> Time = 54 ÷ 3 = 18 days
Therefore The correct answer is 18 days.
Additional Information
Work and Efficiency Relationship
Efficiency is inversely proportional to the time taken to complete the work. Work = Efficiency × Time.
Pipes and Cisterns
This concept applies to filling tanks where inlet pipes have positive efficiency and outlet (leakage) pipes have negative efficiency.
Work and Wages
Wages are distributed based on the ratio of work done, which is (Efficiency × Time) for each individual.

Q29. Answer: (c) Manish is taller by 20 cm

Shortcut Trick
Ratio of Shyam : Manish = 7 : 8.
Given 7 units represent 140 cm.
Value of 1 unit = 140 ÷ 7 = 20 cm.
Since 8 > 7, Manish is taller by (8 − 7) = 1 unit.
Difference = 1 unit = 20 cm.
Therefore The correct answer is Manish is taller by 20 cm.
Alternate Method
Given:
Height of Shyam = 140 cm
Ratio of heights (Shyam : Manish) = 7 : 8
Calculations:
Let the common multiplier for the heights be x.
=> Height of Shyam = 7x
=> Height of Manish = 8x
=> 7x = 140
=> x = 140 ÷ 7 = 20
=> Height of Manish = 8 × 20 = 160 cm
=> Difference in height = 160 − 140 = 20 cm
Comparing the heights (160 cm > 140 cm), Manish is the taller person.
Therefore The correct answer is Manish is taller by 20 cm.

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Additional Information

Concept of Ratio

A ratio compares two quantities by division. If A : B = x : y, then A/x = B/y = Constant (k).

Direct Variation

When quantities are in a fixed ratio, an increase in one quantity leads to a proportional increase in the other.

Unitary Method in Ratios

To find the value of one ratio part, divide the actual total or specific value by its corresponding ratio units.

Q30. Answer: (d) 18 years

Shortcut Trick

In compound interest, if a sum becomes n times in t years, it becomes n^k times in k × t years.

Given: The investment triples (n = 3) in t = 6 years.

Target: Sum becomes 27 times => 3^3 times (here k = 3).

Required time = k × t = 3 × 6 = 18 years.

Therefore The correct answer is 18 years.

Alternate Method

Given: Initial time (t1) = 6 years, Initial growth (n1) = 3 times, Final growth (n2) = 27 times.

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

=> Case 1: 3P = P(1 + r/100)^6

=> 3 = (1 + r/100)^6 ... (i)

=> Case 2: 27P = P(1 + r/100)^t

=> 27 = (1 + r/100)^t

=> 3^3 = (1 + r/100)^t ... (ii)

=> Substituting (i) in (ii): $[(1 + r/100)^6]^3 = (1 + r/100)^t$

=> (1 + r/100)^(18) = (1 + r/100)^t

=> t = 18 years.

Therefore The correct answer is 18 years.

Additional Information

Compound Interest Growth Rule

If a sum becomes x times in T years, then it becomes x^n times in n × T years at the same compound interest rate.

Successive Growth

In compound interest, the amount grows geometrically. If it triples in the first 6 years, it will triple again (becoming 9 times) in the next 6 years, and triple once more (becoming 27 times) in the following 6 years.

Comparison with Simple Interest

In Simple Interest, growth is linear. If a sum triples in 6 years, the interest for 6 years is 2P. To become 27 times, the interest needed is 26P, which would take 13 × 6 = 78 years.

Q31. Answer: (c) Six

The correct answer is Six.

Key Points

• The Constitution of India originally provided for seven Fundamental Rights, but following the 44th Amendment Act, 1978, the Right to Property (Article 31) was removed from the list.

• Currently, there are six broad categories of Fundamental Rights enshrined in Part III of the Constitution, covering Articles 12 to 35.

• These rights are categorized as follows:

• Right to Equality: Spans from Article 14 to Article 18, ensuring equal treatment before the law and prohibiting discrimination.

• Right to Freedom: Includes Articles 19 to 22, providing protections regarding speech, expression, assembly, and personal liberty.

• Right against Exploitation: Covered under Articles 23 and 24, prohibiting human trafficking, forced labor, and child labor.

• Right to Freedom of Religion: Encompassed in Articles 25 to 28, guaranteeing the freedom to practice and manage religious affairs.

• Cultural and Educational Rights: Provided in Articles 29 and 30 to protect the interests of minorities and their educational institutions.

• Right to Constitutional Remedies: Detailed in Article 32, allowing citizens to move the Supreme Court for the enforcement of

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these rights.

Additional Information

• Magna Carta of India:

• Part III of the Indian Constitution is often referred to as the Magna Carta because it contains a long and comprehensive list of justifiable Fundamental Rights.

• The concept of Fundamental Rights in India was heavily influenced by the Bill of Rights of the Constitution of the USA.

• Article 32 and Dr. B.R. Ambedkar:

• Dr. B.R. Ambedkar described Article 32 as the soul and heart of the Constitution, as it provides the mechanism for protecting all other rights via Writs (Habeas Corpus, Mandamus, etc.).

• Distinction from Fundamental Duties:

• While there are six Fundamental Rights, there are eleven Fundamental Duties listed under Article 51A in Part IV-A, which were added by the 42nd Amendment Act, 1976.

• Suspension of Rights:

• Fundamental Rights can be suspended during a National Emergency, except for the rights guaranteed by Articles 20 and 21, which safeguard life and personal liberty.

Q32. Answer: (a) Walnut

The correct answer is Walnut.

Key Points

• Walnut (scientifically known as Juglans regia) is the primary tree species that sustains the world-renowned wood carving industry of Kashmir.

• The wood is highly valued for its strength, durability, and even grain, which allows artisans to perform highly intricate and delicate carvings without the wood splitting or cracking.

• In India, Walnut trees grow almost exclusively in the Himalayan region at altitudes ranging from 1500 to 3000 meters, specifically in Jammu and Kashmir, Himachal Pradesh, and Uttarakhand.

• The Kashmiri Walnut Wood Carving is a protected Geographical Indication (GI) craft, producing items such as jewelry boxes, screens, trays, and furniture which are exported globally.

• The wood is typically sourced from trees that are 70 to 100 years old, as the older wood provides the characteristic dark brown hue and rich textures sought by collectors.

Additional Information

• Deodar (Cedrus deodara):

• It is a coniferous tree and the State Tree of Himachal Pradesh.

• While it is widely used in the construction of Houseboats (Shikaras) and temples due to its rot-resistant properties, it is not the standard wood for fine handicraft carvings.

• Sal (Shorea robusta):

• A Tropical Deciduous species found mainly in the Terai region and Central India.

• It is one of the hardest timbers and is used for heavy construction, railway sleepers, and tool handles, but it does not grow in the high-altitude regions of Kashmir.

• Chir Pine (Pinus roxburghii):

• Found in the lower Himalayan altitudes, this tree is famous for the extraction of Resin and Turpentine.

• The wood is soft and used for packing cases and low-cost construction rather than premium handicraft products.

Q33. Answer: (b) acceleration

The correct answer is acceleration.

Key Points

• Acceleration is defined as the rate of change of velocity of an object with respect to time.

• The mathematical formula for acceleration (a) is expressed as the change in velocity (Δv) divided by the time interval (Δt), represented as $a = \Delta v / \Delta t$.

• The SI unit for velocity is meters per second (m/s), and the unit for time is seconds (s). Therefore, the unit for acceleration is calculated as (m/s) / s, which simplifies to m/s^2 or meters per second squared.

• As a vector quantity, acceleration possesses both magnitude and direction, indicating how fast the velocity changes and in which direction the change occurs.

• According to Newton's Second Law of Motion, acceleration is directly proportional to the net force acting on an object and inversely proportional to its mass ($a = F/m$).

Additional Information

• Force:

• It is an influence that can change the state of motion of an object, measured in Newtons (N).

• In base SI units, one Newton is equivalent to 1 kg×m/s².

• Velocity:

• It refers to the rate of change of displacement in a specific direction.

• The standard SI unit for velocity is meters per second (m/s).

• Energy:

• It represents the capacity for doing work and exists in various forms like kinetic and potential energy.

• The SI unit for energy is the Joule (J), which is defined as 1 kg×m²/s².

Q34. Answer: (d) Nitrogen and phosphorus

The correct answer is Nitrogen and phosphorus.

Key Points

• Eutrophication is a natural or anthropogenic process where a water body becomes excessively enriched with minerals and nutrients, leading to the overgrowth of plants and algae.

• Nitrogen (N) and Phosphorus (P) are the primary limiting nutrients in aquatic ecosystems; their availability determines the rate of biological productivity in lakes and ponds.

• The excessive influx of these nutrients, primarily through agricultural runoff (containing NPK fertilizers), untreated domestic sewage, and industrial effluents, triggers rapid Algal Blooms.

• When these large masses of algae die, they are decomposed by aerobic bacteria, a process that consumes vast amounts of Dissolved Oxygen (DO), leading to a condition known as Hypoxia.

• High levels of Nitrogen (in the form of nitrates) and Phosphorus (as phosphates) significantly increase the Biochemical Oxygen Demand (BOD), eventually causing the death of fish and other aerobic aquatic organisms.

Additional Information

• Nutrient Sources:

• Point Sources: Direct discharge from wastewater treatment plants and factories through pipes.

• Non-point Sources: Diffuse pollution from farmlands where rain washes fertilizers into nearby water bodies.

• Silica:

• Silica is a vital nutrient for Diatoms (a type of algae with glass-like cell walls), but it is generally not the driver of the systemic ecological degradation defined as eutrophication.

• Calcium Carbonate:

• Commonly associated with water hardness and the formation of limescale; it can act as a pH buffer but does not stimulate the rapid biomass production seen with nitrates and phosphates.

• Lake Classification:

• Oligotrophic: Lakes with low nutrient levels, high transparency, and high oxygen content.

• Eutrophic: Lakes with high nutrient levels, low transparency, and frequent oxygen depletion.

Q35. Answer: (c) Frequent urination

The correct answer is Frequent urination.

Key Points

• Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia, where blood glucose levels remain consistently high due to either insulin deficiency or resistance.

• Frequent urination, medically termed polyuria, occurs when blood sugar levels exceed the renal threshold, which is typically around 180 mg/dL.

• When the kidneys cannot reabsorb all the filtered glucose, the excess sugar is excreted into the urine; this creates an osmotic gradient that pulls large amounts of water from the body tissues, a process known as osmotic diuresis.

• The increased volume of urine leads to significant dehydration, which in turn triggers polydipsia, or extreme thirst, to compensate for the fluid loss.

• This symptom is one of the 'classic three' early indicators of diabetes, alongside polyphagia (excessive hunger) and polydipsia.

Additional Information

• Clarification of other symptoms and complications:

• Polydipsia: This is the medical term for increased thirst; it is a direct consequence of polyuria as the body seeks to restore homeostasis and fluid balance.

• Hair loss: Rather than increased hair growth, diabetics may experience thinning hair or alopecia due to poor microcirculation and hormonal stress.

• Hearing impairment: While not a primary diagnostic symptom, chronic hyperglycemia can damage the tiny blood vessels and nerves in the inner ear over time.

• Type 1 vs. Type 2: In Type 1 diabetes, the body produces no insulin (autoimmune), while in Type 2, the body becomes resistant to insulin; both result in polyuria as an early sign.

• Ketones: In some cases, high glucose levels lead to the production of ketones, which can be detected in the urine alongside sugar, indicating diabetic ketoacidosis.

Q36. Answer: (c) 70% and 30%

The correct answer is 70% and 30%.

Key Points

• The Haj Policy 2025 is formulated by the Ministry of Minority Affairs, Government of India, to streamline the pilgrimage process in accordance with the bilateral agreement with the Kingdom of Saudi Arabia (KSA).

• As per the official guidelines, the total quota of seats allocated to India is split between two primary channels: the Haj Committee of India (HCoI) and the Haj Group Organisers (HGOs).

• The policy stipulates that 70% of the total seats are reserved for the Haj Committee of India (HCoI), which is responsible for making arrangements for pilgrims through government-regulated channels.

• The remaining 30% of the total seats are allocated to the Haj Group Organisers (HGOs), providing an alternative for pilgrims who prefer private tour operators for their travel and stay.

• This ratio ensures that the majority of the quota remains accessible through the HCoI, which often offers more standardized and subsidized pricing compared to private entities.

• Selection for the HCoI quota is conducted through a Digitalized Random Selection (e-ballet) process if the number of applicants exceeds the available seats.

Additional Information

• Ministry of Minority Affairs:

• It serves as the nodal agency for all Haj related matters in India, coordinating with the Ministry of External Affairs and the Ministry of Civil Aviation.

• The ministry ensures the implementation of the Haj Committee Act, 2002, which governs the administrative structure of the pilgrimage.

• Haj Committee of India (HCoI):

• It is a statutory body that manages logistics such as embarkation points, vaccination, and accommodation in Makkah and Madinah.

• The Haj Suvidha App has been integrated into the 2025 policy to provide digital assistance and transparent grievance redressal for pilgrims.

• Haj Group Organisers (HGOs):

• These are registered private entities categorized based on their experience and service standards to ensure quality control.

• The HGO quota allows for personalized services and premium accommodation options for those choosing to travel outside the government-managed pool.

Therefore, the correct option is (3).

Q37. Answer: (a) Feeding 1.4 billion people while improving farmers' incomes

The correct answer is Feeding 1.4 billion people while improving farmers' incomes.

Key Points

• The National Agricultural Policy (NAP) was announced by the Government of India on July 28, 2000, marking the first time a comprehensive policy framework was established specifically for the agricultural sector to address the challenges of the 21st century.

• The primary focus of the policy was to achieve food and nutritional security for the country's massive population, which has now grown toward 1.4 billion, by ensuring the sustainable use of natural resources.

• The policy aimed at achieving a growth rate of over 4% per annum in the agriculture sector through a strategy of 'growth with equity', ensuring that the benefits of development reach all regions and all classes of farmers.

• It emphasized improving farmers' incomes by shifting the focus from mere production targets to the economic well-being of the farming community, encouraging value addition and agro-processing.

• The policy sought to provide technological, environmental, and economic support to farmers to help them face the challenges posed by globalization and the World Trade Organization (WTO) regime.

Additional Information

• Rainbow Revolution:

• The NAP 2000 envisioned a Rainbow Revolution, which is an integrated development of various agricultural sectors including

the Green Revolution (Cereals), White Revolution (Milk), Yellow Revolution (Oilseeds), Blue Revolution (Fisheries), and Golden Revolution (Horticulture).

• It aimed at the holistic development of the entire agriculture and allied sectors to ensure diversified income streams for rural households.

• Sustainable Agriculture:

• The policy prioritized the conservation of biodiversity and the sustainable management of land, water, and genetic resources.

• It promoted Integrated Pest Management (IPM) and Integrated Nutrient Management (INM) to reduce the ecological footprint of intensive farming.

• Institutional Reforms:

• Emphasis was placed on strengthening rural credit institutions and the Kisan Credit Card (KCC) scheme to provide timely and adequate credit to farmers.

• It advocated for land reforms, such as the consolidation of holdings and the protection of the rights of tenant farmers and sharecroppers.

Q38. Answer: (b) Indonesia

The correct answer is Indonesia.

Key Points

• The 17th BRICS Summit was hosted by Brazil in 2025, following the Russian Presidency in 2024. This summit served as a critical platform for formalizing the membership of countries that had previously expressed interest or held Partner Country status.

• Indonesia, the largest economy in Southeast Asia and a key member of ASEAN, officially joined the bloc as a full member during this summit. This move significantly bolstered the Global South's representation within the group, reflecting Indonesia's growing geopolitical and economic influence.

• The decision to join was accelerated under the administration of President Prabowo Subianto, who emphasized a 'non-aligned' yet proactive foreign policy. By joining BRICS, Indonesia aimed to diversify its international partnerships and strengthen its voice in global governance reforms.

• The inclusion of Indonesia adds a massive consumer market and a resource-rich economy to the bloc, contributing to BRICS goals of de-dollarization and the use of local currencies in cross-border trade.

Additional Information

• BRICS Expansion Phases:

• Initial Expansion (2010): South Africa joined the original BRIC (Brazil, Russia, India, China) group.

• Second Major Expansion (2024): At the beginning of 2024, Egypt, Ethiopia, Iran, and the United Arab Emirates (UAE) became full members.

• Partner Country Framework: Introduced during the 16th Summit in Kazan (2024), this framework allowed nations like Indonesia, Malaysia, and Vietnam to engage with the bloc before full accession.

• Geopolitical Impact:

• Indonesia's GDP: With a GDP exceeding 1 trillion USD, Indonesia brings substantial economic weight, ranking among the top economies in the world by Purchasing Power Parity (PPP).

• Strategic Autonomy: Indonesia's membership is seen as a balancing act, as the country also pursues membership in the OECD, showcasing its intent to maintain strategic autonomy between different global economic clusters.

Q39. Answer: (c) Kiran Desai

The correct answer is Kiran Desai.

Key Points

• Kiran Desai is the celebrated Indian novelist who was shortlisted for the prestigious 2025 Booker Prize for her novel titled The Loneliness of Sonia and Sunny.

• The novel marks a significant literary return for Desai, exploring profound themes of modern companionship, urban isolation, and the evolving nature of personal identity in a globalized landscape.

• The Booker Prize is one of the most distinguished literary awards in the world, specifically honoring the best sustained work of fiction written in English and published in the UK and Ireland.

• Desai previously achieved international acclaim by winning the Man Booker Prize in 2006 for her second novel, The Inheritance of Loss, which also won the National Book Critics Circle Fiction Award.

• Her shortlisting in 2025 reaffirms her status as a leading voice in Indian English Literature and highlights the enduring relevance of her narrative style and thematic depth.

Additional Information

• Arundhati Roy:

• She was the first Indian citizen to win the Booker Prize in 1997 for her debut novel, The God of Small Things.

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• Her literary work is often characterized by its lyrical prose and sharp critique of social hierarchies and caste systems in India.

• Amish Tripathi:

• Known primarily for his mythological fiction, such as the Shiva Trilogy and the Ram Chandra Series.

• His works focus on reimagining Indian legends and deities through a modern, fast-paced narrative lens.

• Vikram Sampath:

• A prominent Indian historian and author, recognized for his exhaustive biographies and non-fiction research.

• He is a Fellow of the Royal Historical Society and has written extensively on figures like V.D. Savarkar and the history of Indian Classical Music.

Q40. Answer: (d) Participatory Gram Sabha-based planning

The correct answer is Participatory g Sabha-based planning.

Key Points

• The People's Plan Campaign (PPC), also known as Sabki Yojana, Sabka Vikas, was launched nationwide on October 2, 2018, to facilitate the systematic preparation of development plans by rural local bodies.

• The core approach is Participatory Planning, which empowers the Gram Sabha (village assembly) to identify local needs, prioritize developmental works, and manage resources effectively for the upcoming financial year.

• It aims to strengthen rural governance by ensuring that the Gram Panchayat Development Plan (GPDP) is not just an administrative document but a community-led blueprint for social and economic justice.

• The campaign utilizes data from the Mission Antyodaya survey to identify critical gaps in infrastructure and services, ensuring that resource allocation is evidence-based and targets the most deprived households.

• Under this initiative, Gram Sabhas discuss and plan for the 29 subjects listed in the Eleventh Schedule of the Indian Constitution, such as agriculture, health, sanitation, and primary education.

• The process promotes accountability and transparency by involving local stakeholders, Self-Help Groups (SHGs), and front-line workers in the decision-making cycle.

Additional Information

• Gram Panchayat Development Plan (GPDP):

• The GPDP is a decentralized planning process mandated under the 73rd Constitutional Amendment Act, allowing Panchayats to function as institutions of self-government.

• It integrates funds from the 15th Finance Commission, MGNREGA, and other centrally sponsored schemes to achieve Sustainable Development Goals (SDGs) at the village level.

• Contrasting Approaches:

• Centralized expenditure control: This refers to a top-down model where financial decisions are made at the state or national level, which is the opposite of the Democratic Decentralization promoted by the PPC.

• Corporate-led rural investments: While private sector involvement exists in infrastructure, the PPC is fundamentally a Public-Led participatory exercise focused on social welfare and community ownership.

Q41. Answer: (b) Mamluk dynasty

The correct answer is Mamluk dynasty.

Key Points

• The Iqta system was a significant administrative and agrarian reform introduced in India by Shams-ud-din Iltutmish, who was the third ruler of the Mamluk dynasty (also known as the Slave dynasty), reigning from 1211 to 1236.

• Under this system, the Delhi Sultanate was divided into various territorial units called Iqtas, which were assigned to military officers and nobles in place of cash salaries for their services to the state.

• The primary objective of introducing this system was to institutionalize the land revenue collection process and to provide a stable financial base for the standing army and the central bureaucracy.

• The holders of these land grants, known as Iqtadars or Muqtis, were tasked with collecting taxes from the peasants, maintaining law and order, and providing a stipulated number of troops to the Sultan during times of war.

• By introducing the Iqta system, Iltutmish successfully centralized the administration and integrated distant provinces into the Delhi Sultanate, effectively curbing the influence of local hereditary chieftains.

Additional Information

• Khilji dynasty:

• Alauddin Khilji (1296−1316) introduced drastic reforms by converting small Iqtas into Khalisa (crown land) to bring revenue directly to the royal treasury.

• He abolished the intermediary roles of local officials like Khuts and Muqaddams to prevent tax evasion and corruption.

• Tughlaq dynasty:

• Firoz Shah Tughlaq reversed previous centralization efforts by making the Iqta system hereditary, which eventually weakened the central authority of the Delhi Sultanate.

• This period saw the proliferation of land grants to the Ulema and military officers as a means to secure political loyalty.

• Sayyid dynasty:

• Established by Khizr Khan in 1414, this dynasty ruled over a much-diminished territory following the devastation caused by the invasion of Timur in 1398.

Q42. Answer: (d) Mass communication

The correct answer is Mass communication.

Key Points

• Pragati Maidan is the premier exhibition and convention center of India, located in the capital city of New Delhi, and was inaugurated in 1972 to commemorate the silver jubilee of Indian independence.

• In the classification of human interaction, exhibitions and fairs are considered vital tools of Mass communication because they provide a platform to reach a large, diverse audience simultaneously with specific information, products, or cultural messages.

• The venue is most famous for hosting the India International Trade Fair (IITF), an annual event that serves as a massive medium for publicity, propaganda, and the exchange of commercial information between manufacturers and the general public.

• By providing a physical space where information is disseminated through stalls, displays, and seminars to millions of visitors, Pragati Maidan facilitates non-electronic mass media interaction.

• The center helps in the socialization and informational awareness of the masses, which are core functions of Mass communication systems in any developing economy.

Additional Information

• Mass Communication:

• It is the process of creating, sending, receiving, and analyzing messages to large audiences via verbal and written media.

• Traditional forms include Newspapers, Radio, Television, and Cinema, while modern forms include Fairs, Exhibitions, and the Internet.

• India Trade Promotion Organisation (ITPO):

• The managing body of Pragati Maidan, it functions as the nodal agency under the Ministry of Commerce and Industry for promoting India's external trade.

• It organizes various trade fairs in India and abroad to enhance brand visibility of Indian products.

• Bharat Mandapam:

• The newly developed, world-class International Exhibition-cum-Convention Centre (IECC) complex at Pragati Maidan.

• It gained international recognition for hosting the 18th G20 Summit in September 2023, showcasing India's capability in hosting global diplomatic communication events.

Q43. Answer: (c) Assam

The correct answer is Assam.

Key Points

• Bihu is the most significant socio-cultural festival of Assam, deeply intertwined with the state's agricultural calendar and ethnic identity.

• The festival is celebrated thrice a year, marking different stages of the paddy cultivation cycle.

• Bohag Bihu, also known as Rongali Bihu, is celebrated in mid-April. It marks the Assamese New Year and the arrival of the seeding season.

• Magh Bihu, or Bhogali Bihu, is observed in mid-January. It is a harvest festival characterized by community feasts and the burning of Mejis (structures made of bamboo and thatch).

• Kati Bihu, or Kongali Bihu, takes place in mid-October. It is a more solemn occasion involving the lighting of lamps to pray for a good harvest during the sapling growth phase.

Additional Information

• Cultural Symbols of Assam:

• Bihu Dance: A traditional folk dance performed by both men and women, featuring rapid hand movements and rhythmic swaying of the hips.

• Gamosa: A white rectangular piece of cloth with red borders, gifted during Bihu as a mark of respect and affection.

• Musical Instruments: The celebrations feature the Dhol (drum), Pepa (horn made from buffalo horn), Gogona, and Taal.

• Other States/UTs:

• Andaman and Nicobar Islands: Known for the Island Tourism Festival and various tribal celebrations.

• Chhattisgarh: Notable for festivals like Bastar Dussehra, Hareli, and Madai.

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• Lakshadweep: Major festivals include Eid-ul-Fitr, Bakrid, and Milad-un-Nabi, reflecting its unique cultural heritage.

Q44. Answer: (c) Coordinating hardware and running core system processes

The correct answer is Coordinating hardware and running core system processes.

Key Points

• System Software refers to the collection of programs that manage and support the computer system's resources and operations, acting as a bridge between the Hardware and Application Software.

• A primary example of system software is the Operating System (OS), which is responsible for Processor Management. It uses scheduling algorithms to allocate CPU time to various tasks, ensuring the system remains responsive.

• Hardware Coordination is achieved through Device Drivers and Firmware, which provide the necessary instructions for the OS to communicate with peripheral devices like Graphics Cards, Hard Drives, and Input/Output devices.

• Core System Processes involve critical background functions such as Memory Management, which monitors RAM usage, and File System Management, which controls how data is stored and retrieved from the disk using structures like NTFS or ext4.

• Unlike application software, which is triggered by user demand, system software usually starts during the Booting Process (via the BIOS/UEFI) and runs continuously to maintain the stability and integrity of the entire computational environment.

Additional Information

• Application Software:

• These are programs designed to perform specific user-centric tasks. Examples include Media Players (playing audio/video), Word Processors (managing documents), and Spreadsheet Software (designing data sheets).

• They do not have direct access to the Hardware; instead, they make requests to the system software to use system resources.

• Language Translators:

• Considered a type of system software, Compilers, Interpreters, and Assemblers translate high-level programming languages into Machine Code that the Central Processing Unit can execute.

• Utility Software:

• Often bundled with the OS, utilities include Disk Defragmenters, Encryption Tools, and Antivirus Software, which help in the maintenance, optimization, and protection of the computer system.

Q45. Answer: (c) Nritta

The correct answer is Nritta.

Key Points

• Nritta is defined in the Natyashastra, an ancient Sanskrit treatise attributed to Sage Bharata, as a form of 'pure dance' that focuses on rhythmic precision and technical virtuosity.

• It is characterized by the absence of Abhinaya (mimetic expression), meaning the dancer does not attempt to convey a specific story, sentiment, or thematic narrative through facial expressions.

• The performance is composed of Karanas (basic dance units) and Angaharas (combinations of Karanas) that emphasize the aesthetic beauty of the human form in motion.

• The movements in Nritta are strictly governed by Tala (rhythmic cycles) and Laya (tempo), utilizing footwork and stylized hand gestures solely for decorative and rhythmic purposes.

Additional Information

• Nritya:

• Unlike Nritta, Nritya is an expressive dance form that combines rhythmic movement with Abhinaya.

• It aims to evoke Rasa (aesthetic flavor) in the audience by portraying Bhavas (emotions) and specific meanings through hand gestures and facial movements.

• Natya:

• This term refers to the dramatic element or the theatrical aspect of a performance.

• It involves a plot, characters, and often Vachika Abhinaya (speech or dialogue) to enact a full story or play.

• Kuchipudi:

• A classical dance form originating from Andhra Pradesh, which integrates all three elements: Nritta, Nritya, and Natya.

• It is well-known for its Tarangam segment, where the dancer performs while balancing on the edges of a brass plate.

Q46. Answer: (d) Objectives Resolution

The correct answer is Objectives Resolution.

Key Points

• The Objectives Resolution was a historic document moved by Pandit Jawaharlal Nehru in the Constituent Assembly on December 13, 1946, which provided the ideological basis for the Constitution.

• It laid down the fundamentals and philosophy of the constitutional structure, envisioning India as an Independent Sovereign Republic where all power and authority are derived from the people.

• The resolution guaranteed to all Indian citizens social, economic, and political justice; equality of status and opportunity; and freedom of thought, expression, belief, faith, and worship.

• It included specific safeguards for minorities, backward and tribal areas, and depressed and other backward classes to ensure inclusive democratic development.

• The Constituent Assembly unanimously adopted the resolution on January 22, 1947, and its essence was subsequently distilled into the Preamble of the Indian Constitution with minor modifications.

Additional Information

• Fundamental Rights:

• These are enshrined in Part III of the Constitution (Articles 12 − 35).

• They are justiciable in nature and are meant for promoting the ideal of political democracy.

• The concept was inspired by the Bill of Rights of the USA.

• Directive Principles of State Policy (DPSP):

• These are enumerated in Part IV (Articles 36 − 51) and were borrowed from the Irish Constitution.

• They are non-justiciable but are fundamental in the governance of the country, aimed at establishing a welfare state.

• The Preamble:

• It serves as the identity card of the Constitution, reflecting its spirit and objectives.

• It was amended by the 42nd Amendment Act, 1976, which added three new words: Socialist, Secular, and Integrity.

Q47. Answer: (c) Capture of Calcutta and attack on British factories by Siraj-ud-Daulah

The correct answer is Capture of Calcutta and attack on British factories by Siraj-ud-Daulah.

Key Points

• The confrontation began when Siraj-ud-Daulah, who became the Nawab of Bengal in 1756, ordered the British East India Company to stop the unauthorized fortification of Calcutta.

• The British refusal to comply and their perceived interference in the internal politics of Bengal provoked the Nawab to take military action against them.

• In June 1756, the Nawab's forces launched a successful assault on the British factory at Kassim Bazar and subsequently captured Fort William in Calcutta.

• The fall of Calcutta and the controversial Black Hole Tragedy served as the immediate casus belli, leading the Madras Presidency to dispatch a retaliatory force under Robert Clive and Admiral Watson.

• The military expedition to recover Calcutta escalated into a full-scale conflict, eventually resulting in the decisive Battle of Plassey on June 23, 1757.

Additional Information

• Abuse of Dastaks:

• This refers to the misuse of duty-free trade permits (dastaks) by British officials for their private trade, which severely impacted the Bengal state treasury.

• While this was a significant long-term grievance that soured relations, it was the military capture of Calcutta that directly triggered the 1757 military confrontation.

• Battle of Plassey (1757):

• The battle saw the defeat of Siraj-ud-Daulah due to the betrayal of his commander, Mir Jafar, who had made a secret pact with Robert Clive.

• This victory established the British East India Company as a major political power in India and marked the beginning of colonial rule in Bengal.

• Treaty of Alinagar:

• Signed in February 1757 after Robert Clive recaptured Calcutta, this treaty briefly restored British privileges but failed to prevent the final showdown at Plassey.

Q48. Answer: (a) Cristiano Ronaldo

The correct answer is Cristiano Ronaldo.

Key Points

• Cristiano Ronaldo officially became the player with the most wins in international football history, reaching a milestone of 132 victories with the Portugal national team.

• The record-breaking 132nd win occurred on November 15, 2024, during a UEFA Nations League group stage match where Portugal defeated Poland with a score of 5-1.

• In this specific match, Ronaldo also contributed significantly by scoring two goals, including a spectacular overhead kick, further cementing his status as the all-time leading goalscorer in men's international football.

• By achieving 132 wins, he surpassed the previous world record of 131 wins held by his former Real Madrid teammate and Spanish legendary defender Sergio Ramos.

• The Guinness World Records recognized this feat in 2025, adding to Ronaldo's extensive collection of certifications, which include records for most international goals and being the most-capped male player in football history with over 215 appearances.

• Ronaldo's international career, which began in 2003, has spanned over two decades, during which he led Portugal to victory in UEFA Euro 2016 and the inaugural UEFA Nations League in 2019.

Additional Information

• Sergio Ramos:

• A legendary defender for Spain, he held the record for the most international wins (131) for several years.

• He was a pivotal part of the Spanish Golden Generation that won the 2010 FIFA World Cup and consecutive European Championships in 2008 and 2012.

• Lionel Messi:

• The Argentine captain has secured over 115 wins in international football, trailing behind Ronaldo and Ramos.

• He led Argentina to the 2022 FIFA World Cup title and back-to-back Copa América triumphs in 2021 and 2024.

• UEFA Nations League:

• An international association football competition contested by the senior men's national teams of the member associations of UEFA, the sport's European governing body.

Q49. Answer: (a) 19

The correct answer is 19.

Key Points

• The Central Administrative Tribunal (CAT) was established under Article 323A of the Constitution of India, a provision added by the 42nd Amendment Act, 1976, to adjudicate disputes regarding the recruitment and conditions of service of public servants.

• The tribunal functions under the statutory framework of the Administrative Tribunals Act, 1985, which grants the Central Government the authority to set up benches across the country for administrative convenience.

• As of the current structural organization, there are a total of 19 benches operating across India. These include the Principal Bench located in New Delhi and 18 regional benches situated in various states.

• The expansion to 19 benches was finalized with the operationalization of the Jammu Bench in June 2020 and the Srinagar Bench in July 2021, ensuring specialized service dispute resolution for the Union Territory of Jammu and Kashmir and the Union Territory of Ladakh.

• Apart from the Principal Bench, other locations include Ahmedabad, Allahabad, Bengaluru, Chandigarh, Chennai, Cuttack, Ernakulam, Guwahati, Hyderabad, Jabalpur, Jaipur, Jodhpur, Kolkata, Lucknow, Mumbai, Patna, Jammu, and Srinagar.

Additional Information

• Composition of the Tribunal:

• The CAT is a multi-member body consisting of a Chairperson and several Members. The Chairperson is usually a sitting or retired Judge of a High Court.

• Each bench comprises both Judicial Members and Administrative Members to ensure that legal expertise is combined with a deep understanding of governmental administrative processes.

• Jurisdiction and Powers:

• The tribunal exercises original jurisdiction over all service matters concerning employees of the Central Government, Union Territories, and notified Public Sector Undertakings (PSUs) or Autonomous Bodies.

• It is not bound by the technicalities of the Code of Civil Procedure, 1908, but is guided by the principles of natural justice, making the process faster and more flexible for employees.

• Appeals against the orders of the CAT can be made before the Division Bench of the respective High Court, as established by the Supreme Court in the L. Chandra Kumar case (1997).

Q50. Answer: (c) (i) True, (ii) False

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

Key Points

• The First Generation of Computers (roughly 1940−1956) relied on Vacuum Tubes for circuitry and Magnetic Drums for memory. These machines, such as the ENIAC and UNIVAC, were physically massive, often occupying entire rooms, and generated extreme amounts of heat, which frequently caused hardware failures. Hence, statement (i) is correct.

• The Second Generation of Computers (roughly 1956−1963) was characterized by the replacement of vacuum tubes with the Transistor. This technological shift did not make computers larger or slower; rather, it allowed them to become significantly

smaller, faster, cheaper, and more energy-efficient than their predecessors. Hence, statement (ii) is incorrect.

Additional Information

• First Generation (Vacuum Tubes):

• These computers used Machine Language (binary code) for programming.

• They were extremely expensive to operate and consumed vast amounts of electricity.

• The ENIAC contained approximately 18,000 vacuum tubes and weighed over 30 tons.

• Second Generation (Transistors):

• The Transistor was invented at Bell Labs in 1947 but saw widespread use in computers in the mid-1950s.

• This era saw the development of early high-level programming languages like COBOL and FORTRAN.

• Computers moved from using magnetic drums to magnetic core technology for primary memory.

Q51. Answer: (b) Seva dals and tufan dals

The correct answer is Seva dals and tufan dals.

Key Points

• The Prati Sarkar, or the Parallel Government, was established in the Satara district of Maharashtra as a powerful act of resistance during the Quit India Movement of 1942.

• It was spearheaded by prominent leaders such as Krantisinh Nana Patil, G.D. Bapu Lad, and Nathaji Lad, who aimed to liberate the region from British colonial rule by setting up a self-sustaining local administration.

• The volunteer force of this parallel government was primarily organized into two specific groups: the Seva Dals and the Tufan Dals.

• The Seva Dals functioned as village-level service units responsible for social welfare, implementing reformative policies, and maintaining civil administration.

• The Tufan Dals (also known as Tufan Sena) served as the specialized armed wing or revolutionary army that protected the movement, conducted raids on British communications, and enforced the laws of the parallel government.

• This administrative structure effectively paralyzed the British Raj in over 600 villages, creating a functional alternative that provided swift justice and economic security to the local populace.

Additional Information

• Krantisinh Nana Patil:

• A legendary revolutionary hero who led the Satara Prati Sarkar and was later elected to the Lok Sabha in 1957. He was renowned for his underground activities and for inspiring the rural masses against imperialist oppression.

• Administrative Features:

• The Prati Sarkar established Nyayadan Mandals (peoples courts) to settle disputes locally, effectively boycotting the British legal system and reducing the influence of oppressive landlords and moneylenders.

• Quit India Movement Context:

• Launched in August 1942 after the failure of the Cripps Mission, this movement saw the rise of several parallel governments across India, including those in Tamluk (Midnapore) and Talcher (Odisha).

Therefore, the correct answer is Seva dals and tufan dals.

Q52. Answer: (b) By the members of the Vidhan Sabha

The correct answer is By the members of the Vidhan Sabha.

Key Points

• According to Article 178 of the Constitution of India, every Legislative Assembly (Vidhan Sabha) of a State must choose two of its members to be the Speaker and Deputy Speaker.

• The Speaker is elected from amongst the elected members of the Vidhan Sabha itself, ensuring that the presiding officer is a representative of the House.

• The election process typically occurs during the first session of a newly constituted assembly after a General Election.

• The process is conducted through a simple majority, where the candidate who secures more than half the votes of the members present and voting is declared elected.

• The Speaker Pro-tem, who is usually the senior-most member of the house appointed by the Governor, presides over the initial proceedings and the election of the permanent Speaker.

• The Speaker must vacate their office if they cease to be a member of the Vidhan Sabha, ensuring the position remains strictly within the legislative body.

Additional Information

• Role of the Governor:

• The Governor does not elect the Speaker but is responsible for fixing the date of the election and administering the oath to the

Speaker Pro-tem.

• Powers and Functions of the Speaker:

• Maintenance of Order: The Speaker is the guardian of the powers and privileges of the members and the house, maintaining decorum during debates.

• Casting Vote: Under normal circumstances, the Speaker does not vote; however, they exercise a casting vote in the event of a tie to resolve a deadlock.

• Money Bills: The Speaker has the final authority to certify whether a bill is a Money Bill, and their decision is final and cannot be challenged in court.

• Anti-Defection Law: Under the Tenth Schedule of the Constitution, the Speaker has the power to disqualify members on grounds of defection.

• Resignation:

• The Speaker can resign at any time by submitting a resignation letter specifically addressed to the Deputy Speaker of the Vidhan Sabha.

Q53. Answer: (d) Jannik Sinner

The correct answer is Jannik Sinner.

Key Points

• Jannik Sinner successfully defended his title at the 2025 Australian Open, marking his second consecutive Grand Slam victory at Melbourne Park.

• The final match took place on January 26, 2025, at the Rod Laver Arena, where Sinner faced the German player Alexander Zverev.

• The Italian star won the championship in straight sets with a scoreline of 6-4, 7-6(5), 6-3, showcasing his dominance on the hard-court surface.

• With this victory, Sinner solidified his position as the ATP World No. 1, becoming one of the few players in the modern era to win back-to-back titles in Melbourne.

• His journey to the 2025 title involved defeating several top-ten opponents, further establishing his era of dominance in men's professional tennis following his initial breakthrough in 2024.

Additional Information

• Alexander Zverev:

• He is a high-ranking German professional who reached the 2025 Australian Open final, marking his strongest performance at the tournament.

• Zverev is a two-time ATP Finals champion and an Olympic Gold Medalist (Tokyo 2020).

• Taylor Fritz:

• A leading American tennis player who reached the latter stages of the 2025 draw, maintaining his status as the top-ranked player from the United States.

• Jack Draper:

• A rising star from Great Britain who achieved a career-best Grand Slam run during the 2025 season, known for his powerful left-handed game.

• Australian Open:

• Known as the Happy Slam, it is the first of the four annual Grand Slam events and is played on GreenSet acrylic hard courts at Melbourne Park.

• The 2025 edition was the 113th installment of the tournament, featuring a record-breaking attendance and prize pool.

Q54. Answer: (c) SpaDeX

The correct answer is SpaDeX.

Key Points

• The Indian Space Research Organisation (ISRO) successfully conducted the Space Docking Experiment (SpaDeX) in January 2025, marking a historic milestone in India's space exploration journey.

• This mission involved two spacecraft, a Chaser and a Target, which were launched together and then programmed to autonomously find, approach, and dock with each other in Low Earth Orbit (LEO).

• With the success of SpaDeX, India became only the fourth nation in the world to demonstrate autonomous docking capabilities, joining the ranks of the USA, Russia, and China.

• The docking technology is fundamental for building the Bharatiya Antariksha Station (BAS), as it allows various modules of the space station to be launched separately and joined in orbit.

• The mission was launched using the PSLV-C60 rocket, and the docking occurred at an altitude of approximately 450 kilometers above the Earth's surface.

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Additional Information

• NISAR:

• It stands for NASA-ISRO Synthetic Aperture Radar, a joint Earth-observation mission.

• Its primary goal is to use dual-frequency radar to monitor ecosystem disturbances, ice-sheet collapse, and natural hazards like earthquakes and tsunamis.

• Gaganyaan-1:

• This is the first uncrewed test flight of India's human spaceflight program.

• It serves to validate the performance of the Launch Vehicle Mark-3 (LVM3) and the safety systems of the Crew Module.

• Chandrayaan-4:

• A planned lunar sample return mission that will follow the successful Chandrayaan-3.

• This mission will utilize docking technology in lunar orbit to transfer collected moon rocks from a lander to a return module.

Q55. Answer: (c) Article 100

The correct answer is Article 100.

Key Points

• Article 100 of the Constitution of India specifically addresses the procedures for voting in the Houses, the power of Houses to act despite vacancies, and the requirements for a quorum.

• According to Article 100(3), until Parliament provides otherwise by law, the quorum to constitute a meeting of either the Lok Sabha or the Rajya Sabha is fixed at one-tenth of the total number of members of that House.

• A quorum is the minimum number of members required to be present for the House to legally conduct its official business and proceedings.

• The Constitution further mandates under Article 100(4) that if at any time during a meeting there is a lack of quorum, it is the duty of the Speaker or Chairman to either adjourn the House or suspend the meeting until the required number of members is present.

• In practical terms, for the Lok Sabha (with 543 members), the quorum is 55 members, while for the Rajya Sabha (with 245 members), the quorum is 25 members.

Additional Information

• Article 96:

• This Article specifies that the Speaker or the Deputy Speaker of the Lok Sabha shall not preside while a resolution for their removal from office is under consideration, although they have the right to participate and vote (except in the case of a tie).

• Article 99:

• It mandates that every member of either House of Parliament must, before taking their seat, subscribe to an oath or affirmation before the President or a person appointed by the President, according to the forms in the Third Schedule.

• Article 102:

• This Article details the disqualifications for being chosen as, and for being, a member of either House of Parliament, including holding an office of profit, being of unsound mind, or being an undischarged insolvent.

Q56. Answer: (d) Satavahanas Dynasty

The correct answer is Satavahanas Dynasty.

Key Points

• The Ikshvaku dynasty, also known as the Andhra Ikshvakus, established their rule in the Eastern Deccan region, specifically the Krishna-Guntur area, following the decline of the Satavahana Empire in the early 3rd century CE.

• They were originally feudatories or Mahatalavaras of the Satavahanas and asserted their independence as the central authority of the Satavahanas weakened after the reign of Pulumavi IV (around 225 CE).

• The founder of the dynasty was Santamula I, who performed Vedic sacrifices such as Ashvamedha and Vajapeya to mark the beginning of his sovereign rule over the Krishna-Godavari delta.

• Their capital was located at Vijayapuri, situated in the Nagarjunakonda valley, which became a significant center for both Brahmanism and Buddhism.

• The dynasty is noted for its unique matrilineal naming tradition, where kings often used their mothers names as titles, a practice inherited from their Satavahana predecessors.

Additional Information

• Kadambas Dynasty:

• Founded by Mayurasharma in the 4th century CE (around 345 CE), they ruled the Karnataka region with their capital at Banavasi.

• They emerged as a power in the Western Deccan after the decline of the Pallavas and Satavahanas in that region.

• Guptas Dynasty:

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• Founded by Sri Gupta, they were the dominant power in Northern India from the 4th to 6th centuries CE.

• While they were contemporaries of the later Ikshvakus, their empire focused on the Gangetic plains and they did not directly precede the Ikshvakus in the Eastern Deccan.

• Mauryas Dynasty:

• Established by Chandragupta Maurya around 322 BCE, it was the first major empire to cover most of the Indian subcontinent.

• The Satavahanas themselves rose to power in the Deccan following the fragmentation of the Mauryan Empire after the death of Ashoka.

Q57. Answer: (d) Sam

The correct answer is Sam.

Key Points

• In Hindustani Classical Music, a Tala is a rhythmic cycle characterized by a specific number of Matras (beats) and Vibhags (divisions).

• The first matra of any tala cycle is fundamentally termed Sam, which serves as the primary point of resolution and maximum rhythmic emphasis.

• Sam acts as the essential junction where the main performer (vocalist or instrumentalist) and the percussionist (usually playing the Tabla or Pakhawaj) meet to conclude a rhythmic pattern or melodic phrase.

• In the standardized Bhatkhande Notation System, the Sam is denoted by the symbol 'X', distinguishing it from other accented or unaccented beats.

• The arrival at Sam signifies the completion of one Avartan (full cycle) and the simultaneous commencement of the next, maintaining the structural continuity of the Raga performance.

Additional Information

• Khali:

• The term literally translates to 'empty' and refers to a specific beat in a tala cycle that is marked by a wave of the hand rather than a clap.

• In notation, it is represented by the symbol '0' and serves to provide a structural counter-balance to the Sam and Tali.

• Tali:

• This term refers to the claps used to mark the beginning of various Vibhags within a tala, excluding the Khali.

• It helps performers navigate complex rhythmic structures, such as Teental (16 beats) or Jhaptal (10 beats), by identifying internal subdivisions.

• Laya:

• Laya refers to the tempo or the speed at which the tala cycle is executed.

• It is categorized into three primary levels: Vilambit (slow), Madhya (medium), and Drut (fast), each dictating the mood and complexity of the musical composition.

Q58. Answer: (b) Rasbehari Bose and Sachindranath Sanyal

The correct answer is Rasbehari Bose and Sachindranath Sanyal.

Key Points

• The assassination attempt on the then Viceroy of India, Lord Hardinge, took place on December 23, 1912, and is historically known as the Delhi-Lahore Conspiracy Case.

• The incident occurred during the State Entry into Delhi to celebrate the transfer of the British Indian capital from Calcutta to the new capital, Delhi.

• The revolutionary mastermind behind this plot was Rasbehari Bose, who worked closely with Sachindranath Sanyal to coordinate the network of underground activists in Bengal and Punjab.

• A homemade bomb was thrown at the Viceroy's elephant carriage in the Chandni Chowk area of Old Delhi. While Lord Hardinge survived with severe injuries, his Mahout (attendant) was killed in the blast.

• The actual person who threw the bomb was Basant Kumar Biswas, who was assisted by other revolutionaries like Amir Chand, Avadh Behari, and Bhai Balmukund.

• Following the attack, Rasbehari Bose managed to evade capture and eventually escaped to Japan in 1915, where he later played a crucial role in founding the Indian Independence League.

Additional Information

• Madanlal Dhingra and VD Savarkar:

• Madanlal Dhingra assassinated Sir Curzon Wyllie in London in 1909.

• Vinayak Damodar Savarkar founded the Abhinav Bharat Society and was a key figure at India House.

• Khudiram Bose and Prafulla Chaki:

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• They were involved in the Muzaffarpur Bomb Case of 1908, targeting District Magistrate Douglas Kingsford.

• Khudiram Bose became one of the youngest revolutionaries to be executed by the British.

• Surya Sen and Jatin Mukherjee:

• Surya Sen, popularly known as Master Da, led the famous Chittagong Armoury Raid in 1930.

• Jatin Mukherjee, also known as Bagha Jatin, was the leader of the Jugantar party and died in a gunfight at Balasore in 1915.

Q59. Answer: (c) Arithmetic Logic Unit

The correct answer is Arithmetic Logic Unit.

Key Points

• The Arithmetic Logic Unit (ALU) is a fundamental combinational digital circuit within the Central Processing Unit (CPU) that performs all mathematical and logical computations required by a computer program.

• Arithmetic Operations: The ALU is responsible for executing basic integer arithmetic, including addition, subtraction, multiplication, and division. It utilizes binary adders and accumulators to process numerical data fetched from registers.

• Logical Comparisons: Beyond simple math, the ALU performs bitwise logic operations such as AND, OR, XOR, and NOT. These are essential for manipulating data at the bit level and managing boolean logic within software.

• Relational Evaluations: It handles comparisons between two operands to determine if one is greater than, less than, or equal to another. The results of these comparisons often set specific status flags (like the Zero flag or Carry flag), which dictate the control flow and branching of the software.

• Integration: While the Control Unit manages the flow of instructions, the ALU is the actual 'engine' where the data transformation occurs. Therefore, Option 3 is the correct answer as it precisely defines this component's role.

Additional Information

• Control Unit (CU):

• Acts as the CPU's coordinator, fetching instructions from memory and decoding them into control signals.

• It tells the ALU, memory, and I/O devices how to respond to the instructions but does not perform data processing itself.

• Motherboard:

• The main Printed Circuit Board (PCB) that houses the CPU, RAM, and provides slots for other hardware components.

• It acts as the communication bridge or 'backbone' for the entire system using various buses and chipsets.

• Random Access Memory (RAM):

• A form of primary volatile memory that provides high-speed data access for the CPU during active processing.

• It stores the operating system, applications, and data currently in use, but loses its contents when the system is powered off.

Q60. Answer: (b) Diligence

The correct answer is Diligence.

Key Points

• Diligence is a core characteristic of a computer that defines its ability to perform repetitive tasks with the same consistency and precision from the first instruction to the last.

• Unlike humans, who may experience physical fatigue, mental exhaustion, or a drop in concentration after working for several hours, a computer does not suffer from boredom or monotony.

• This property ensures that the machine can operate 24/7 for days or even years (as seen in servers and supercomputers) without requiring a break, provided the hardware components and power supply remain stable.

• In technical environments, diligence means that if a computer is tasked with performing ten million calculations, it will perform the last one with exactly the same reliability as the first.

Additional Information

• Versatility:

• Refers to the flexibility of a computer to carry out a wide range of diverse activities, from scientific calculations to multimedia editing.

• It allows the machine to switch between software applications like word processors, spreadsheets, and gaming environments seamlessly.

• Accuracy:

• Represents the degree of correctness in the results produced; computers are capable of error-free processing.

• Errors in computer results are generally attributed to human errors in programming or data entry, a concept known as GIGO (Garbage In, Garbage Out).

• Speed:

• Computers are high-speed electronic devices capable of processing millions of instructions in a fraction of a second.

• Computational speed is typically measured in Microseconds (10^(−6)), Nanoseconds (10^(−9)), or Picoseconds (10^(−12)).

Q61. Answer: (a) ^(35)17Cl and ^(37)17Cl

The correct answer is ^(35)17Cl and ^(37)17Cl.

Key Points

• The Atomic Number (Z) of an element is defined as the total number of protons present in the nucleus of its atom. In this problem, the element has 17 protons, which identifies it as Chlorine (Cl).

• The Mass Number (A) is the sum of the number of protons and neutrons (collectively called nucleons) in the nucleus. It is expressed by the formula: A = Z + n, where n is the number of neutrons.

• For the first isotope, the mass number is calculated as 17 (protons) + 18 (neutrons) = 35. Thus, its mass number is 35.

• For the second isotope, the mass number is calculated as 17 (protons) + 20 (neutrons) = 37. Thus, its mass number is 37.

• In chemical notation, an isotope is represented as ^A_ZX, where the Mass Number (A) is written as a superscript and the Atomic Number (Z) is written as a subscript to the left of the chemical symbol X.

• By substituting the values, we get the two isotopes as ^(35)17Cl and ^(37)17Cl.

Additional Information

• Isotopes:

• Isotopes are atoms of the same element that have the same number of protons but a different number of neutrons.

• They possess identical chemical properties because they have the same electronic configuration and number of valence electrons.

• They exhibit different physical properties, such as density and boiling points, due to the variation in their atomic masses.

• Average Atomic Mass:

• Naturally occurring Chlorine is a mixture of its isotopes. Chlorine-35 and Chlorine-37 occur in a ratio of approximately 3:1 (75% and 25% respectively).

• The average atomic mass of Chlorine is calculated as a weighted average, resulting in the value of 35.5 u, which is why many periodic tables do not show a whole number for its mass.

• Other Examples:

• Hydrogen has three isotopes: Protium (^1H), Deuterium (^2H), and Tritium (^3H).

• Carbon isotopes include Carbon-12 (stable), Carbon-13, and Carbon-14 (used in radiocarbon dating).

Q62. Answer: (a) Brahui

The correct answer is Brahui.

Key Points

• Brahui is a member of the North Dravidian language family, primarily spoken by the Brahui people in the Balochistan province of Pakistan.

• It is the only Dravidian language spoken almost entirely outside the Indian subcontinent proper, situated approximately 1,500 kilometers away from the main cluster of Dravidian languages in Southern India.

• Beyond Pakistan, significant speaker populations are found in Southern Afghanistan and the Sistan and Baluchestan province of Iran.

• Linguistically, Brahui is highly significant as its isolation provides evidence for the historical migration of Dravidian-speaking groups or the potential linguistic landscape of the ancient Indus Valley Civilization.

• While it maintains a Dravidian grammatical core, the language has been heavily influenced by Iranian and Indo-Aryan languages, specifically Balochi, Sindhi, and Persian.

• It is typically written using the Perso-Arabic script, unlike its sister languages in India which use Brahmic-derived scripts.

Additional Information

• Kannada:

• A South Dravidian language spoken primarily in Karnataka, India.

• It is recognized as one of the Classical Languages of India with a literary history of over 1,500 years.

• Malayalam:

• Spoken mainly in the state of Kerala and the Lakshadweep islands.

• It branched off from Middle Tamil around the 9th century and is known for its extensive Sanskrit vocabulary.

• Tamil:

• One of the oldest surviving classical languages, spoken in Tamil Nadu, Sri Lanka, and Singapore.

• It has the oldest recorded non-Sanskrit literature in India, specifically the Sangam literature.

Q63. Answer: (d) Intensive subsistence farming

The correct answer is Intensive subsistence farming.

Key Points

• Intensive subsistence farming is predominantly practiced in the densely populated regions of the monsoon lands of South, Southeast, and East Asia, including countries like India, China, Japan, Vietnam, and Bangladesh.

• This agricultural system is characterized by a high population pressure on limited land resources, resulting in small and fragmented landholdings due to traditional laws of inheritance.

• Farmers utilize intensive manual labor, simple tools, and animal power to maximize the yield from small plots, often achieving high productivity per unit area despite low output per worker.

• The tropical monsoon climate, providing high temperatures and abundant seasonal rainfall, allows for multiple cropping, where two or more crops are grown on the same piece of land within a single year.

• Paddy (wet rice) is the dominant crop because it can support large populations; however, in areas with lower rainfall, crops like wheat, maize, pulses, and oilseeds are cultivated.

• Modern variations of this farming include the use of High Yielding Variety (HYV) seeds, chemical fertilizers, and irrigation facilities to further enhance food security for the massive local population.

Additional Information

• Shifting cultivation:

• Also known as slash and burn agriculture, it is practiced in the thick tropical forests of the Amazon basin, Africa, and Northeast India (where it is called Jhumming).

• It involves clearing land by burning vegetation and moving to a new plot once the soil fertility is exhausted.

• Nomadic herding:

• Practiced in the semi-arid and arid regions of the Sahara, Central Asia, and parts of India like Rajasthan.

• Herdsmen move with their livestock (sheep, camel, yak, or goats) along defined routes in search of fodder and water.

• Mediterranean agriculture:

• A highly specialized commercial farming practiced in regions bordering the Mediterranean Sea, California, and Southwest Australia.

• It is globally renowned for viticulture (grape cultivation) and the production of citrus fruits, olives, and figs.

Q64. Answer: (c) Mixed economy combining public and private sectors

The correct answer is Mixed economy combining public and private sectors.

Key Points

• Following Independence in 1947, India adopted a Mixed Economic System to balance the dual goals of rapid economic growth and social justice.

• This model was championed by Jawaharlal Nehru, who believed that the state must control the commanding heights of the economy to ensure equitable distribution of wealth.

• The Industrial Policy Resolution of 1948 officially laid the foundation for this system, dividing industries into those reserved for the public sector and those open to the private sector.

• Under this strategy, the Government of India took responsibility for heavy industries, infrastructure, and social services, while leaving agriculture and consumer goods largely to private enterprise.

• The implementation was managed through centralized planning, leading to the establishment of the Planning Commission in 1950 and the launch of the First Five-Year Plan in 1951.

Additional Information

• Economic Ideologies Comparison:

• Free Market Capitalism: This was rejected because the private sector at the time lacked sufficient capital and technology to build the massive infrastructure required for a newly independent nation.

• Socialist System: While influenced by Soviet planning, India did not adopt a total communist/socialist model (eliminating private property) to uphold democratic principles and individual freedom.

• License-Permit Raj: To regulate the private sector within the mixed economy, the government introduced strict licensing under the Industries (Development and Regulation) Act, 1951.

• Mahalanobis Model: The Second Five-Year Plan (1956-61) shifted focus toward capital-intensive heavy industries to achieve self-reliance and import substitution.

Q65. Answer: (a) Low-pressure systems over warm ocean water

The correct answer is Low-pressure systems over warm ocean water.

Key Points

• Tropical cyclones are intense low-pressure systems that develop over tropical or subtropical waters, characterized by a closed atmospheric circulation and strong winds.

• The primary engine for these storms is the latent heat of condensation; as warm, moist air rises from the ocean surface, it cools and condenses into clouds, releasing energy that fuels the storm.

• A critical requirement for formation is a sea surface temperature (SST) of at least 26.5°C (approximately 80°F) reaching down to a depth of about 50 meters.

• The Coriolis force is necessary to provide the rotation required for the storm to spin; because this force is zero at the equator, tropical cyclones typically form between 5° and 30° latitude.

• These systems are known by different names based on their location: Hurricanes in the North Atlantic and Eastern Pacific, Typhoons in the Northwest Pacific, and Cyclones in the Indian Ocean and South Pacific.

Additional Information

• High-pressure systems over land:

• These systems, also called anticyclones, generally bring stable, clear weather and sinking air, which inhibits the vertical cloud growth necessary for cyclone development.

• Rising continental winds:

• While rising air (convection) occurs over land, continents do not provide the massive, sustained supply of moisture found over oceans required to maintain a tropical cyclone's intensity.

• Fast-moving cold fronts:

• Cold fronts are characteristic of extratropical cyclones (mid-latitude storms) rather than tropical ones; tropical cyclones are warm-core systems that thrive on heat rather than temperature gradients between air masses.

• Vertical Wind Shear:

• A low vertical wind shear is essential for formation; strong winds at higher altitudes can tilt or disrupt the storm's structure, preventing it from organizing.

Q66. Answer: (a) National Emergency

The correct answer is National Emergency.

Key Points

• Under Article 352 of the Indian Constitution, the President of India can declare a National Emergency when the security of India or any part of it is threatened by war, external aggression, or internal disturbance.

• The phrase 'internal disturbance' was part of the original constitutional text since its adoption in 1950, providing a broad and somewhat vague ground for the executive to assume extraordinary powers.

• This specific provision was famously utilized by the Indira Gandhi-led government to proclaim a National Emergency on June 25, 1975, which lasted for 21 months until 1977.

• To prevent the potential misuse of this term in the future, the 44^(th) Constitutional Amendment Act, 1978, introduced by the Janata Government, replaced 'internal disturbance' with the more specific term 'armed rebellion'.

• The amendment ensured that a National Emergency could no longer be declared merely on the grounds of political instability or non-violent protests, requiring a higher threshold of domestic violence involving arms.

Additional Information

• President's Rule:

• Governed by Article 356, it is imposed when a State Government cannot function according to constitutional provisions.

• It is also known as State Emergency or Constitutional Emergency.

• Financial Emergency:

• Authorized under Article 360, it can be declared if the financial stability or credit of India is under threat.

• Notably, this type of emergency has never been declared in the history of independent India.

• Martial Law:

• Referenced in Article 34, it involves the suspension of ordinary law and the administration of justice by military tribunals in specific areas.

• Unlike a National Emergency, there is no specific provision in the Constitution that defines the exact grounds for its declaration.

Q67. Answer: (c) It links production centres with markets, enhancing trade and economic activity

The correct answer is It links production centres with markets, enhancing trade and economic activity.

Key Points

• Transport and communication systems serve as the lifelines of a national economy by bridging the spatial gap between areas of production and areas of consumption.

• Efficient transport infrastructure, such as Roadways, Railways, and Ports, ensures the seamless movement of raw materials to

industrial hubs and finished goods to domestic and international markets, thereby reducing logistics costs.

• In India, massive projects like the Golden Quadrilateral and Dedicated Freight Corridors are designed to enhance the speed of trade, making Indian products more competitive in the global market.

• Modern communication networks, including telecom and high-speed internet, facilitate real-time business transactions, e-commerce, and digital banking, which are fundamental to a modern service-oriented economy.

• By reducing the time and cost involved in the exchange of goods and information, these sectors directly contribute to the Gross Domestic Product (GDP) and foster industrialization in previously inaccessible regions.

Additional Information

• PM Gati Shakti - National Master Plan:

• Launched to provide multi-modal connectivity infrastructure to various economic zones.

• Aims to break silos between departments and ensure holistic planning for logistical efficiency.

• Bharatmala Pariyojana:

• A centrally-sponsored umbrella program focusing on optimizing the efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps.

• Digital India Programme:

• A flagship program to transform India into a digitally empowered society, significantly boosting the communication infrastructure required for FinTech and knowledge-based industries.

• Impact on Regional Development:

• Infrastructure prevents regional isolation by integrating rural and remote areas into the mainstream market, promoting balanced regional growth and poverty reduction.

Q68. Answer: (b) Andhra Pradesh

The correct answer is Andhra Pradesh.

Key Points

• In December 2025, the Andhra Pradesh state government formally approved the transfer of 480 acres of land in the Visakhapatnam and Anakapalli districts to Adani Infra (India) Private Limited.

• Adani Infra acts as the primary Notified Partner of Raiden Infotech India Pvt. Ltd., a special purpose vehicle and subsidiary owned by tech giant Google for its digital infrastructure investments in India.

• The project aims to establish a massive 1 GW (1,000 MW) Artificial Intelligence (AI) Data Centre, representing a cumulative phased investment of over Rs. 87,520 crore.

• The land allocation managed by the Andhra Pradesh Industrial Infrastructure Corporation (APIIC) is distributed across Adavivaram, Mudasarlova, Tarluvada, and Rambilli villages.

Additional Information

• Google's Raiden Infotech Project Details:

• State Incentives: The Andhra Pradesh administration approved an incentive package worth approximately Rs. 22,002 crore to facilitate this hyperscale technology development.

• Global Standards: The facility is engineered to run the most heavy AI workloads, maintaining the exact operational and design standards that power global platforms like Google Search, YouTube, and Google Workspace.

• Subsequent Expansion: In February 2026, the state cabinet increased the land allotment from 480 acres to 601.4 acres to accommodate the growing project scale.

• Ecosystem in Other States:

• Gujarat and Tamil Nadu host several subsea cables and data parks, such as the GIFT City and Chennai hubs, but did not receive this specific 1 GW Google AI infrastructure package.

Therefore, the correct option is 2.

Q69. Answer: (d) Change in speed of light

The correct answer is Change in speed of light.

Key Points

• Refraction is the physical phenomenon where a wave, such as light, changes direction as it passes from one transparent medium into another.

• The primary cause of this bending is the change in the speed of light as it crosses the boundary between media of different optical densities.

• Light travels at its maximum speed of approximately 3 × 10^8 m/s in a vacuum; however, when it enters a medium like water, its speed decreases significantly.

• When light moves from air (a rarer medium) into water (a denser medium), it slows down and bends toward the normal (an imaginary line perpendicular to the surface).

• The extent of bending depends on the refractive index of the materials involved, which is directly linked to the velocity of light in those substances.

Additional Information

• Refractive Index (n):

• It is a dimensionless constant defined by the formula n = c / v, where c is the speed of light in vacuum and v is the speed in the medium.

• For water, the refractive index is approximately 1.33, meaning light travels about 1.33 times slower in water than in a vacuum.

• Snell's Law:

• This law relates the angles of incidence and refraction to the refractive indices: n1 sin (θ1) = n2 sin (θ2).

• Frequency and Color:

• During refraction, the frequency of the light remains constant; therefore, the color of the light does not change. Only the wavelength and speed vary.

• Incorrect Concepts:

• Gravity: While gravitational lensing can bend light, it requires massive celestial bodies like stars and is negligible in a laboratory setting involving water.

• Temperature: While temperature can slightly affect the density and thus the refractive index, it is not the fundamental property responsible for the bending itself.

Q70. Answer: (d) eScan

The correct answer is eScan.

Key Points

• In December 2025, the cybersecurity firm eScan, which is a global brand under MicroWorld Technologies, announced the introduction of an advanced Tenant Control feature specifically tailored for Generative AI applications like ChatGPT.

• The Tenant Control feature is designed to empower Enterprise IT Administrators by allowing them to restrict ChatGPT usage to only official, company-sanctioned Tenants or Workspaces.

• This solution effectively mitigates the risk of Shadow AI, where employees use personal accounts to process sensitive Corporate Data, leading to potential Data Breaches or Intellectual Property theft.

• By leveraging Deep Packet Inspection (DPI) and SSL Filtering, the software identifies the Tenant ID during the login request and blocks any session that does not match the organization’s approved Enterprise Instance.

• This proactive measure ensures that all interactions with OpenAI's platform are governed by Organizational Security Policies and Compliance Standards.

• Therefore, eScan is the provider that introduced this specific security enhancement for managing ChatGPT in an enterprise environment, making Option 4 the correct answer.

Additional Information

• MicroWorld Technologies:

• Founded in 1993 and headquartered in Mumbai, India, it is a pioneer in Information Security and Content Security solutions.

• Its flagship product, eScan, provides comprehensive Endpoint Security, Antivirus, and Data Loss Prevention (DLP) tools for both home and business users.

• Cybersecurity Context:

• Bitdefender: A major Romanian cybersecurity company known for its GravityZone platform and high-performance threat detection engines.

• Kaspersky: A Russian global cybersecurity provider famous for its Endpoint Security and deep research into Advanced Persistent Threats (APTs).

• Quick Heal: An Indian antivirus software company that offers Seqrite, its enterprise security brand focusing on SME and corporate security.

• Data Loss Prevention (DLP):

• The Tenant Control feature is a subset of Cloud Access Security Broker (CASB) and DLP capabilities, aimed at preventing Data Exfiltration through modern cloud-based productivity tools.

Q71. Answer: (c) E

Given: Seven boxes B, C, D, E, Q, R and S are kept one over the other but not necessarily in the same order

1. No box is kept below C.

2. Only two boxes are kept between E and C.

3. Only Q is kept above D.

Position	Box

7	Q
6	D
5	
4	E
3	
2	
1	C

1. S is kept at some place below B but at some place above R.

Final Arrangement:

7	**Q**
6	D
5	B
4	E
3	S
2	R
1	C

Thus, the box kept immediately above S is E.

Hence, the correct answer is 'Option 3'.

Q72. Answer: (c) A

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. No box is kept above G.
2. Only three boxes are kept between G and D.
3. B is kept immediately above D.

Position	**Box**
7	G
6	
5	
4	B
3	D
2	
1	

1. Only one box is kept between E and B.
2. Only four boxes are kept between E and C.
3. F is kept at some place above A.

Final Arrangement:

7	**G**
6	E
5	F
4	B
3	D
2	A

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1	C

Thus, the box kept immediately below D is A.

Hence, the correct answer is 'Option 3'.

Q73. Answer: (b) SDU

The logic follows here,

Combining the results, the next term in the series is SDU.

Hence, the correct answer is "option 2"

Q74. Answer: (d) 10

Given number: 4317856

Given Number	4	3	1	7	8	5	6
Ascending Order	1	3	4	5	6	7	8

Left 1 3 4 5 6 7 8 Right

• second digit from the Left : 7

• second digit from the right = 3

• 3 + 7 = 10

Hence, the correct answer is "Option 4"

Q75. Answer: (b) Wife's mother

Family Chart:

Symbol	%	€	=	?
Meaning	Father	Wife	Mother	Daughter

Given: B = C ? O % P € X

Therefore, B is the mother of P, who is the wife of X → B is the Wife's mother of X.

Hence, the correct answer is "Option 2".

Q76. Answer: (b) Both conclusions (I) and (II) follow

The least possible Venn diagram for the given statements is:

(I) Some mountains are kings - Follows (All kings are mountains and Some kings are mountains. So, Some mountains are kings is true)

(II) All kings are arrows - Follows (All kings are mountains and all mountains are arrow. All kings are arrow. So it's true)

Both conclusions (I) and (II) follow.

Hence, the correct answer is "Option 2"

Q77. Answer: (c) Two

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

Required Conditions: Perfect Square - Odd Digit - Odd Digit.

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

So, there are exactly Two such odd digits in the given sequence = 415 and 153

Hence, the correct answer is 'Option 3'.

Q78. Answer: (b) L

Given word COMPLEX.

Original Letter	C	O	M	P	L	E	X
Preceding Letter	B	N	L	O	K	D	W

• New Word : B, N, L, O, K, D, W

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• Alphabetical order: B, D, K, L, N, O, W

Left B, D, K, L, N, O, W Right

The letter fourth from the right in the arranged group is L.

Hence, the correct answer is "option 2"

Q79. Answer: (a) HKJ

The logic followed here is:

HKJ,

NQU,

PSW,

KNR,

Therefore, the letter cluster that is different from the others is HKJ.

Hence, the correct answer is 'Option 1'.

Q80. Answer: (a) M

The logic followed here is,

Given Word: ANTIQUE

Original Letter	A	N	T	I	Q	U	E
Condition	+1	−1	−1	+1	−1	+1	+1
New Letter	B	M	S	J	P	V	F

The new group of letters formed is: B M S J P V F

Left B M S J P V F Right

• Second letter from left = M

Hence, the correct answer is "option 1"

Q81. Answer: (a) CEG

The logic followed here is:

The missing term in the series is CEG.

Hence, the correct answer is "option 1"

Q82. Answer: (b) 62

The logic followed here is.

Logic: The pattern of differences observed is: −3, −6, −9, −12, −15.

• 71 − 3 = 68

• 68 − 6 = 62

• 62 − 9 = 53

• 53 − 12 = 41

• 41 − 15 = 26

Following this logic, the missing number in the series is 62.

Hence, the correct answer is "option 2"

Q83. Answer: (b) 47

BODMAS Table:

The logic followed here is.

The signs are interchanged as follows:

• + ↔ −

• × ↔ ÷

Given Equation:14 × 2 − 12 ÷ 4 + 8 = ?

After interchanging the signs and following BODMAS rule

= 14 ÷ 2 + 12 × 4 − 8

= 7 + 12 × 4 − 8

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= 7 + 48 − 8
= 55 − 8
= 47
Hence, the correct answer is "Option 2".

Q84. Answer: (a) KFK : NBM

The logic followed here is:
For ROD : UKF,
For OLF : RHH,
Applying to the same logic,
Hence, the correct answer is "option 1"

Q85. Answer: (c) 171

The logic followed here is,
Observe the pattern in the differences:
• 372 − 51 = 321
• 321 − 44 = 277
• 277 − 37 = 240
• 240 − 30 = 210
• 210 − 23 = 187
• 187 − 16 = 171
Thus, the missing term in the series is 171.
Hence, the correct answer is 'Option 3';

Q86. Answer: (d) 4

The logic follows here,
Therefore, the code for R is 4.
Hence, the correct answer is "option 4"

Q87. Answer: (b) OW – HF

The logic followed here is:
YG−RO,
OW − HF,
AI−TQ,
SA − LI,
Therefore, the letter-cluster pair that is different from the others is OW − HF.
Hence, the correct answer is 'Option 2'.

Q88. Answer: (a) 9

Given number: 7 5 4 3 1 6 8
Ascending order: 1 3 4 5 6 7 8

Given Number	**7**	**5**	**4**	**3**	**1**	**6**	**8**
Ascending Order	1	3	4	5	6	7	8

Left 1 3 4 5 6 7 8 Right
Addition of the second digit from the left and the third digit from the right is:3 + 6 = 9.
Hence, the correct answer is 'Option 1'.

Q89. Answer: (a) M

Given: Seven boxes, G, H, I, L, M, N and O, are kept one over the other, but not necessarily in the same order.
1. No box is kept above M.
2. Only three boxes are kept between M and H.

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3. N is kept immediately above H.

Position	Box
7	M
6	
5	
4	N
3	H
2	
1	

1. Only two boxes are kept between L and H.
2. Only four boxes are kept between L and I.
3. G is kept at some place above O.

Final Arrangement:

7	M
6	L
5	G
4	N
3	H
2	O
1	I

Thus, the box kept second above G is M.

Hence, the correct answer is 'Option 1'.

Q90. Answer: (d) SZ - VW

The logic followed here is:

HV - KT,

YT - BR,

OA - RY,

SZ - VW,

This pair does not follow the rule.

Therefore, the letter-cluster pair that is different from the others is SZ - VW.

Hence, the correct answer is 'Option 4'.

Q91. Answer: (b) 2

The logic followed here is.

Therefore, the code for O is 2.

Hence, the correct answer is "option 2"

Q92. Answer: (b) 541, 534

The logic followed here is:

Logic: Second Number = First Number − 7

For 123, 116

=> 123 − 7 = 116

For 102, 95

=> 102 − 7 = 95

Applying the same logic to the options:

541, 534

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=> 541 − 7 = 534 (Follows the logic)

Hence, the correct answer is 'Option 2'.

Q93. Answer: (c) 2 km to the north

• Bhavesh starts from Point A and drives 19 km towards the east.

• He then takes a left turn, drives 16 km, turns left and drives 23 km.

• He then takes a left turn and drives 18 km.

• He takes a final left turn, drives 4 km and stops at Point P.

The Final Diagram is,

Bhavesh must travel a distance of 2 km in the north direction.

Hence, the correct answer is " Option 3"

Q94. Answer: (b) HHRR 36

The logic followed here is:

The next cluster in the series is HHRR 36.

Hence, the correct answer is "option 2"

Q95. Answer: (b) Neither conclusion (I) nor (II) follows

The least possible Venn diagram for the given statements is:

(I) Some lamps are rings - Don't follows

(Their is no direct relation between lamps and rings may be it is possible but not definite. Hence, it is false)

(II) All rings are lamps - Don't follows

(Their is no direct relation between lamps and rings may be it is possible but not definite. Hence, it is false)

Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 2"

Q96. Answer: (b) A

Given: Seven people A, B, D, J, O, T and Z are sitting in a row, facing north.

1. Only three people sit to the left of B.

2. Only Z sits to the right of T.

3. Only three people sit between T and O.

4. J sits at some place to the left of A but at some place to the right of D

The Final Arrangement is,

According to the arrangement, A sits immediately to the right of B.

Hence, the correct answer is "option 2".

Q97. Answer: (b) MPRL

The logic followed in this pattern is a consistent alphabetical shift based on the positional values of the letters.

For 'LOQK' related to 'SVXR':

L(12)	**O(15)**	**Q(17)**	**K(11)**
+7 ↓	+7 ↓	+7 ↓	+7 ↓
S(19)	V(22)	X(24)	R(18)

For 'ILNH' related to 'PSUO':

I(9)	**L(12)**	**N(14)**	**H(8)**
+7 ↓	+7 ↓	+7 ↓	+7 ↓
P(16)	S(19)	U(21)	O(15)

Applying the same logic to 'FIKE':

F(6)	**I(9)**	**K(11)**	**E(5)**
+7 ↓	+7 ↓	+7 ↓	+7 ↓
M(13)	P(16)	R(18)	L(12)

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Thus, FIKE is related to MPRL.

Hence, the correct answer is 'Option 2'.

Q98. Answer: (b) MP - QT - UX

The logic followed in this pattern is

For the triad 'JM - NQ - RU':

For the triad 'BE - FI - JM':

Applying the same logic to 'MP - QT - UX':

MP - QT - UX is the only one that follows the same pattern of shifts within and between the pairs.

Hence, the correct answer is 'Option 2'.

Q99. Answer: (c) Two

Given: Seven people F, G, H, L, M, O and Q are sitting around a circular table, facing the centre of the table.

1. O sits to the immediate right of G.
2. F sits to the immediate right of H.
3. Only two people sit between Q and O when counted from the right of Q.
4. Only three people sit between M and G when counted from the right of G

The Final Arrangement is,

There are two people (M and Q) sitting between F and L.

Hence, the correct answer is 'Option 3'.

Q100. Answer: (d) Brother's wife's father

Family Chart:

Symbol	@	**$**	#	&
Meaning	Sister	Father	Wife	Brother

Given: E N @ T # R & Y

Therefore, E is the father of T, and T is the wife of R, while R is the brother of Y. This implies E is the father of Y's brother's wife .E is the Brother's wife's father of Y.

Hence, the correct answer is 'Option 4'.

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