RRB NTPC (UG) CBT-I Official Paper (Held On 14 Jun, 2026 Shift 3) (Previous Year Paper)

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

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MATHEMATICS

Q1. A merchant marks his products 30% above the cost price and provides a 10% discount on the marked price. What percent profit does he earn?

(a) 12%
(b) 13%
(c) 17%
(d) 15%

Q2. A and B can do a piece of work in 12 days and 24 days, respectively. Both work for 2 days and then A leaves. How long (in days) will B take to complete the remaining work?

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

Q3. If the fourth proportional to 5, 15, and 25 is k, then find k.

(a) k = 90
(b) k = 60
(c) k = 125
(d) k = 75

Q4. The price of an article is first increased by 30% and then decreased by 20%. Due to these successive changes, the final price becomes Rs. 40 more than the original price. What is the original price of the article?

(a) Rs. 1,200
(b) Rs. 1,000
(c) Rs. 1,100
(d) Rs. 900

Q5. The value of (27^(2/3) · 9^(-1/2))/(3^(-1) · 81^(1/4)) is

(a) 6
(b) 9
(c) 3
(d) 1

Q6. Two friends, P and Q, started a business by investing Rs. 2,300 and Rs. 4,600, respectively. At the end of one year, the business earned a total profit of Rs. 37,272. What is the share (in Rs.) of P in the profit?

(a) 12,524
(b) 12,274
(c) 12,424
(d) 12,374

Q7. Two articles are sold at the same selling price. On one article, the trader makes a 25% profit, and on the other, he incurs a 25% loss. What is the overall percentage loss?

(a) 7.25%
(b) 8.25%
(c) 5.25%
(d) 6.25%

Q8. Three positive integers a, b, and c satisfy the following conditions: (i) a and b are coprime, (ii) b and c are coprime, (iii) a and c are not coprime, (iv) abc = 360. The minimum possible value of a + b + c is:

(a) 95
(b) 33
(c) 23
(d) 27

Q9. Find the third proportional to 240 and 120.

(a) 40
(b) 60
(c) 50
(d) 80

Q10. A certain sum amounts to Rs. 5,200 in 2 years and Rs. 6,400 in 4 years at simple interest. What is the rate of interest per annum?

(a) 10 percent
(b) 12 percent
(c) 18 percent
(d) 15 percent

Q11. The average of 8 numbers is 45. If each number is decreased by 3, what will the new average be?

(a) 42
(b) 39
(c) 45
(d) 8

Q12. If 45% of a number exceeds 20% of it by 30, then the number is:

(a) 140
(b) 100
(c) 160
(d) 120

Q13. The sum of two numbers is 54. If three times the smaller number exceeds twice the larger number by 6, find the difference between the two numbers.

(a) 7.6
(b) 7.2
(c) 8.4
(d) 6.6

Q14. A ladder of length 8 m is placed against a vertical wall, making an angle of 60° with the ground. How high does the ladder reach up the wall?

(a) $3\sqrt{3}$ m
(b) $4\sqrt{3}$ m
(c) $5\sqrt{3}$ m
(d) $6\sqrt{3}$ m

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Q15. In a triangle, the ratio of three angles is 3 : 3 : 4. Find the measure of the largest angle.

(a) 84°
(b) 72°
(c) 62°
(d) 40°

Q16. The sides of a rectangular field are 77 m and 98 m long. Its area is equal to the area of a circular field. What is the perimeter (in m) of the circular field?

(Take π = 22/7)

(a) 353
(b) 304
(c) 330
(d) 308

Q17. A team of 3 workers, P, Q, and R, is assigned to paint a large wall. P alone can finish the work in 14 days, Q alone in 21 days, and R alone in 42 days. If they start together but P leaves after 4 days, and the remaining work is completed by Q and R together, in how many total days is the wall completely painted?

(a) 10 days
(b) 9 days
(c) 11 days
(d) 12 days

Q18. The average of 6.5, 10.8, 20 and a is 13. The value of a is:

(a) 15.7
(b) 13.7
(c) 16.7
(d) 14.7

Q19. Four identical cubes are placed one after another and the length of the cuboid so formed is 256 cm. Find the volume of a single cube.

(a) 362144 cm^3
(b) 262144 cm^3
(c) 262154 cm^3
(d) 265144 cm^3

Q20. Two trains are moving in opposite directions at speeds of 8 m/s and 10 m/s. If they completely pass each other in 8 seconds, find the combined length of both trains.

(a) 156 meters
(b) 152 meters
(c) 144 meters
(d) 150 meters

Q21. Find the greatest number that divides 75, 105 and 150 exactly.

(a) 5
(b) 15
(c) 10
(d) 25

Q22. A product with marked price Rs. 3,000 is sold with successive discounts of 15% and 25%. What is the final selling price after these two discounts?

(a) Rs. 1,936.50
(b) Rs. 1,896
(c) Rs. 1,912.50
(d) Rs. 1,872

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Q23. The sum of the ages of two siblings is 28 years and the difference of their ages is 8 years. What is the present age of the elder sibling?

(a) 18 years
(b) 16 years
(c) 20 years
(d) 14 years

Q24. At what annual interest rate will a principal amount of Rs. 1,000 become Rs. 1,728 in a period of 1 year and 6 months, assuming that the interest is compounded semi-annually?

(a) 41%
(b) 32%
(c) 35%
(d) 40%

Q25. A shopkeeper fixes the marked price of an item 150% above its cost price. What percentage of discount on marked price should be allowed to gain 110%?

(a) 15%
(b) 17%
(c) 16%
(d) 14%

Q26. The sum of two positive numbers is 40 and their product is 175. The positive difference between them is:

(a) 30
(b) 34
(c) 36
(d) 32

Q27. If 3^x - 3^(x-1) = 18, then the value of (2x-1)/(2x+3) is:

(a) 5/13
(b) 5/9
(c) 5/12
(d) 5/6

Q28. Which of the following pairs of numbers is co-prime?

A) (15, 25)
B) (14, 35)
C) (9, 28)
D) (21, 49)

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

Q29. The largest four-digit number which when divided by 12, 8 and 11 leaves the remainder 3 in each case, is:

(a) 9535
(b) 9928
(c) 9771
(d) 9821

Q30. A car travels from Gwalior to Jhansi at 60 km/hr and returns at 80 km/hr. If the total travel time is 3.5 hours, what is the one-way distance?

(a) 110 km
(b) 120 km
(c) 112 km
(d) 125 km

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GENERAL AWARENESS

Q31. Joint Sitting of both the houses of the Parliament is summoned by:

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

Q32. Which of the following physiographic regions of India is primarily formed by the extensive deposition of alluvium brought by the Himalayan river systems?

(a) The Peninsular Plateau
(b) The Meghalaya Plateau
(c) The Western Coastal Plains
(d) The Northern Plains

Q33. Which practice supports sustainable agriculture by maintaining soil health?

(a) Monoculture farming
(b) Excessive chemical fertilisers
(c) Crop rotation
(d) Deforestation

Q34. In August 2025, which body released the first National Annual Report & Index on Women's Safety (NARI 2025)?

(a) National Commission for Women
(b) NITI Aayog
(c) Ministry of Women and Child Development
(d) National Human Rights Commission

Q35. Which of the following is the correct full form of LAN?

(a) Local Area Network
(b) Low Area Net
(c) Line Access Network
(d) Large Access Node

Q36. The Carriage of Goods by Sea Act, 2025, enforced from 10 September 2025, is primarily intended to:

(a) Define carrier liability
(b) Control marine pollution
(c) Develop port infrastructure
(d) Regulate vessel registration

Q37. According to World Population Prospects, 2024, what is the estimated peak of the world's population in the mid-2080s?

(a) 8.2 billion
(b) 11.1 billion
(c) 9.5 billion
(d) 10.3 billion

Q38. The Windows 11 Task Manager helps monitor system resources to identify applications that are _____ system performance.

(a) degrading
(b) enhancing
(c) simplifying
(d) stabilizing

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Q39. According to the Census 2011, which of the following states has the highest population density among the northern Indian states?

(a) Uttarakhand
(b) Rajasthan
(c) Bihar
(d) Himachal Pradesh

Q40. Which of the following rulers of the Maitraka dynasty attended Harshavardhana's assembly at Prayaga?

(a) Dhruvasena II
(b) Prabhakarvardhana
(c) Rudrasena II
(d) Grihavarman

Q41. Which of the following goddesses is primarily worshipped during the Gangaur festival of Rajasthan?

(a) Goddess Saraswati
(b) Goddess Parvati
(c) Goddess Durga
(d) Goddess Lakshmi

Q42. Which type of soil is most suitable for cotton cultivation in India?

(a) Laterite Soil
(b) Black Soil
(c) Alluvial Soil
(d) Red Soil

Q43. Who among the following dancers received the 'Abhinandan Saroja National Award, 2021' from the National Institute of Indian Classical Dance?

(a) Aparna Satheesan
(b) Geetanjali Lal
(c) Saswati Sen
(d) Yamini Krishnamurthy

Q44. Which AI-enabled digital governance tool, integrated with BHASHINI, was introduced to generate structured minutes of Gram Sabha and Panchayat meetings from audio or video inputs, with multilingual support across 14 Indian languages?

(a) Panchayat Digital Recorder System
(b) GramLekha AI Platform
(c) SabhaSaar
(d) Rural Governance Documentation Tool

Q45. If a scientist is comparing the energy output of two light bulbs and records their values in joules, which dimensional formula should be used to represent energy in the SI system?

(a) [M L² T^(-2)]
(b) [M L T^(-2)]
(c) [M T²]
(d) [L² T^(-2)]

Q46. Where was the 8^(th) session of the Indian Ocean Conference held in February 2025?

(a) Perth, Australia
(b) New Delhi, India
(c) Muscat, Oman
(d) Colombo, Sri Lanka

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Q47. Fundamental Duties of the citizens were enumerated by the 42nd Amendment of the Constitution, adopted in the year:

(a) 1988
(b) 1986
(c) 1976
(d) 1966

Q48. Which continent is entirely in the Southern and Eastern Hemispheres?

(a) Europe
(b) Asia
(c) Africa
(d) Australia

Q49. Raja and Radha Reddy, who founded the Natya Tarangini Institute in New Delhi, are renowned exponents of which classical dance form?

(a) Sattriya
(b) Kuchipudi
(c) Kathak
(d) Mohiniyattam

Q50. Which of the following movements, founded by Jyotirao Phule, was specifically aimed at the upliftment of lower castes in Maharashtra?

(a) Ramakrishna Mission
(b) Arya Samaj
(c) Brahmo Samaj
(d) Satyashodhak Samaj

Q51. What percentage of all detected trafficking victims in 2022 were children, as per the Global Report on Trafficking in Persons 2024?

(a) 31%
(b) 20%
(c) 45%
(d) 38%

Q52. Which term refers to the quantitative study of reactants and products in a chemical reaction?

(a) Mole fraction
(b) Stoichiometry
(c) Mass per cent
(d) Molarity

Q53. Which of the following teams won the Vijay Hazare Trophy in 2024-25?

(a) Saurashtra
(b) Karnataka
(c) Tamil Nadu
(d) Mumbai

Q54. In which of the following years was the Technology Mission on Oilseeds launched due to which oilseeds production increased to a record level of 18 million tonnes in 1988-89?

(a) 1987-88
(b) 1985-86
(c) 1984-85
(d) 1983-84

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Q55. Which of the following is a characteristic feature of the gaseous state of matter?

(a) Definite volume but no definite shape
(b) Negligible intermolecular forces and high compressibility
(c) Strong intermolecular forces and fixed shape
(d) High rigidity and fixed volume

Q56. The Bahmani kingdom stretched from Mandu in north to which southern boundary?

(a) Madurai
(b) Mysore
(c) Tiruchirapalli
(d) Raichur

Q57. Parliament, the legislative organ of the Union government, is mentioned in which part of the Constitution of India?

(a) Part V
(b) Part VII
(c) Part VI
(d) Part VIII

Q58. Who among the following founded the secret revolutionary society ‘Abhinav Bharat’ in 1904?

(a) V.D. Savarkar
(b) Khudiram Bose
(c) Shyamji Krishna Varma
(d) Lala Har Dayal

Q59. In December 2025, in which of the following cities did the All Living Things Environmental Film Festival (ALT EFF) festival spark public dialogue on environmental issues through impactful films and discussions?

(a) Bengaluru
(b) Ahmedabad
(c) Jaipur
(d) Patna

Q60. IRIS chip, developed by ISRO in partnership with IIT-Madras, is designed for:

(a) Space applications with SHAKTI
(b) Commercial smartphones
(c) Gaming consoles
(d) Automotive systems

Q61. Who among the following highlighted the widespread poverty in India during the colonial period through the book Poverty and Un-British Rule in India?

(a) Pherozeshah Mehta
(b) Bal Gangadhar Tilak
(c) Mahatma Gandhi
(d) Dadabhai Naoroji

Q62. Who among the following is the head of the Union Council of Ministers?

(a) Union Home Minister
(b) Attorney General of India
(c) President
(d) Prime Minister

Q63. Which book written by Jyotirao Phule was dedicated to those who fought against slavery in America?

(a) Gulamgiri
(b) Satyarth Prakash
(c) The Cultivator's Whipcord
(d) Stripurushtulna

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Q64. In September 2025, 26 nations vowed to provide postwar security guarantees to which country?

(a) Palestine
(b) Iran
(c) Ukraine
(d) Poland

Q65. What is the purpose of using different file types with extensions in an operating system like MS Windows?

(a) To hide file content and remove the content from file
(b) To allow the OS to determine which application should open the file
(c) To increase file size and make changes in file
(d) To make file names longer and rename file

Q66. Which of the following provisions requires ratification by the legislatures of NOT less than half the States for amendment under Article 368(2), making it a 'rigid' feature?

(a) Composition of the Council of Ministers
(b) Manner of election of the President of India
(c) Provisions related to citizenship acquisition and termination
(d) Duration of the term of the Lok Sabha

Q67. In Windows, which file extension represents a dynamic-link library containing reusable code shared across applications?

(a) .dll
(b) .is
(c) .drv
(d) .tmp

Q68. Select the correct match of the musician with their musical instrument.

(a) Bismillah Khan – Shehnai
(b) Ravi Shankar – Bansuri
(c) Zakir Hussain – Sitar
(d) Shiv Kumar Sharma – Sarod

Q69. Action and reaction forces are exerted on which bodies during an interaction?

(a) Two different bodies
(b) Only moving bodies
(c) The same body
(d) Only bodies at rest

Q70. Which Amendment created the National Judicial Appointments Commission (NJAC) in India?

(a) 99^(th) Amendment
(b) 76^(th) Amendment
(c) 102^(nd) Amendment
(d) 82^(nd) Amendment

GENERAL INTELLIGENCE AND REASONING

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

Which is the one that does not belong to that group?

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

(a) PT – LG
(b) RF – NB
(c) MJ – IF
(d) UG – QC

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Q72. 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) QAI
(b) OGY
(c) PHZ
(d) KCU

Q73. In a certain code language, 'LOTS' is coded as '8439' and 'JOLS' is coded as '4853'.

What is the code for 'J' in the given code language?

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

Q74. 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 apples are baskets. Some baskets are cups.

Conclusions:

(I) Some apples are cups.

(II) All cups are apples.

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

Q75. 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) XV−SQ
(b) US−OP
(c) TR−OM
(d) PN−KI

Q76. Seven people F, G, H, L, M, O and Q are sitting around a circular table, facing the centre of the table. Only two people sit between Q and L when counted from the right of Q. Only two people sit between L and O when counted from the left of O. Only three people sit between Q and F when counted from the right of Q. M sits to the immediate left of H.

Who sits third to the left of G?

(a) L
(b) F
(c) H
(d) M

Q77. What should come in place of '?' in the given series?

135 150 180 225 285 ?

(a) 360
(b) 350
(c) 340
(d) 330

Q78. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(2, 5, 7)

(3, 10, 13)

(a) (8, 63, 75)
(b) (6, 37, 43)
(c) (7, 49, 51)
(d) (5, 26, 36)

Q79. Mr. Yorly starts from Point A and drives 17 km towards East. He then takes a left turn, drives 18 km, turns left and drives 30 km. He then takes a left turn and drives 31 km. He then takes a left turn, drives 9 km, turns left and drives 6 km. He takes a final right 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 degrees turns only unless specified.)

(a) 9 km to the East
(b) 7 km to the North
(c) 5 km to the West
(d) 8 km to the North

Q80. Seven people, T, E, A, R, I, N and G, are sitting in a row, facing north. Only two people sit to the left of N. Only three people sit between N and G. Only one person sits between G and E. I sits to the immediate left of R. A is not an immediate neighbor of G. How many people sit to the right of T?

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

Q81. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statement: All Eagles are Seagulls. Some Seagulls are Peacocks.

Conclusion (I): Some Eagles are Peacocks.

Conclusion (II): No Peacocks are Eagles.

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

Q82. In a certain code language,

J + Q means ‘J is the mother of Q’,

J – Q means ‘J is the brother of Q’,

J x Q means ‘J is the husband of Q’ and

J ÷ Q means ‘J is the sister of Q’.

Based on the above, how is A related to F if ‘A ÷ B x C + D – E ÷ F’?

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

Q83. In a certain code language, ‘stage pig add’ is coded as ‘yv se kk’ and ‘third add bee’ is coded as ‘se ec wm’. How is ‘add’ coded in that language? (All codes are two-letter codes.)

(a) se
(b) yv

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(c) ec
(d) kk

Q84. What should come in place of '?' in the given series?

4 10 18 38 74 ?

(a) 154
(b) 152
(c) 148
(d) 150

Q85. Each vowel in the word RADULAE 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. How many letters will appear exactly twice in the new group of letters thus formed?

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

Q86. KL 9 is related to IH −2 in a certain way. In the same way, PG 7 is related to NC −4.

To which of the following is JQ 14 related, following the same logic?

(a) IM 3
(b) HM 3
(c) IN 6
(d) HN 6

Q87. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

PRY WYF DFM KMT ?

(a) RTA
(b) RAT
(c) RTY
(d) ERT

Q88. If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+' and 'D' stands for '−', then what will come in place of the question mark (?) in the following equation?

3 A 42 B 14 C 29 D 22 = ?

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

Q89. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

TUW XYA BCE FGI ?

(a) JMK
(b) JKM
(c) KJL
(d) JLM

Q90. Seven boxes, K, N, I, G, H, T and S, are kept one over the other, but not necessarily in the same order.

K is kept fourth from the top. Only one box is kept between H and K. Only three boxes are kept between H and S. S is kept at some place above K. I is kept immediately below S. N is kept at one of the places above T. G is not kept immediately above or below H.

How many boxes are kept below N?

(a) Two
(b) Zero
(c) Three

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(d) One

Q91. If ‘A’ stands for ‘÷’, ‘B’ stands for ‘×’, ‘C’ stands for ‘+’ and ‘D’ stands for ‘−’, what will come in place of the question mark ‘?’ in the following equation?

7 A 7 C 20 B 2 = ? C 20

(a) 22
(b) 24
(c) 20
(d) 21

Q92. Seven boxes, A, U, V, W, X, Y and Z, are kept one over the other, but not necessarily in the same order.

Y is kept second from the bottom. Only two boxes are kept between Y and V. A is kept on one of the positions before V but on one of the positions after W. Only Z is kept between Y and U.

Which box is kept first from the bottom?

(a) X
(b) A
(c) W
(d) U

Q93. What should come in place of the question mark (?) in the given series based on the English alphabetical order?

YBZ DGE ILJ NQO ?

(a) SVT
(b) SUS
(c) STV
(d) SWS

Q94. Seven boxes, F, G, H, I, J, K and L, are kept one over the other, but not necessarily in the same order.

Only one box is kept between G and F. J is kept at the fourth position from the top. Only one box is kept above L. I is kept immediately below L. K is kept at a position somewhere above J.

How many boxes are kept between K and H?

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

Q95. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which letter-cluster pair DOES NOT belong to that group? (Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) IJ - OP
(b) MJ - LP
(c) CD - IJ
(d) ST - YZ

Q96. LOSM is related to QTXR in a certain way based on the English alphabetical order. In the same way, ILPJ is related to NQUO. To which of the following is FIMG related, following the same logic?

(a) KNRL
(b) NKRL
(c) NKLR
(d) KNLR

Q97. Each vowel in the word NOTFERN 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. How many letters will appear exactly twice in the new group of letters thus formed?

(a) Three
(b) One

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(c) Two
(d) Zero

Q98. In a certain code language,
A x B means 'A is the mother of B',
A ≠ B means 'A is the wife of B',
A ÷ B means 'A is the daughter of B' and
A Rs. B means 'A is the father of B'.
Based on the above, how is C related to M if 'C ≠ D Rs. E x L ÷ M'?
(a) Wife's brother's wife
(b) Wife's mother
(c) Brother's wife
(d) Husband's mother

Q99. What will come in place of '?' in the following equation, if '+' and '-' are interchanged and 'x' and '÷' are interchanged?
12 ÷ 4 + 9 x 3 - 8 = ?
(a) 35
(b) 53
(c) 39
(d) 44

Q100. Refer to the given letter series and answer the question that follows. Counting to be done from left to right only.
(Left) F M I H Y F Y E G K Y O N V K H Q T E K N (Right)
How many such vowels are there, each of which is immediately preceded by a consonant and also immediately followed by a vowel?
(a) None
(b) One
(c) Three
(d) Two

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (c) 17%
Shortcut Trick
Use the successive percentage formula: Net Profit % = x + y + (xy ÷ 100)
Here, markup (x) = +30 and discount (y) = −10.
Net Profit % = 30 − 10 + [30 × (−10)] ÷ 100

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Net Profit % = 20 − 3 = 17%

Therefore The correct answer is 17%.

Alternate Method

Let the Cost Price (CP) of the product be 100 units.

Given: Markup % = 30%, Discount % = 10%.

=> Marked Price (MP) = CP + 30% of CP

=> MP = 100 + (30 ÷ 100 × 100) = 130 units.

=> Discount = 10% of MP = 10 ÷ 100 × 130 = 13 units.

=> Selling Price (SP) = MP − Discount

=> SP = 130 − 13 = 117 units.

=> Profit = SP − CP = 117 − 100 = 17 units.

=> Profit % = (Profit ÷ CP) × 100 = (17 ÷ 100) × 100 = 17%.

Therefore The correct answer is 17%.

Additional Information

Relationship between MP and CP

The ratio of Marked Price to Cost Price is given by: MP ÷ CP = (100 + Profit%) ÷ (100 − Discount%).

Successive Discounts

If two successive discounts of d1% and d2% are given, the equivalent single discount is (d1 + d2 − d1d2 ÷ 100)%.

Selling Price Formula

Selling Price can be calculated directly from the Marked Price as SP = MP × (100 − Discount%) ÷ 100.

Q2. Answer: (c) 18

Shortcut Trick

Total Work (LCM of 12 and 24) = 24 units.

Efficiency: A = 24 ÷ 12 = 2; B = 24 ÷ 24 = 1.

Work done by (A + B) in 2 days = (2 + 1) × 2 = 6 units.

Remaining work = 24 − 6 = 18 units.

Time taken by B alone = 18 ÷ 1 = 18 days.

Therefore The correct answer is 18 days.

Alternate Method

Given: A takes 12 days and B takes 24 days to finish the work.

Person	Days	Total Work	Efficiency
A	12	24 units	2 units/day
B	24	1 unit/day	

=> Total work to be completed = 24 units.

=> Efficiency of A = 24 ÷ 12 = 2 units/day.

=> Efficiency of B = 24 ÷ 24 = 1 unit/day.

=> Work done by A and B together in 2 days = (2 + 1) × 2 = 6 units.

=> Remaining work after A leaves = Total work − Work done = 24 − 6 = 18 units.

=> Time taken by B to complete the remaining work = Remaining work ÷ Efficiency of B.

=> Time = 18 ÷ 1 = 18 days.

Therefore The correct answer is 18 days.

Additional Information

Work and Efficiency Relation

Efficiency is inversely proportional to time. If time ratio is x : y, then efficiency ratio is y : x.

Total Work Calculation

Total Work = Efficiency × Time. Using the LCM of individual days is the fastest way to find a common work unit.

Work and Wages

Wages are distributed in the ratio of the total work done by each person, which is (Efficiency × Days worked).

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Q3. Answer: (d) k = 75

Shortcut Trick

If a, b, c, d are in proportion, then a × d = b × c.

Given: 5, 15, 25, k are in proportion.

5 × k = 15 × 25

k = 3 × 25 = 75 (Since 15 ÷ 5 = 3)

Therefore The correct answer is k = 75.

Alternate Method

Given:

First term (a) = 5

Second term (b) = 15

Third term (c) = 25

Fourth proportional = k

Formula Used:

For four numbers to be in proportion: a ÷ b = c ÷ d

Calculations:

=> 5 ÷ 15 = 25 ÷ k

=> 1 ÷ 3 = 25 ÷ k

=> k = 25 × 3

=> k = 75

Therefore The correct answer is k = 75.

Additional Information

Mean Proportional

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

Third Proportional

If a, b, c are in continued proportion, then a : b = b : c, and c = b² ÷ a is the third proportional.

Product Property

In any proportion, the product of extremes (outer terms) is always equal to the product of means (inner terms).

Q4. Answer: (b) Rs. 1,000

Shortcut Trick

Net percentage change = a + b + (ab/100)

Here, a = +30 and b = −20

Net change = 30 − 20 + (30 × (−20) / 100) = 10 − 6 = 4%

Since 4% change corresponds to Rs. 40 increase, then 100% (original price) = (40 ÷ 4) × 100 = Rs. 1,000.

Therefore The correct answer is Rs. 1,000.

Alternate Method

Given:

First increase = 30%

Second decrease = 20%

Difference between final price and original price = Rs. 40

Let the original price of the article be Rs. x.

=> Price after 30% increase = x + (30 ÷ 100) × x = 1.3x

=> Price after 20% decrease = 1.3x − (20 ÷ 100) × 1.3x

=> Final Price = 1.3x − 0.26x = 1.04x

=> Given: Final Price − Original Price = Rs. 40

=> 1.04x − x = 40

=> 0.04x = 40

=> x = 40 ÷ 0.04

=> x = 4000 ÷ 4 = 1000

Therefore The correct answer is Rs. 1,000.

Additional Information

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Successive Percentage Change

When a value is changed by a% and then by b%, the effective change is given by [a + b + (ab/100)]%.

Multiplying Factor Method

An increase of x% is equivalent to multiplying the value by (1 + x/100), and a decrease of y% is equivalent to multiplying by (1 − y/100).

Ratio Method for Successive Changes

Convert percentages to fractions (30% = 13/10 and −20% = 4/5). Multiply the ratios: (13/10) × (4/5) = 52/50 = 104/100, which shows a 4% increase.

Q5. Answer: (c) 3

Given:

Expression = (27^(2/3) × 9^(-1/2))/(3^(-1) × 81^(1/4))

Formula used:

(a^m)^n = a^(m × n)

a^(−n) = 1 / a^n

Calculation:

Simplify the Numerator:

=> 27^(2/3) × 9^(−1/2)

=> (3^3)^(2/3) × (3^2)^(−1/2)

=> 3^2 × 3^(−1)

=> 9 × (1/3) = 3

Simplify the Denominator:

=> 3^(−1) × 81^(1/4)

=> (1/3) × (3^4)^(1/4)

=> (1/3) × 3 = 1

Evaluate the final Value:

=> Result = 3 / 1

=> Result = 3

Therefore The correct answer is option 3.

Q6. Answer: (c) 12,424

Shortcut Trick

Investment Ratio (P : Q) = 2300 : 4600 = 1 : 2

Since time is constant, Profit Ratio = Investment Ratio = 1 : 2

Total units = 1 + 2 = 3 units → Rs. 37,272

P's share (1 unit) = 37,272 ÷ 3 = Rs. 12,424

Therefore The correct answer is Rs. 12,424.

Alternate Method

Given:

Investment of P = Rs. 2,300

Investment of Q = Rs. 4,600

Total Profit earned at the end of 1 year = Rs. 37,272

Formula Used:

Profit Share of a Partner = (Individual Investment × Time Period) ÷ (Total Investment × Time Period) × Total Profit

Calculations:

=> Ratio of profits of P and Q = (2300 × 1) : (4600 × 1)

=> Ratio (P : Q) = 23 : 46 = 1 : 2

=> Sum of ratio components = 1 + 2 = 3

=> P's share in profit = (1 ÷ 3) × 37272

=> P's share = Rs. 12,424

Therefore The correct answer is Rs. 12,424.

Additional Information

Simple Partnership

If all partners invest their capital for the same time period, then the profits or losses are distributed in the ratio of their investments.

Compound Partnership

If partners invest for different time periods, the profit is shared in the ratio of the product of their capital and the time (Capital1 × Time1 : Capital2 × Time2).

Working and Sleeping Partners

A working partner manages the business and may receive a salary or extra commission, while a sleeping partner only provides the capital.

Q7. Answer: (d) 6.25%

Shortcut Trick

When two articles are sold at the same Selling Price, one at a gain of x% and the other at a loss of x%, the transaction always results in an overall loss.

Net Loss % = $(x / 10)^2$

Given x = 25%

Net Loss % = $(25 / 10)^2 = (2.5)^2 = 6.25\%$

Therefore The correct answer is 6.25%.

Alternate Method

Given: Selling Price (SP) is same for both articles. 1^(st) article profit = 25%, 2^(nd) article loss = 25%.

=> For 1^(st) article (25% profit): 25% = 1/4 → CP1 : SP1 = 4 : 5

=> For 2^(nd) article (25% loss): 25% = 1/4 → CP2 : SP2 = 4 : 3

=> To make Selling Prices equal, take LCM(5, 3) = 15 units.

=> Article 1: CP1 = 4 × 3 = 12 units | SP1 = 5 × 3 = 15 units

=> Article 2: CP2 = 4 × 5 = 20 units | SP2 = 3 × 5 = 15 units

=> Total Cost Price = 12 + 20 = 32 units

=> Total Selling Price = 15 + 15 = 30 units

=> Overall Loss % = [(32 − 30) / 32] × 100 = (2 / 32) × 100 = 6.25%

Therefore The correct answer is 6.25%.

Additional Information

Net Percentage Change Rule

For two successive percentage changes of a% and b%, the net change is given by (a + b + ab/100)%. However, when SP is same, the shortcut $(x/10)^2$ is derived from specific CP adjustments.

Same Cost Price Case

If two articles are bought at the same Cost Price (CP) and sold at x% profit and x% loss respectively, there is No Profit No Loss overall.

Profit and Loss Ratios

Profit % = (Profit / CP) × 100 and Loss % = (Loss / CP) × 100. Always ensure the denominator is Cost Price unless specified otherwise.

Q8. Answer: (c) 23

Shortcut Trick

Prime factorization of 360 = $2^3 \times 3^2 \times 5 = 8 \times 9 \times 5$.

To minimize the sum, a, b, and c should be as close to $\sqrt[3]{360} \approx 7.1$ as possible.

Condition (iii) requires a and c to share a factor, so we split the 2^3 into 2^2 for a and 2^1 for c.

Assigning factors: a = $2^2 = 4$, b = $3^2 = 9$, c = $2 \times 5 = 10$.

Check: gcd(4, 9)=1, gcd(9, 10)=1, gcd(4, 10)=2. All conditions satisfied.

Minimum sum = 4 + 9 + 10 = 23.

Therefore The correct answer is 23.

Alternate Method

Given: abc = 360, gcd(a, b) = 1, gcd(b, c) = 1, gcd(a, c) > 1.

Prime Factorization: 360 = $2^3 \times 3^2 \times 5^1$.

=> Total prime factors available are {2, 2, 2}, {3, 3}, {5}.

=> For gcd(a, c) > 1, both a and c must share at least one prime factor (2, 3, or 5).

=> If we share prime 2: a contains 2^x and c contains 2^y. Since b is coprime to both, b cannot have any factor of 2.

=> Trial 1: b = 3^2 = 9. Then ac = 360 ÷ 9 = 40. Since a, c are even, possible pairs (a, c) are (4, 10), (2, 20). Sums: 4+9+10 = 23; 2+9+20 = 31.

=> Trial 2: b = 5. Then ac = 360 ÷ 5 = 72. To share a factor and keep sum low, try (a, c) = (6, 12). Sum: 6+5+12 = 23.

=> Trial 3: b = 8. Then ac = 360 ÷ 8 = 45. To share a factor, try (a, c) = (3, 15). Sum: 3+8+15 = 26.

=> Comparing all valid combinations, the minimum sum is 23.

Therefore The correct answer is 23.

Additional Information

Coprime Numbers

Two numbers are coprime if their Greatest Common Divisor (GCD) is 1. They do not share any prime factors.

Prime Factorization

Every composite number can be expressed as a unique product of prime powers. For 360, it is $2^3 \times 3^2 \times 5^1$.

AM-GM Inequality Concept

For a fixed product, the sum of positive numbers is minimized when the numbers are as close to each other as possible (ideally equal to the n-th root).

Q9. Answer: (b) 60

Shortcut Trick

The ratio of the first two numbers is 240 : 120 = 2 : 1.

For the third proportional (c), the ratio 120 : c must also be 2 : 1.

Since the ratio is halved, c = 120 ÷ 2 = 60.

Therefore The correct answer is 60.

Alternate Method

Given:

First term (a) = 240

Second term (b) = 120

Formula Used:

If three numbers a, b, and c are in continued proportion, then:

a : b :: b : c => c = b^2 ÷ a

Calculations:

=> Let the third proportional be c.

=> 240 : 120 = 120 : c

=> 240 ÷ 120 = 120 ÷ c

=> 2 = 120 ÷ c

=> c = 120 ÷ 2

=> c = 60

Therefore The correct answer is 60.

Additional Information

Mean Proportional

The Mean Proportional between two numbers x and y is given by the formula √(x × y).

Fourth Proportional

If four numbers a, b, c, and d are in proportion (a : b = c : d), then d is the Fourth Proportional, calculated as (b × c) ÷ a.

Product Rule

In any proportion, the Product of Extremes (first and last terms) is always equal to the Product of Means (middle terms).

Q10. Answer: (d) 15 percent

Shortcut Trick

Simple Interest (SI) for 2 years = Rs. 6,400 − Rs. 5,200 = Rs. 1,200

Principal (P) = Amount after 2 years − SI for 2 years = Rs. 5,200 − Rs. 1,200 = Rs. 4,000

Rate (R) = (SI for 2 years × 100) ÷ (P × Time)

Rate = (1,200 × 100) ÷ (4,000 × 2) = 15%

Therefore The correct answer is 15 percent.

Alternate Method

Given:

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Amount after 2 years (A1) = Rs. 5,200
Amount after 4 years (A2) = Rs. 6,400
Formula Used:
Simple Interest (SI) = (Principal × Rate × Time) ÷ 100
Amount (A) = Principal (P) + Simple Interest (SI)
Calculations:
=> Simple Interest for 2 years = A2 − A1
=> SI for 2 years = 6,400 − 5,200 = 1,200
=> Principal (P) = A1 − SI for 2 years
=> P = 5,200 − 1,200 = 4,000
=> We know, SI = (P × R × T) ÷ 100
=> 1,200 = (4,000 × R × 2) ÷ 100
=> 1,200 = 80 × R
=> R = 1,200 ÷ 80 = 15
Therefore The correct answer is 15 percent.
Additional Information
Simple Interest Constant Property
In simple interest, the interest earned remains constant every year because it is always calculated on the original principal.
Relationship between Amount and Principal
The amount (A) is the sum of the principal (P) and the accumulated interest (I) over a period of time T: A = P + (P × R × T)/100.
Finding Principal from Two Amounts
If a sum amounts to A1 in T1 years and A2 in T2 years, then SI for (T2 − T1) years is (A2 − A1).

Q11. Answer: (a) 42

Shortcut Trick
If each number in a set is decreased by a constant value k, the average of the set also decreases by the same value k.
Given Old Average = 45 and Decrease per number = 3.
New Average = 45 − 3 = 42.
Therefore The correct answer is 42.
Alternate Method
Given:
Total numbers = 8
Initial Average = 45
Formula Used:
Average = Sum of observations ÷ Number of observations
Calculations:
=> Initial Sum = Average × Count = 45 × 8 = 360
=> Total Reduction = 8 × 3 = 24
=> New Sum = 360 − 24 = 336
=> New Average = 336 ÷ 8
=> New Average = 42
Therefore The correct answer is 42.
Additional Information
Addition Rule
If k is added to every observation, the new average is Old Average + k.
Multiplication Rule
If every observation is multiplied by a constant n, the new average becomes Old Average × n.
Division Rule
If every observation is divided by a non-zero constant m, the new average is Old Average ÷ m.

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Q12. Answer: (d) 120

Shortcut Trick

Percentage difference = 45% − 20% = 25%

The question states that this 25% difference is equal to 30.

Using the Unitary method:

25% → 30

100% → 30 × (100 ÷ 25) = 30 × 4 = 120

Therefore The correct answer is 120.

Alternate Method

Given: 45% of a number exceeds 20% of the same number by 30.

Formula Used: Percentage of a number = (Percent ÷ 100) × Number

=> Let the number be x. => (45% of x) − (20% of x) = 30 => (45/100) × x − (20/100) × x = 30 => (45 − 20)/100 × x = 30 => (25/100) × x = 30 => (1/4) × x = 30 => x = 30 × 4 => x = 120

Therefore The correct answer is 120.

Additional Information

Percentage to Fraction Conversion

To solve quickly, remember common fractions: 25% = 1/4, 20% = 1/5, 50% = 1/2, and 75% = 3/4.

Base Value Property

When comparing two percentages of the same number, you can directly subtract or add the percentage values before applying them to the base.

Percentage Change Formula

Percentage change = (Difference ÷ Original Value) × 100. This is used to find how much one value is greater or smaller than another in percentage terms.

Q13. Answer: (c) 8.4

Shortcut Trick

Let the smaller number be x. Then the larger number is 54 − x.

Given condition: 3 × x − 2 × (54 − x) = 6

=> 3x − 108 + 2x = 6 => 5x = 114 => x = 22.8.

Larger number = 54 − 22.8 = 31.2.

Difference = 31.2 − 22.8 = 8.4.

Therefore The correct answer is 8.4.

Alternate Method

Given: Sum of two numbers = 54. Let smaller number = x and larger number = y.

Formulas: (i) x + y = 54 | (ii) 3x − 2y = 6

=> From (i), y = 54 − x.

=> Substitute y in (ii): 3x − 2(54 − x) = 6

=> 3x − 108 + 2x = 6

=> 5x = 114 => x = 22.8

=> y = 54 − 22.8 = 31.2

=> Difference = y − x = 31.2 − 22.8 = 8.4

Therefore The correct answer is 8.4.

Additional Information

Linear Equations in Two Variables

Equations of the form ax + by = c can be solved using the Elimination Method or Substitution Method to find unique values for the variables.

Sum and Difference Relation

If the Sum (S) and Difference (D) of two numbers are known, the Larger number = (S + D) ÷ 2 and the Smaller number = (S − D) ÷ 2.

Algebraic Modeling

Key phrases like exceeds or more than indicate subtraction (Larger − Smaller = Difference) when setting up equations.

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Q14. Answer: (b) 4√3 m

Shortcut Trick

In a right-angled triangle with angles 30°−60°−90°, the ratio of sides is 1 : √3 : 2.

Here, the side opposite to 60° (Height of wall) corresponds to √3 parts.

The hypotenuse (Ladder length) corresponds to 2 parts = 8 m.

=> 1 part = 8 ÷ 2 = 4 m.

=> Height (opposite to 60°) = 4 × √3 = 4√3 m.

Therefore The correct answer is 4√3 m.

Alternate Method

Given:

Length of the ladder (Hypotenuse, AC) = 8 m

Angle of elevation with the ground (θ) = 60°

Let the height of the wall reached by the ladder be AB.

Formula Used:

In a right-angled triangle, sin θ = Perpendicular (Height) ÷ Hypotenuse

Calculations:

=> sin 60° = AB ÷ AC

=> √3 ÷ 2 = AB ÷ 8

=> AB = 8 × (√3 ÷ 2)

=> AB = 4 × √3

=> AB = 4√3 m

Therefore The correct answer is 4√3 m.

Additional Information

Trigonometric Ratios

For an angle θ, sin θ = opposite/hypotenuse, cos θ = adjacent/hypotenuse, and tan θ = opposite/adjacent.

Standard Trigonometric Values

Key values include sin 30° = 1/2, sin 45° = 1/√2, and sin 60° = √3/2.

Pythagoras Theorem

In any right-angled triangle, the square of the hypotenuse is equal to the sum of squares of the other two sides: $a^2 + b^2 = c^2$.

Q15. Answer: (b) 72°

Shortcut Trick

Total units in the ratio = 3 + 3 + 4 = 10 units.

Sum of angles in a triangle = 180°.

10 units → 180°

1 unit → 18°

Measure of the largest angle (4 units) = 4 × 18° = 72°.

Therefore The correct answer is 72degree.

Alternate Method

Given:

Ratio of three angles = 3 : 3 : 4

Formula Used:

The Angle-Sum Property of a triangle states that the sum of all interior angles is exactly 180°.

Calculations:

=> Let the three angles of the triangle be 3x, 3x, and 4x.

=> 3x + 3x + 4x = 180°

=> 10x = 180°

=> x = 180° / 10 = 18°

=> Measure of the first angle = 3 × 18° = 54°

=> Measure of the second angle = 3 × 18° = 54°

=> Measure of the third (largest) angle = 4 × 18° = 72°

Therefore The correct answer is 72degree.

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Additional Information

Angle-Sum Property

For any polygon with n sides, the sum of interior angles is (n − 2) × 180°.

Isosceles Triangle

When a triangle has two equal angles, the sides opposite those angles are also equal.

Classification by Angles

A triangle where all angles are less than 90° is an acute triangle; if one is exactly 90°, it is a right triangle.

Q16. Answer: (d) 308

Shortcut Trick

Area of Rectangle = Area of Circle => 98 × 77 = (22/7) × r^2

r^2 = (98 × 77 × 7) ÷ 22 => r^2 = 49 × 11 × 7 × 7 ÷ 11 × 2 ÷ 2 (Simplifying: 98 = 49 × 2 and 77 = 11 × 7)

r^2 = 49 × 49 => r = 49 m

Perimeter of Circle = 2 × (22/7) × 49 = 44 × 7 = 308 m

Therefore The correct answer is 308 m.

Alternate Method

Given: Length of rectangular field = 98 m, Breadth = 77 m. Area of circle = Area of rectangle.

=> Area of Rectangular Field = Length × Breadth

=> Area = 98 × 77 = 7546 m^2

=> Area of Circular Field = πr^2

=> Since Area of Circle = Area of Rectangle:

=> (22/7) × r^2 = 7546

=> r^2 = (7546 × 7) ÷ 22

=> r^2 = 343 × 7 = 2401

=> Radius (r) = √2401 = 49 m

=> Perimeter (Circumference) of Circular Field = 2 × π × r

=> Perimeter = 2 × (22/7) × 49 = 2 × 22 × 7 = 308 m

Therefore The correct answer is 308 m.

Additional Information

Area and Perimeter of a Rectangle

The Area is length × breadth (l × b) and the Perimeter is 2(l + b).

Circle Mensuration Formulas

For a circle of radius r, the Area = πr^2 and the Circumference (Perimeter) = $2\pi r$.

Relation Between Radius and Area

If the radius is multiplied by a factor k, the Area increases by k^2 and the Perimeter increases by k.

Q17. Answer: (a) 10 days

Shortcut Trick

Total Work = LCM(14, 21, 42) = 42 units.

Efficiencies: P = 3, Q = 2, R = 1. Combined (P+Q+R) = 6.

Work done in 4 days = 6 × 4 = 24 units.

Remaining work = 42 − 24 = 18 units.

Time for Q and R to finish = 18 ÷ (2 + 1) = 6 days.

Total time = 4 + 6 = 10 days.

Therefore The correct answer is 10 days.

Alternate Method

Given: Time taken by P = 14 days, Q = 21 days, and R = 42 days.

Person	Days	Total Work (LCM)	Efficiency
P	14	42 units	3 units/day
Q	21	2 units/day	
R	42	1 unit/day	

=> All three started together, so combined efficiency = 3 + 2 + 1 = 6 units/day.

=> Work completed by P, Q, and R in 4 days = 6 × 4 = 24 units.

=> Remaining work to be done = 42 − 24 = 18 units.

=> Since P left, Q and R complete the remaining work.

=> Combined efficiency of Q and R = 2 + 1 = 3 units/day.

=> Time taken by Q and R = 18 ÷ 3 = 6 days.

=> Total days taken for the wall to be painted = 4 + 6 = 10 days.

Therefore The correct answer is 10 days.

Additional Information

Efficiency and Time

Efficiency is inversely proportional to the time taken to complete a task. If the ratio of time is a:b, then the ratio of efficiency is b:a.

Work and Wages

Wages are generally distributed in the ratio of the total work done by each individual. If they work for the same time, it is the ratio of their efficiencies.

Pipes and Cisterns

This concept follows the same logic as Time & Work, where an inlet pipe does positive work and an outlet pipe (leakage) does negative work.

Q18. Answer: (d) 14.7

Shortcut Trick

Assume the mean 13 as the balance point for all deviations.

Net deviation from 13: (6.5 − 13) + (10.8 − 13) + (20 − 13) + (a − 13) = 0

=> −6.5 − 2.2 + 7.0 + (a − 13) = 0

=> −1.7 + (a − 13) = 0

=> a − 13 = 1.7 => a = 13 + 1.7 = 14.7

Therefore The correct answer is 14.7.

Alternate Method

Given: Numbers = 6.5, 10.8, 20, a | Total Count (n) = 4 | Average = 13

Formula Used: Average = (Sum of all observations) ÷ (Total number of observations)

=> Sum of observations = Average × Count

=> 6.5 + 10.8 + 20 + a = 13 × 4

=> 37.3 + a = 52

=> a = 52 − 37.3

=> a = 14.7

Therefore The correct answer is 14.7.

Additional Information

Arithmetic Mean Properties

If each observation is increased or decreased by a constant k, the new average also increases or decreases by k.

Sum of Deviations

The sum of deviations of all observations from their mean is always zero (Σ(x_i − x) = 0).

Weighted Average

When two groups with averages A1 and A2 and sizes n1 and n2 are combined, the combined average = (n1A1 + n2A2) ÷ (n1 + n2).

Q19. Answer: (b) 262144 cm³

Shortcut Trick

Length of 4 identical cubes placed in a row = 256 cm.

Side of a single cube (a) = 256 ÷ 4 = 64 cm.

Volume of the cube = a^3 = 64 × 64 × 64.

Volume = 262144 cm^3.

Therefore The correct answer is 262144 cm^3.

Alternate Method

Given:

Total length of the cuboid formed by 4 cubes = 256 cm.
Formula Used:
Volume of a cube = $(side)^3$
Calculations:
=> Let the side of each cube be a.
=> When 4 cubes are placed side-by-side, length (L) = 4a.
=> 4a = 256
=> a = 256 ÷ 4
=> a = 64 cm
=> Volume of a single cube = a × a × a
=> Volume = 64 × 64 × 64
=> Volume = 262144 cm^3
Therefore The correct answer is 262144 cm^3.
Additional Information
Total Surface Area of Cube
The total surface area of a cube with side a is given by $6a^2$.
Diagonal of a Cube
The length of the longest diagonal in a cube is $a\sqrt{3}$.
Volume of a Cuboid
For a cuboid with dimensions L, B, and H, the volume is L × B × H.

Q20. Answer: (c) 144 meters

Shortcut Trick
When two trains move in opposite directions, their relative speed is the sum of their individual speeds.
Relative Speed = 8 + 10 = 18 m/s.
Combined Length = Relative Speed × Time = 18 × 8 = 144 m.
Therefore The correct answer is 144 m.
Alternate Method
Given:
Speed of the first train (v1) = 8 m/s
Speed of the second train (v2) = 10 m/s
Time taken to pass each other (t) = 8 sec
Formula Used:
Total Distance (Sum of lengths) = Relative Speed × Time
Calculations:
=> When two objects move in opposite directions, Relative Speed (S_R) = v1 + v2
=> S_R = 8 + 10 = 18 m/s
=> Combined Length (L1 + L2) = S_R × t
=> Combined Length = 18 × 8 = 144 m
Therefore The correct answer is 144 m.
Additional Information
Relative Speed in Same Direction
When two objects move in the same direction with speeds u and v (where v), the relative speed is u − v.
Crossing a Stationary Object
When a train crosses a stationary object of negligible length (like a pole), the distance covered is the length of the train.
Unit Conversion Shortcut
To convert speed from km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

Q21. Answer: (b) 15

Shortcut Trick
The greatest number that divides the given numbers exactly is their Highest Common Factor (HCF).
Find the differences between the consecutive numbers:

105 − 75 = 30

150 − 105 = 45

The HCF must divide these differences. The greatest common divisor of 30 and 45 is 15.

Since 15 also divides 75, 105, and 150 exactly, the greatest divisor is 15.

Therefore The correct answer is 15.

Alternate Method

Given:

The numbers are 75, 105, and 150.

Formula/Concept Used:

To find the greatest number that divides a set of numbers exactly, we calculate their Highest Common Factor (HCF) using the Prime Factorization Method.

Q22. Answer: (c) Rs. 1,912.50

Shortcut Trick

Final Selling Price = Marked Price × (1 − d1/100) × (1 − d2/100)

=> SP = 3000 × (1 − 15/100) × (1 − 25/100)

=> SP = 3000 × 0.85 × 0.75

=> SP = 3000 × 0.6375 = Rs. 1,912.50

Therefore The correct answer is Rs. 1,912.50.

Alternate Method

Given:

Marked Price (MP) = Rs. 3,000

First Discount (d1) = 15%

Second Discount (d2) = 25%

Calculations:

=> Price after first discount = 3000 − (15% of 3000)

=> Price after first discount = 3000 − (15/100 × 3000) = 3000 − 450 = Rs. 2,550

=> Price after second discount = 2550 − (25% of 2550)

=> Price after second discount = 2550 − (25/100 × 2550) = 2550 − 637.50

=> Final Selling Price = Rs. 1,912.50

Therefore The correct answer is Rs. 1,912.50.

Additional Information

Single Equivalent Discount Formula

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

Order of Successive Discounts

The final selling price remains the same regardless of the order in which the successive discounts are applied (e.g., 15% then 25% is the same as 25% then 15%).

Marked Price vs Selling Price

Selling Price = Marked Price − Discount. Discounts are always calculated on the Marked Price (or the remaining balance in successive cases).

Q23. Answer: (a) 18 years

Shortcut Trick

To find the larger value (Elder Sibling) when the Sum and Difference are given:

Elder Sibling Age = (Sum + Difference) ÷ 2

=> Age = (28 + 8) ÷ 2

=> Age = 36 ÷ 2 = 18 years

Therefore The correct answer is 18 years.

Alternate Method

Given:

Sum of ages = 28 years

Difference of ages = 8 years

Method: Linear Equations

=> Let the age of the elder sibling be x years and the younger sibling be y years.

=> x + y = 28 --- (Equation 1)

=> x − y = 8 --- (Equation 2)

=> Adding Equation 1 and Equation 2:

=> (x + y) + (x − y) = 28 + 8

=> 2x = 36

=> x = 36 ÷ 2

=> x = 18 years

Therefore The correct answer is 18 years.

Additional Information

Sum and Difference Formula

For any two numbers x and y, if Sum = S and Difference = D, then the larger number x = (S + D) ÷ 2 and the smaller number y = (S − D) ÷ 2.

Age Ratio Problems

If the ratio of ages of two people is a : b, their ages can be taken as ax and bx. The difference between their ages remains constant throughout their lives.

Average Age

The average age of n persons is the sum of their ages divided by n. If each person's age increases by 'k' years, the average also increases by 'k' years.

Q24. Answer: (d) 40%

Shortcut Trick

Ratio of Amount to Principal = 1728 : 1000.

Since interest is compounded semi-annually for 1.5 years, there are 3 half-yearly periods.

Take the cube root for one period: $\sqrt[3]{1728} : \sqrt[3]{1000} = 12 : 10$.

Rate per half-year = (12 − 10)/10 × 100 = 20%.

Annual Interest Rate = 20% × 2 = 40%.

Therefore The correct answer is 40%.

Alternate Method

Given: Principal (P) = Rs. 1,000, Amount (A) = Rs. 1,728, Time = 1 year 6 months.

Formula Used: $A = P(1 + r/200)^{2n}$ (for semi-annual compounding, where r is annual rate and n is years).

=> Total periods (n) = 1.5 years × 2 = 3 half-years.

=> $1728 = 1000 \times (1 + r/200)^3$

=> $1728/1000 = (1 + r/200)^3$

=> $1.728 = (1 + r/200)^3$

=> $\sqrt[3]{(1.728)} = 1 + r/200$

=> 1.2 = 1 + r/200

=> r/200 = 1.2 − 1 = 0.2

=> r = 0.2 × 200 = 40%.

Therefore The correct answer is 40%.

Additional Information

Compound Interest Compounding Frequency

For semi-annual compounding, the rate is halved (r/2) and the time periods are doubled (2n). For quarterly, the rate is divided by 4 and periods multiplied by 4.

Effective Interest Rate

The actual interest earned over a year when compounding occurs more than once. Formula: E = (1 + r/k)^k − 1, where k is compounding frequency per year.

Rule of 72

A quick way to estimate the time required to double an investment: Years to double ≈ 72 ÷ Annual Interest Rate.

Q25. Answer: (c) 16%

Shortcut Trick

Let Cost Price (CP) = 100.

Marked Price (MP) is 150% above CP => 100 + 150 = 250.
To gain 110%, Selling Price (SP) must be 100 + 110 = 210.
Discount = MP − SP = 250 − 210 = 40.
Discount % = (40 ÷ 250) × 100 = 16%.
Therefore The correct answer is 16%.
Alternate Method
Given:
Markup = 150% above Cost Price
Required Profit = 110%
Calculations:
=> Assume CP = 100 units
=> Marked Price (MP) = 100 + (150% of 100) = 100 + 150 = 250 units
=> Selling Price (SP) = 100 + (110% of 100) = 100 + 110 = 210 units
=> Discount Amount = MP − SP = 250 − 210 = 40 units
=> Discount % = (Discount Amount ÷ MP) × 100
=> Discount % = (40 ÷ 250) × 100
=> Discount % = 4 ÷ 25 × 100 = 16%
Therefore The correct answer is 16%.
Additional Information
Relationship between CP, MP, Profit, and Discount
The ratio of MP to CP can be expressed as: MP/CP = (100 + Profit%) ÷ (100 − Discount%).
Markup Percentage
Markup % is the percentage by which the cost price is increased to set the marked price: ((MP − CP) ÷ CP) × 100.
Effective Discount
For two successive discounts d1 and d2, the single equivalent discount is (d1 + d2 − (d1 × d2) ÷ 100)%.

Q26. Answer: (a) 30

Shortcut Trick
Identify factors of the product 175 that add up to the sum 40.
Factors of 175: 1 × 175, 5 × 35, 7 × 25.
Check sum: 5 + 35 = 40 (Correct).
Calculate positive difference: 35 − 5 = 30.
Therefore The correct answer is 30.
Alternate Method
Given: Sum (x + y) = 40 and Product (xy) = 175.
Formula: $(x - y)^2 = (x + y)^2 - 4xy$
=> $(x - y)^2 = 40^2 - 4 \times 175$
=> $(x - y)^2 = 1600 - 700$
=> $(x - y)^2 = 900$
=> $x - y = \sqrt{900} = 30$
Therefore The correct answer is 30.
Additional Information
Algebraic Identity
The relationship between sum, product, and difference is given by the identity: $(a+b)^2 - (a-b)^2 = 4ab$.
Quadratic Equations
If the sum (S) and product (P) are known, the numbers are roots of the equation: $t^2 - St + P = 0$.
Difference of Roots
For a quadratic equation $ax^2 + bx + c = 0$, the positive difference of roots is given by $\sqrt{D} / |a|$, where $D = b^2 - 4ac$.

Q27. Answer: (b) 5/9

Given:
3^x − 3^(x−1) = 18

Formula used:

a^(m−n) = a^m / a^n

Calculation:

3^x − 3^(x−1) = 18

=> 3^x − (3^x / 3) = 18

=> 3^x (1 − 1/3) = 18

=> 3^x × (2/3) = 18

=> 3^x = (18 × 3) / 2

=> 3^x = 9 × 3

=> 3^x = 27

=> 3^x = 3^3

=> x = 3

Substituting x in the expression (2x − 1) / (2x + 3):

=> (2 × 3 − 1) / (2 × 3 + 3)

=> (6 − 1) / (6 + 3)

=> 5/9

Therefore The correct answer is option (2).

Q28. Answer: (c) C

Shortcut Trick

To identify co-prime numbers, check if the two numbers have any common factor other than 1.

(15, 25) → Both are divisible by 5.

(14, 35) → Both are divisible by 7.

(21, 49) → Both are divisible by 7.

(9, 28) → 9 = 3×3 and 28 = 2×2×7. No common prime factor exists.

Therefore The correct answer is (9, 28).

Alternate Method

Given: Pairs of numbers (15, 25), (14, 35), (9, 28), and (21, 49).

Formula Used: Two numbers are co-prime if their Highest Common Factor (HCF) is 1.

=> Factors of 15: 1, 3, 5, 15 | Factors of 25: 1, 5, 25. HCF = 5.

=> Factors of 14: 1, 2, 7, 14 | Factors of 35: 1, 5, 7, 35. HCF = 7.

=> Factors of 21: 1, 3, 7, 21 | Factors of 49: 1, 7, 49. HCF = 7.

=> Factors of 9: 1, 3, 9 | Factors of 28: 1, 2, 4, 7, 14, 28. HCF = 1.

Therefore The correct answer is (9, 28).

Additional Information

Definition of Co-prime Numbers

A set of numbers is co-prime if they have no common positive factor other than 1. Their HCF is always 1.

Consecutive Numbers

Any two consecutive natural numbers (e.g., 14 and 15, or 20 and 21) are always co-prime to each other.

LCM of Co-prime Numbers

The Least Common Multiple (LCM) of two co-prime numbers is always equal to their product (a × b).

Prime Numbers Property

Any two prime numbers are always co-prime to each other since their only common factor is 1.

Q29. Answer: (c) 9771

Shortcut Trick

Find the LCM of the given divisors: LCM(12, 8, 11) = 264.

Divide the largest 4-digit number (9999) by 264 to find the remainder: 9999 ÷ 264 gives a remainder of 231.

Subtract this remainder from 9999 to get the largest multiple: 9999 − 231 = 9768.

Add the required common remainder of 3 to the multiple: 9768 + 3 = 9771.

Therefore The correct answer is 9771.

Alternate Method

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Given:

Divisors = 12, 8, 11

Common remainder in each case = 3

Formula Used:

Required Number = (LCM of divisors × k) + Remainder, where k is an integer.

4-Digit Numbers 5-Digit

Q30. Answer: (b) 120 km

Shortcut Trick

Apply the Direct Distance Formula for Total Travel Time: Distance = (S1 × S2) ÷ (S1 + S2) × Total Time.

Here, S1 = 60 km/hr, S2 = 80 km/hr, and Total Time = 3.5 hr.

=> Distance = (60 × 80) ÷ (60 + 80) × 3.5

=> Distance = (4800 ÷ 140) × 3.5 = (480 ÷ 14) × 3.5

=> Distance = 480 ÷ 4 = 120 km.

Therefore The correct answer is 120 km.

Alternate Method

Given: Speed from Gwalior to Jhansi = 60 km/hr, speed from Jhansi to Gwalior = 80 km/hr, and Total travel time = 3.5 hr.

Formula Used: Time = Distance ÷ Speed

Let the one-way distance be x km.

=> Time taken to travel from Gwalior to Jhansi = x ÷ 60

=> Time taken to travel from Jhansi to Gwalior = x ÷ 80

=> Total Time = (x ÷ 60) + (x ÷ 80) = 3.5

=> (4x + 3x) ÷ 240 = 3.5

=> 7x ÷ 240 = 3.5

=> 7x = 3.5 × 240

=> 7x = 840

=> x = 840 ÷ 7 = 120 km.

Therefore The correct answer is 120 km.

Additional Information

Average Speed Formula

When a person travels the same distance at two different speeds S1 and S2, the Average Speed is given by (2 × S1 × S2) ÷ (S1 + S2).

Speed and Time Relation

For a constant distance, Speed is inversely proportional to Time (S1 ÷ S2 = T2 ÷ T1).

Distance when Time Difference is Given

If the difference in time (ΔT) is given instead of total time, the formula becomes: Distance = (S1 × S2) ÷ |S1 − S2| × ΔT.

Q31. Answer: (b) President of India

The correct answer is President of India.

Key Points

• According to Article 108 of the Constitution of India, the President has the constitutional authority to summon a Joint Sitting of both the Lok Sabha and the Rajya Sabha.

• The Joint Sitting is a mechanism provided to resolve a deadlock between the two Houses of Parliament over the passage of a bill.

• A deadlock is deemed to have occurred if a bill passed by one House is rejected by the other, if the Houses disagree on amendments, or if more than six months elapse without the bill being passed by the second House.

• The President issues a notification or message expressing the intention to summon the members of both Houses to meet in a joint session for the purpose of deliberating and voting on the bill.

• Once the President notifies the intention to summon a joint sitting, neither House can proceed further with the bill independently.

Additional Information

• Presiding Officers:

• While the President summons the session, the Speaker of the Lok Sabha presides over the joint sitting.

• In the absence of the Speaker, the Deputy Speaker of the Lok Sabha presides. If they are also absent, the Deputy Chairman of

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the Rajya Sabha takes the chair.

• The Chairman of the Rajya Sabha (the Vice-President of India) never presides over a joint sitting because they are not a member of either House of Parliament.

• Applicability and Exceptions:

• A joint sitting can only be convened for Ordinary Bills or Financial Bills.

• It cannot be summoned for a Money Bill (as the Lok Sabha has overriding powers) or a Constitution Amendment Bill (which must be passed by each House separately under Article 368).

Q32. Answer: (d) The Northern Plains

The correct answer is The Northern Plains.

Key Points

• The Northern Plains of India were formed by the interplay of three major river systems: the Indus, the Ganga, and the Brahmaputra, along with their numerous tributaries.

• These rivers originate in the Himalayas and carry vast amounts of silt and sedimentary debris as they flow downstream toward the lower elevations.

• Over millions of years, these sediments were deposited in a vast basin located at the foothills of the Himalayas, creating a flat landmass composed entirely of alluvial soil.

• The plain spreads over an area of approximately 7 lakh sq. km, stretching about 2400 km in length and ranging between 240 to 320 km in width.

• Due to the rich alluvial deposits and abundant water supply from the perennial Himalayan rivers, this region is one of the most fertile and densely populated physiographic divisions in India.

Additional Information

• The Peninsular Plateau

• This is the oldest landmass of India, formed by the breaking and drifting of the Gondwana land.

• It consists of igneous and metamorphic rocks with gently rising hills and wide valleys, rather than deep alluvial deposits.

• The Meghalaya Plateau

• Geologically, it is an extension of the Peninsular Plateau, separated by the Malda fault.

• It is characterized by ancient crystalline rocks and receives the highest rainfall in the world at Mawsynram.

• The Western Coastal Plains

• These are narrow strips located between the Western Ghats and the Arabian Sea.

• Unlike the Northern Plains, they are formed by a combination of submergence, emergence, and the action of shorter Peninsular rivers.

• Regional Divisions of Northern Plains

• Bhabar: A narrow belt of pebbles at the foot of the Shiwaliks.

• Terai: A marshy, damp, and thickly forested region south of Bhabar.

• Bhangar: The older, less fertile alluvium containing kankar (calcareous deposits).

• Kadar: The newer, highly fertile floodplain alluvium renewed every year.

Q33. Answer: (c) Crop rotation

The correct answer is Crop rotation.

Key Points

• Crop rotation is a core practice in sustainable agriculture that involves growing different types of crops in a planned sequence on the same land over successive seasons.

• It significantly enhances soil fertility by alternating crops with different nutrient needs; for instance, leguminous plants (like beans or pulses) are included to facilitate biological nitrogen fixation.

• Through symbiotic relationships with Rhizobium bacteria found in root nodules, these legumes convert atmospheric nitrogen into nitrates, naturally replenishing the soil for subsequent nitrogen-demanding crops like maize or wheat.

• The practice improves soil structure and organic matter levels by rotating deep-rooted and shallow-rooted plants, which aids in better water infiltration and prevents soil compaction.

• It serves as a natural pest management strategy by breaking the life cycles of host-specific pathogens and insects that thrive when a single crop is grown continuously.

Additional Information

• Monoculture farming:

• Involves the repeated cultivation of only one crop species, leading to severe nutrient depletion and increased vulnerability to epidemics.

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• Reduces agrobiodiversity and requires higher doses of synthetic chemicals to maintain yields.

• Excessive chemical fertilisers:

• While providing immediate nutrients, long-term use leads to soil acidification and the destruction of beneficial microorganisms like earthworms.

• Contributes to environmental issues such as eutrophication in nearby water bodies due to nutrient runoff.

• Deforestation:

• The clearing of forest land for agriculture results in massive soil erosion and the loss of the nutrient-rich humus layer.

• Disrupts the carbon cycle and leads to habitat fragmentation, which is the antithesis of sustainable land management.

Therefore, the correct answer is 3.

Q34. Answer: (a) National Commission for Women

The correct answer is National Commission for Women.

Key Points

• The National Annual Report & Index on Women's Safety (NARI) 2025 was officially released by the National Commission for Women (NCW) on August 28, 2025, in New Delhi.

• It represents India's first comprehensive, perception-based safety index designed to capture unreported harassment and lived experiences of women, moving beyond the traditional crime statistics provided by the National Crime Records Bureau (NCRB).

• The index was launched by the NCW Chairperson, Vijaya Rahatkar, and was developed in collaboration with Pvalue Analytics and academic inputs from Jindal Global Law School.

• The NARI 2025 report is based on a massive nationwide survey of 12,770 women conducted across 31 major cities in India.

• India received an overall national safety score of 65%, with the report highlighting that nearly 40% of women still perceive their urban environments as unsafe or only somewhat safe.

• According to the rankings, Kohima emerged as the safest city for women with a score of 82.9%, followed by Visakhapatnam, Bhubaneswar, and Aizawl.

• Conversely, cities like Patna, Jaipur, and Delhi were ranked at the bottom of the index, indicating significant gaps in urban safety infrastructure and policing responsiveness.

• The report identified neighborhoods (38%) and public transport (29%) as the primary harassment hotspots, with younger women under 24 years being the most vulnerable demographic.

Additional Information

• NITI Aayog:

• Functions as the premier policy think tank of the Government of India, providing directional and policy inputs.

• It is responsible for monitoring the Sustainable Development Goals (SDGs) and releases the SDG India Index, which includes gender equality metrics.

• Ministry of Women and Child Development (MWCD):

• The nodal ministry for the formulation of policies and legislation for women and children.

• It administers the Nirbhaya Fund and schemes like Mission Shakti, One Stop Centres (OSC), and the Women Helpline (181).

• National Human Rights Commission (NHRC):

• A statutory public body established under the Protection of Human Rights Act, 1993.

• It investigates violations of human rights and oversees the protection of civil liberties for all citizens, including women.

Q35. Answer: (a) Local Area Network

The correct answer is Local Area Network.

Key Points

• A Local Area Network (LAN) is a computer network that interconnects computers within a limited geographical area such as a residence, school, laboratory, university campus, or office building.

• The primary function of a LAN is to enable the sharing of resources such as files, printers, games, and other applications among connected users.

• LANs are characterized by significantly higher data transfer rates compared to Wide Area Networks (WAN), often ranging from 100 Mbps to 10 Gbps or more in modern infrastructure.

• In terms of ownership, a LAN is typically private and managed by a single individual or organization, providing a high degree of security and control over the network traffic.

• The most common physical layer technologies used for LAN implementation are Ethernet (wired) and Wi-Fi (wireless), which operate under the IEEE 802.3 and IEEE 802.11 standards respectively.

Additional Information

• Network Classifications:

• Wide Area Network (WAN): Covers a large geographical area such as a country, continent, or the entire globe; the Internet is the most prominent example.

• Metropolitan Area Network (MAN): Interconnects users with computer resources in a geographic area larger than a LAN but smaller than a WAN, typically covering an entire city.

• Personal Area Network (PAN): A network used for data transmission among personal devices such as computers, telephones, and tablets within a very short range, often utilizing Bluetooth.

• LAN Components:

• Network Interface Card (NIC): A hardware component that enables a computer to connect to a network.

• Switches and Hubs: Central devices that facilitate the distribution of data packets across the network to the correct destination device.

• Routers: Used to connect a LAN to other networks, such as a WAN or the Internet.

• Transmission Media: Includes Twisted Pair Cables, Fiber Optic Cables, and Radio Waves for wireless communication.

Q36. Answer: (a) Define carrier liability

The correct answer is Define carrier liability.

Key Points

• The Carriage of Goods by Sea Act, 2025 was introduced to modernize and replace the nearly century-old Carriage of Goods by Sea Act, 1925, aligning Indian maritime law with contemporary international standards.

• The primary objective of this legislation is to provide a comprehensive legal framework that defines the rights, responsibilities, liabilities, and immunities of carriers (ship owners or charterers) and shippers (cargo owners) involved in the maritime transport of goods.

• It establishes the statutory limits of liability for loss or damage to cargo, ensuring that carriers cannot contract out of their basic obligations to provide a seaworthy vessel and properly handle goods.

• The Act incorporates principles from the Hague-Visby Rules, which determine the maximum compensation a carrier must pay per package or unit of weight in the event of cargo damage, thereby providing legal certainty to the global shipping industry.

• By clarifying the burden of proof and the specific instances where a carrier is exempt from liability (such as Act of God or perils of the sea), the law facilitates smoother dispute resolution in Admiralty Courts.

Additional Information

• While the Carriage of Goods by Sea Act focuses on cargo liability, other maritime functions are regulated by distinct legislative frameworks:

• Marine Pollution Control: These matters are primarily governed by the Merchant Shipping Act, 1958 and international conventions such as MARPOL (International Convention for the Prevention of Pollution from Ships), which regulate the discharge of oil, sewage, and garbage into the ocean.

• Port Infrastructure: The development and administration of major ports in India fall under the Major Port Authorities Act, 2021, and schemes like the Sagarmala Programme, which focuses on port-led industrialization and connectivity.

• Vessel Registration: The technical requirements for the registration of ships, tonnage measurement, and the nationality of vessels are codified under the Merchant Shipping Act to ensure compliance with safety and security standards.

• Bill of Lading: The 2025 Act specifically addresses the Bill of Lading as a document of title, defining it as the primary evidence of the contract of carriage and receipt of goods.

Q37. Answer: (d) 10.3 billion

The correct answer is 10.3 billion.

Key Points

• The World Population Prospects 2024, released by the United Nations Department of Economic and Social Affairs (UN DESA), provides the latest official population estimates and projections, serving as a critical global demographic benchmark.

• According to the 2024 revision, the global population is projected to reach its peak at approximately 10.3 billion people during the mid-2080s, specifically around the year 2084.

• Following this peak, the report anticipates a gradual decline in the total number of people on Earth, with the population expected to settle at approximately 10.2 billion by the year 2100.

• This updated projection indicates that the global population peak will occur earlier and at a lower magnitude than what was forecasted in earlier UN reports, such as the 2022 revision.

• The primary reason for this downward revision is the faster-than-anticipated decline in fertility rates in several large and populous nations, coupled with increasing mortality rates in specific regions due to health crises or socio-economic factors.

Additional Information

• Current Demographic Status:

• As of 2024, the world population is estimated to have reached 8.2 billion.

• In 2024, the global fertility rate stands at approximately 2.25 births per woman, which is just above the replacement level of 2.1 required for long-term population stability.

• More than 60 countries have already reached their population peak or are expected to do so before 2054, including nations like China, Germany, Japan, and the Russian Federation.

• Life Expectancy and Aging:

• Global life expectancy at birth reached 73.3 years in 2024 and is projected to rise to 77.4 years by 2054.

• By the late 2070s, the number of persons aged 65 or older is projected to exceed the number of children under age 18, indicating a significant global demographic shift toward an aging population.

• The report highlights that by 2054, nearly one in five people globally will be aged 65 or older.

Q38. Answer: (a) degrading

The correct answer is degrading.

Key Points

• The Windows 11 Task Manager is a powerful system monitoring utility that allows users to view and manage active processes, services, and system performance metrics in real-time.

• One of its primary roles is to track the consumption of hardware resources such as the Central Processing Unit (CPU), Random Access Memory (RAM), Disk I/O, and GPU (Graphics Processing Unit).

• By providing a detailed breakdown of which applications are utilizing the most power or memory, the tool helps users identify 'resource-heavy' programs that are degrading system performance, leading to lag, freezing, or slow response times.

• The Processes tab specifically highlights apps that are consuming disproportionate resources, often marked by percentage usage levels that turn yellow or red when they reach critical thresholds.

• Identifying these performance bottlenecks allows users to troubleshoot the Operating System by terminating unresponsive tasks using the End Task button, thereby restoring the system's overall speed and responsiveness.

Additional Information

• Efficiency Mode: A feature introduced in Windows 11 that allows users to manually throttle back specific processes that are degrading performance, prioritizing resources for more critical foreground applications.

• Performance Tab: This section provides graphical representations of system resource usage, helping users visualize throughput and latency across different hardware components over time.

• Startup Apps: Task Manager also monitors applications that launch automatically during boot-up; users can disable these to prevent them from degrading the initial startup speed of the computer.

• App History: This provides a record of resource usage for Universal Windows Platform (UWP) apps, showing the total CPU time and network data used over a specific period.

• Users Tab: In a multi-user environment, this allows administrators to see which user account is running processes that might be degrading the shared system's performance.

Q39. Answer: (c) Bihar

The correct answer is Bihar.

Key Points

• Population density is a measurement of the number of people in an area relative to the size of that area, typically calculated as persons per square kilometer.

• As per the Census 2011, Bihar has the highest population density among all Indian states, with a value of 1,106 persons per sq km.

• In the previous 2001 Census, West Bengal held the top position, but Bihar overtook it in 2011, showing significant demographic growth.

• The high density in Bihar is primarily due to its location in the fertile Indo-Gangetic plains, which supports intensive agriculture and large human settlements.

• Among the options provided, Bihar significantly exceeds the density figures of Rajasthan, Uttarakhand, and Himachal Pradesh.

Additional Information

• Uttarakhand:

• The population density is recorded at 189 persons per sq km.

• The lower density is due to its hilly terrain and vast areas covered by forests and mountains.

• Rajasthan:

• It has a population density of 200 persons per sq km.

• Despite being the largest state by geographical area, a major portion is covered by the Thar Desert, limiting human habitation.

• Himachal Pradesh:

• The state has a population density of 123 persons per sq km.

• Similar to Uttarakhand, its mountainous topography results in a sparse population distribution.

• National Statistics:

• The average population density of India according to the 2011 Census is 382 persons per sq km.

• The state with the lowest population density is Arunachal Pradesh, with only 17 persons per sq km.

• Among Union Territories, Delhi has the highest density at 11,320 persons per sq km.

Q40. Answer: (a) Dhruvasena II

The correct answer is Dhruvasena II.

Key Points

• Harshavardhana (reigned 606−647 CE) organized grand religious assemblies every five years at Prayaga (modern-day Prayagraj), known as the Quinquennial Assembly or Maha Moksha Parishad.

• The assembly held in 643 CE was the sixth such event, which was famously attended and documented by the Chinese pilgrim Hiuen Tsang (Xuanzang).

• Dhruvasena II, also known as Baladitya, was the ruler of the Maitraka dynasty of Valabhi (located in present-day Gujarat) and was one of the most prominent participants.

• He was the son-in-law of Harshavardhana; after a period of conflict between the Pushyabhutis and Maitrakas, Harsha gave his daughter in marriage to Dhruvasena II to secure a powerful diplomatic and military alliance.

• During the Prayaga Assembly, Dhruvasena II and Bhaskaravarman (the king of Kamarupa) occupied distinguished positions alongside the Emperor as Harsha ritually distributed his accumulated treasures to scholars, monks, and the destitute.

• The presence of the Valabhi ruler at this event signified the vassalage or close subordinate alliance of the Maitraka kingdom under the hegemony of Kannauj.

Additional Information

• Prabhakarvardhana

• He was the father of Harshavardhana and the first powerful monarch of the Pushyabhuti dynasty, based in Thanesar.

• He assumed titles like Paramabhattaraka Maharajadhiraja and was known for his successful campaigns against the Hunas.

• Rudrasena II

• He belonged to the Vakataka dynasty of the Deccan region and is noted for marrying Prabhavatigupta, the daughter of the Gupta Emperor Chandragupta II.

• His reign was relatively short, leading to a period of Gupta influence over the Vakataka administration during his wife's regency.

• Grihavarman

• He was a ruler of the Maukhari dynasty of Kannauj and the husband of Rajyashri (Harsha's sister).

• His assassination by the ruler of Malwa, Devagupta, directly led to Harshavardhana ascending the throne of Kannauj to protect his sister's kingdom.

Q41. Answer: (b) Goddess Parvati

The correct answer is Goddess Parvati.

Key Points

• The term Gangaur is derived from two words: Gan, which represents Lord Shiva, and Gaur (or Gauri), which represents Goddess Parvati. The festival celebrates the divine union and marital fidelity of this celestial couple.

• It is one of the most important and vivid festivals in Rajasthan, observed with great fervor by women. Married women worship the goddess for the longevity and health of their husbands, while unmarried girls pray to find a suitable and virtuous life partner.

• The festivities begin on the day following Holi and continue for 18 days, reaching their peak on the third day of the Shukla Paksha in the Hindu month of Chaitra.

• Rituals involve the creation of clay or wooden idols of Isar (Shiva) and Gauri (Parvati). These images are beautifully dressed in traditional attire, adorned with jewelry, and worshipped with henna (Mehendi), flowers, and special sweets like Ghewar.

• The festival concludes with a grand visarjan (immersion) ceremony, where the idols are carried in a colorful procession to a local Johad (pond), lake, or well, symbolizing Gauri returning to her husband's home.

Additional Information

• Regional Variations and Significance:

• Jaipur: Known for its world-famous Gangaur procession, which originates from the City Palace (Tripolia Gate) and features chariots, elephants, and folk dancers.

• Udaipur: A distinct boat procession is organized on Lake Pichola, where the idols are placed on decorated boats starting from the Gangaur Ghat.

• Goddess Saraswati: She is the deity of knowledge, wisdom, and arts. Her primary festival is Vasant Panchami, where devotees

wear yellow garments and offer prayers for academic success.

• Goddess Durga: Representing Shakti or divine feminine power, she is the central figure of Navratri and Durga Puja, symbolizing the victory of good over evil.

• Goddess Lakshmi: The goddess of wealth, fortune, and prosperity, she is primarily worshipped during Diwali and Lakshmi Puja across India.

Q42. Answer: (b) Black Soil

The correct answer is Black Soil.

Key Points

• Black Soil, also known as Regur Soil or Black Cotton Soil, is considered the most suitable for cotton cultivation due to its unique physical and chemical properties.

• It is predominantly found in the Deccan Trap region (basaltic area) across states like Maharashtra, Gujarat, Madhya Pradesh, and parts of Andhra Pradesh.

• The soil is composed of extremely fine clayey material, which gives it a remarkable capacity to retain moisture for long durations, supporting the plant during dry spells.

• During the dry season, the soil develops deep cracks, allowing for proper aeration and the diffusion of oxygen deep into the layers, a process often described as self-plowing.

• This soil is rich in essential plant nutrients such as Calcium Carbonate, Magnesium, Potash, and Lime, although it is generally poor in phosphorus content.

Additional Information

• Alluvial Soil:

• Formed by the deposition of silt by the Indus, Ganga, and Brahmaputra river systems.

• It is highly fertile and supports crops like Rice, Wheat, and Sugarcane.

• Red Soil:

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

• The red color is due to a wide diffusion of Iron in crystalline and metamorphic rocks.

• Laterite Soil:

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

• It is acidic in nature and is widely used for growing Cashew nuts and Tea.

Q43. Answer: (a) Aparna Satheesan

The correct answer is Aparna Satheesan.

Key Points

• Aparna Satheesan, a globally renowned Kuchipudi and Bharatanatyam dancer, was honored with the Abhinandan Saroja National Award 2021.

• The award was presented by the National Institute of Indian Classical Dance (NIICD) for her excellence and lifetime dedication to Indian classical dance forms.

• The ceremony was part of the Abhinandan Saroja Festival, which honors the legacy of the legendary Bharatanatyam exponent Guru Saroja Vaidyanathan.

• Based in the United States, Aparna Satheesan is celebrated for her innovative choreography and her efforts in popularizing Indian heritage through her dance academy and international performances.

• In addition to this honor, she has received several other accolades, including the Natya Shiromani National Award and the Abhinav Nirupama Award.

Additional Information

• Geetanjali Lal:

• She is an eminent Kathak dancer and choreographer representing the Jaipur Gharana.

• A recipient of the Sangeet Natak Akademi Award, she is known for her rhythmic precision and has served as the head of the Kathak Kendra in New Delhi.

• Saswati Sen:

• She is one of the most prominent disciples of the late Pandit Birju Maharaj and a leading exponent of the Lucknow Gharana of Kathak.

• She is the driving force behind Kalashram and has contributed significantly to the global propagation of Kathak.

• Yamini Krishnamurthy:

• A legendary figure in Indian classical dance, she excelled in both Bharatanatyam and Kuchipudi.

• She has been honored with India's highest civilian awards, including the Padma Shri, Padma Bhushan, and Padma Vibhushan

for her unparalleled contribution to the arts.

Q44. Answer: (c) SabhaSaar

The correct answer is SabhaSaar.

Key Points

• SabhaSaar is an innovative AI-enabled digital governance tool developed to transform the documentation process of Gram Sabha and Panchayat meetings.

• The tool is designed to process audio and video recordings of rural local body proceedings and automatically generate structured minutes of the meeting (MoM), facilitating better record-keeping and transparency.

• It is integrated with BHASHINI (the National Language Translation Mission), which provides the underlying technology for multilingual support across 14 Indian languages, ensuring that language is not a barrier to digital governance.

• By utilizing Natural Language Processing (NLP) and Automatic Speech Recognition (ASR), it extracts key discussion points, decisions, and resolutions, significantly reducing the manual workload of Panchayat Secretaries.

• The platform aligns with the Digital India vision by empowering Panchayati Raj Institutions (PRIs) to maintain verifiable digital trails of grassroots democratic processes.

Additional Information

• BHASHINI (National Language Translation Mission):

• This is a flagship initiative of the Ministry of Electronics and Information Technology (MeitY) to provide AI-led language translation services in all scheduled Indian languages.

• It aims to bridge the digital divide by making internet content and digital services accessible to citizens in their native dialects.

• Ministry of Panchayati Raj (MoPR):

• The MoPR has been at the forefront of digital transformation through the e-Panchayat mission, including portals like e-GramSwaraj and AuditOnline.

• Tools like SabhaSaar represent the next step in Governance 4.0, where Artificial Intelligence is used to improve the efficiency of Local Self-Government.

Q45. Answer: (a) [M L² T^(-2)]

The correct answer is [M L^2 T^-2].

Key Points

• Energy is defined as the capacity to perform Work. In the International System of Units (SI), both energy and work are measured in Joules (J).

• The Dimensional Formula of a physical quantity is an expression showing which of the fundamental quantities (Mass, Length, and Time) it contains.

• Work (or Energy) is calculated as the product of Force and Displacement (Work = Force × Displacement).

• The fundamental dimensions used are Mass [M], Length [L], and Time [T].

• Acceleration is the rate of change of velocity, represented dimensionally as [L T^(−2)].

• According to Newton second law of motion, Force is the product of Mass and Acceleration. Therefore, the dimension of Force is [M] × [L T^(−2)] = [M L T^(−2)].

• By substituting the dimensions of Force into the work equation, Energy = [M L T^(−2)] × [L] = [M L² T^(−2)].

• This formula applies to all forms of energy, including Kinetic Energy (1/2 mv²) and Potential Energy (mgh), as they all share the same SI unit, the Joule, which is equivalent to 1 kg?m²/s².

Additional Information

• Other dimensional formulas in the options represent different physical quantities:

• [M L T^(−2)]: This is the dimensional formula for Force, measured in Newtons (N).

• [L² T^(−2)]: This represents quantities like Latent Heat or Gravitational Potential, where mass is not a factor in the ratio, or simply the square of Velocity.

• [M T^(−2)]: This represents Surface Tension or the Spring Constant (Force per unit length).

• The Joule is named after the English physicist James Prescott Joule, who demonstrated the conservation of energy and the mechanical equivalent of heat in the 19th century.

Q46. Answer: (c) Muscat, Oman

The correct answer is Muscat, Oman.

Key Points

• The 8th edition of the Indian Ocean Conference (IOC) is scheduled to be hosted in Muscat, the capital of Oman, in February 2025.

• The Indian Ocean Conference is a flagship consultative forum for countries in the region, organized annually by the India Foundation in association with the Ministry of External Affairs, Government of India, and the host country.

• The 2025 session aims to address critical regional themes including maritime security, climate change, and economic cooperation, aligned with India's vision of SAGAR (Security and Growth for All in the Region).

• Hosting the event in Muscat highlights the Strategic Partnership between India and Oman and emphasizes the importance of the Western Indian Ocean in global trade and geopolitics.

Additional Information

• Previous Sessions:

• Perth, Australia: This city hosted the 7th Indian Ocean Conference in February 2024 with the theme 'Towards a Stable and Sustainable Indian Ocean'.

• Colombo, Sri Lanka: Served as the venue for the 2nd edition of the conference in 2017.

• The conference first started in Singapore in 2016 and has since evolved into a vital platform for heads of state, ministers, and scholars to discuss the Indo-Pacific framework.

• Geopolitical Importance:

• The Indian Ocean handles nearly 80 percent of the world's maritime oil trade and acts as a primary corridor for global shipping.

• Sessions often focus on Non-Traditional Security threats like piracy, illegal fishing, and maritime pollution.

Therefore, the correct answer is Muscat, Oman.

Q47. Answer: (c) 1976

The correct answer is 1976.

Key Points

• The Fundamental Duties were not part of the original Constitution of India adopted in 1949; they were added later to emphasize the obligations of citizens toward the nation.

• These duties were incorporated through the 42nd Constitutional Amendment Act, which was passed by the Parliament in 1976 during the Internal Emergency.

• The amendment was based on the recommendations of the Sardar Swaran Singh Committee, which suggested that citizens should be conscious of their duties while enjoying their Fundamental Rights.

• By this amendment, a new Part IV-A and a new Article 51A were inserted into the Constitution, initially enumerating ten Fundamental Duties.

• The idea of Fundamental Duties in the Indian Constitution was inspired by the Constitution of the erstwhile USSR (Union of Soviet Socialist Republics).

Additional Information

• 42nd Constitutional Amendment Act:

• Commonly referred to as the Mini-Constitution, it brought about the most extensive changes to the Indian Constitution to date.

• Beyond duties, it amended the Preamble to include the terms Socialist, Secular, and Integrity.

• 86th Constitutional Amendment Act, 2002:

• This amendment added the 11th Fundamental Duty to the existing list.

• It mandates that parents or guardians provide educational opportunities to children between the ages of 6 and 14 years.

• Nature of Fundamental Duties:

• These duties are non-justiciable, meaning they cannot be enforced through legal proceedings in a court of law, similar to the Directive Principles of State Policy.

• They serve as a reminder to citizens that while they enjoy rights, they also have social and moral responsibilities toward the country.

Q48. Answer: (d) Australia

The correct answer is Australia.

Key Points

• Australia is geographically positioned entirely within the Southern Hemisphere because its entire landmass lies south of the Equator (0° latitude). Its latitudinal extent spans approximately from 10°S to 44°S.

• The continent is also located entirely within the Eastern Hemisphere as it lies completely east of the Prime Meridian (0° longitude) and west of the International Date Line (180° longitude). Its longitudinal extent is roughly between 113°E and 154°E.

• Commonly referred to as the Island Continent, it is surrounded by the Indian Ocean to the west and south, and the Pacific Ocean to the east.

• It is the smallest continent in terms of land area but remains a significant global entity as the only continent that is governed as a single sovereign nation.

• The continent's isolation in the South-Eastern quadrant of the globe has led to the development of unique flora and fauna, such as marsupials, that are not found natively in other hemispheres.

Additional Information

• Africa

• It is the only continent that spans across all four hemispheres (Northern, Southern, Eastern, and Western) because both the Equator and the Prime Meridian pass through it.

• Asia

• While predominantly in the Northern and Eastern Hemispheres, it is not 'entirely' within them; the Indonesian archipelago extends into the Southern Hemisphere, and parts of eastern Russia cross the 180° meridian into the Western Hemisphere.

• Europe

• This continent is located entirely in the Northern Hemisphere, but it is divided by the Prime Meridian at Greenwich, meaning it occupies both the Eastern and Western Hemispheres.

Therefore, the correct answer is Australia.

Q49. Answer: (b) Kuchipudi

The correct answer is Kuchipudi.

Key Points

• Raja Reddy and Radha Reddy are a world-renowned dancing duo who have been instrumental in elevating Kuchipudi to the international stage.

• They established the Natya Tarangini Institute of Kuchipudi Dance in New Delhi in 1976 to train new generations of dancers in this classical tradition.

• The couple is celebrated for their synchronized movements and expressive storytelling, often performing together to showcase the tandava (vigorous) and lasya (graceful) aspects of the dance.

• In recognition of their excellence and contribution to Indian culture, both have been honored with the Padma Shri and Padma Bhushan by the Government of India.

• Kuchipudi is one of the eight major Indian classical dance forms, originating from the village of Kuchelapuram in the Krishna district of Andhra Pradesh.

• The dance form is unique for its Tarangam segment, where the dancer performs on the edge of a brass plate while balancing a pot of water on their head.

Additional Information

• Other classical dance forms mentioned in the options include:

• Sattriya:

• Origin: Assam.

• Introduced by the Vaishnava saint Srimanta Sankardev in the 15th century.

• Originally performed by male monks (Bhokots) in monasteries known as Sattras.

• Kathak:

• Origin: North India (Uttar Pradesh).

• Derived from the word Katha, meaning story; traditionally performed by storytellers known as Kathakars.

• Notable for its rhythmic footwork, Chakkars (spins), and the Gharana system (e.g., Lucknow, Jaipur, Banaras).

• Mohiniyattam:

• Origin: Kerala.

• Known as the Dance of the Enchantress, it is a solo dance performed by women.

• Features graceful, swaying body movements and subtle facial expressions focusing on the Lasya style.

Q50. Answer: (d) Satyashodhak Samaj

The correct answer is Satyashodhak Samaj.

Key Points

• Satyashodhak Samaj, also known as the Truth Seekers Society, was established by Mahatma Jyotirao Phule on September 24, 1873, in Pune, Maharashtra.

• The movement was primarily focused on the social transformation and human rights of the marginalized sections, specifically the Shudras and Ati-Shudras (untouchables), to liberate them from the religious and social tyranny of the Brahminical hegemony.

• Phule emphasized the universal brotherhood of all human beings and rejected the role of intermediaries (priests) between the individual and the Creator (whom he referred to as Nirmik).

• A significant contribution of this movement was the promotion of secular education and women education; Phule and his wife, Savitribai Phule, opened the first school for girls in Bhide Wada, Pune, in 1848.

• The ideology of the Samaj was heavily influenced by Phule's seminal work, Gulamgiri (1873), which critiqued the caste system and compared the plight of lower castes in India to the Black American slaves.

Additional Information

• Ramakrishna Mission:

• Founded by Swami Vivekananda in 1897 at Belur Math, West Bengal.

• It aimed at promoting the teachings of Ramakrishna Paramahamsa through social service, spirituality, and Vedanta.

• Arya Samaj:

• Established by Swami Dayanand Saraswati in 1875 in Bombay.

• It advocated for the slogan Go back to the Vedas and focused on monotheism and Vedic ritualism while opposing idolatry.

• Brahmo Samaj:

• Founded by Raja Ram Mohan Roy in 1828 in Calcutta.

• It was the first major social-religious reform movement in India, targeting Sati, child marriage, and promoting monotheism.

Q51. Answer: (d) 38%

The correct answer is 38%.

Key Points

• The Global Report on Trafficking in Persons 2024 is a flagship publication by the United Nations Office on Drugs and Crime (UNODC), which analyzes global trafficking trends using data collected from 142 countries.

• Based on the data collected for the year 2022, the report identifies that children constituted 38% of all detected victims of human trafficking worldwide.

• The report highlights a significant disparity in age demographics across regions, noting that in low-income countries, children make up the majority of detected victims, while in high-income regions, adults remain the primary detected group.

• The 38% global figure reflects a persistent and alarming trend where children are increasingly targeted for forced labor, sexual exploitation, and forced criminality.

• The findings indicate that the share of children among detected victims has remained high, with girls often being trafficked for sexual exploitation and boys frequently being used for forced labor in sectors like agriculture and mining.

Additional Information

• United Nations Office on Drugs and Crime (UNODC):

• Established in 1997 through a merger between the United Nations Drug Control Programme and the Centre for International Crime Prevention.

• It acts as the custodian of the Palermo Protocol, which is the primary international legal instrument to prevent, suppress, and punish trafficking in persons, especially women and children.

• The Global Report on Trafficking in Persons is published biennially to inform Member States and the international community about evolving trafficking patterns and response effectiveness.

• Trafficking Trends:

• The report also notes the impact of climate change and armed conflicts as major drivers that increase the vulnerability of children to traffickers.

• In addition to forced labor, the 2024 report emphasizes the rise of online recruitment and the use of digital technologies by traffickers to exploit minors.

Q52. Answer: (b) Stoichiometry

The correct answer is Stoichiometry.

Key Points

• Stoichiometry is the section of chemistry that involves the quantitative calculation of the masses and volumes of reactants and products participating in a chemical reaction.

• The concept is fundamentally based on the Law of Conservation of Mass, which necessitates that the total mass of reactants must equal the total mass of products, as atoms are only rearranged during a reaction.

• The term is etymologically derived from the Greek words 'stoicheion', meaning element, and 'metron', meaning measure, effectively signifying the measurement of chemical elements.

• It utilizes balanced chemical equations and stoichiometric coefficients to establish molar ratios, which serve as conversion factors to determine the theoretical yield of a chemical process.

• These calculations are essential in industrial chemistry for optimizing feedstock amounts and predicting the efficiency of large-scale chemical syntheses.

Additional Information

• Mole fraction:

• Defined as the ratio of the number of moles of a particular component to the total number of moles of all substances present in a solution or mixture.

• It is a dimensionless quantity and is independent of temperature changes.

• Mass per cent:

• A concentration expression representing the mass of a solute divided by the total mass of the solution, multiplied by 100.

• It is commonly used in commercial chemical labeling to denote the purity or concentration of reagents.

• Molarity:

• Determined by the number of moles of solute dissolved in exactly one liter of solution (moles per liter).

• Unlike molality, molarity is temperature-dependent because the volume of a liquid expands or contracts with temperature fluctuations.

Q53. Answer: (b) Karnataka

The correct answer is Karnataka.

Key Points

• The Karnataka cricket team emerged as the champions of the 2024-25 Vijay Hazare Trophy, which is India's premier List A domestic cricket tournament.

• The final match was contested on January 18, 2025, at the Kotambi Stadium in Vadodara, Gujarat, where Karnataka faced Vidarbha.

• Batting first, Karnataka posted a formidable total of 348/6 in their 50 overs, primarily driven by a magnificent century from Smaran Ravichandran, who scored 105 runs.

• Supporting the innings were Krishnan Shrijith and Abhinav Manohar, who contributed quickfire scores of 78 and 79 runs respectively to bolster the total.

• In the second innings, Vidarbha was bowled out for 312 in 48.2 overs, despite a fighting century of 110 runs by their opener Dhruv Shorey.

• The bowling performance for Karnataka was clinical, with Vasuki Koushik, Prasidh Krishna, and Abhilash Shetty each claiming three wickets to secure a 36-run victory.

• This win marked Karnataka's fifth title in the competition, making them the joint-most successful team in the national era of the tournament along with Tamil Nadu.

• Under the captaincy of Mayank Agarwal, Karnataka ended a five-year title drought in the BCCI-organized limited-overs domestic circuit.

Additional Information

• Saurashtra:

• This team was the champion of the 2022-23 edition of the Vijay Hazare Trophy.

• Saurashtra is noted for its strong pace-bowling depth and has become a consistent contender in Indian domestic cricket.

• Tamil Nadu:

• Historically one of the strongest white-ball teams in India, they have won the Vijay Hazare Trophy 5 times.

• The state is known for producing specialized limited-overs cricketers and has a high success rate in the Syed Mushtaq Ali Trophy (T20) as well.

• Mumbai:

• Mumbai holds the record for the most titles (8) during the tournament's initial Ranji One Day Trophy (zonal) phase.

• The association has the most successful legacy in Ranji Trophy (First-Class) history, with over 40 titles to its name.

• Vijay Hazare Trophy:

• Named after the legendary cricketer Vijay Hazare, the tournament was officially launched as a national competition in 2002-03.

• It follows the 50-over format and serves as a vital scouting platform for the Indian Premier League (IPL) and the Indian National Team.

Q54. Answer: (b) 1985-86

The correct answer is 1985-86.

Key Points

• The Technology Mission on Oilseeds (TMO) was launched by the Government of India in May 1986, falling within the 1985-86 fiscal cycle's planning phase, to achieve self-sufficiency in edible oils.

• The mission was a critical part of the Seventh Five Year Plan (1985-1990), aimed at reducing the heavy financial burden of edible oil imports on the national exchequer.

• It integrated four distinct functional prongs: improvement of crop production technology, better post-harvest technology, strengthening input support services for farmers, and ensuring remunerative prices through marketing and processing support.

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• The success of this mission is historically highlighted by the surge in production from 10.83 million tonnes in 1985-86 to a record 18.03 million tonnes in 1988-89.

• This massive growth in oilseed productivity is widely recognized as the Yellow Revolution in the Indian agricultural sector.

Additional Information

• Evolution of the Mission:

• The scope of the mission was expanded in 1990 to include Pulses, renaming it the Technology Mission on Oilseeds and Pulses (TMOP).

• In 1991-92, Oil Palm was brought under its ambit, and Maize was added in 1995-96.

• The Integrated Scheme of Oilseeds, Pulses, Oilpalm and Maize (ISOPOM) was later launched in 2004 by merging these individual programs.

• Major Oilseeds in India:

• The mission primarily targeted nine oilseeds: Groundnut, Mustard, Soybean, Sunflower, Safflower, Sesame, Niger, Castor, and Linseed.

• Gujarat and Rajasthan emerged as leading producers of Groundnut and Rapeseed-Mustard respectively during the post-mission era.

• Key Figures:

• Sam Pitroda is often credited as one of the key advisors who spearheaded the Technology Missions under the leadership of Prime Minister Rajiv Gandhi.

Q55. Answer: (b) Negligible intermolecular forces and high compressibility

The correct answer is Negligible intermolecular forces and high compressibility.

Key Points

• Matter in the gaseous state consists of particles that are far apart from each other, resulting in maximum intermolecular spaces compared to solids and liquids.

• Due to these large distances, the intermolecular forces of attraction between gas particles are negligible, allowing them to move freely and randomly in all directions at high velocities.

• The presence of vast empty spaces between molecules allows gases to be easily squeezed into smaller volumes when pressure is applied, leading to high compressibility.

• Gases lack a definite shape and a definite volume; they expand to completely fill whatever container they are placed in, exerting uniform pressure on the container walls.

• The kinetic energy of gas molecules is significantly higher than that of molecules in the solid or liquid states, which contributes to their rapid diffusion and lack of structural rigidity.

Additional Information

• Solid State:

• Characterized by strong intermolecular forces that keep particles in fixed positions.

• Possesses high rigidity, a fixed shape, and a definite volume.

• The compressibility is negligible because particles are already closely packed.

• Liquid State:

• Particles have intermediate intermolecular forces, allowing them to slide past one another.

• Maintains a definite volume but takes the shape of the container (no fixed shape).

• Liquids are generally considered incompressible for most practical purposes, though slightly more compressible than solids.

• Comparison of Density:

• Gases generally have the lowest density among the three primary states of matter because their mass is spread over a much larger volume.

• This property, combined with high mobility, makes them essential in applications like LPG (Liquefied Petroleum Gas) and CNG (Compressed Natural Gas) storage.

Q56. Answer: (d) Raichur

The correct answer is Raichur.

Key Points

• The Bahmani Sultanate was a Persianate Muslim state founded in 1347 by Ala-ud-Din Bahman Shah, also known as Hasan Gangu, after he revolted against the Delhi Sultanate under Muhammad bin Tughlaq.

• Geographically, the kingdom dominated the Deccan plateau, extending from the Tapti River and the borders of Mandu (the capital of the Malwa Sultanate) in the north to the Krishna River in the south.

• The town of Raichur, situated in the fertile Raichur Doab between the Krishna and Tungabhadra rivers, served as the definitive

southern frontier and a permanent military flashpoint between the Bahmani and Vijayanagara empires.

• Throughout its existence until its fragmentation into the five Deccan Sultanates (Ahmadnagar, Berar, Bidar, Bijapur, and Golconda) around 1527, the kingdom maintained its southern limit primarily at Raichur.

• Historical records from the era of Mahmud Gawan, the famous Prime Minister (Peshwa) of the Bahmani Kingdom, confirm that the territorial administration was organized into Tarafs (provinces), with the southern reaches heavily fortified to guard the Raichur region.

Additional Information

• Incorrect Options Breakdown:

• Madurai:

• Located in the deep south of the Tamil region, it was the capital of the Pandyan Empire and later the Madurai Sultanate.

• It was annexed by the Vijayanagara Empire during the 14th century and never formed the boundary of the Bahmani state.

• Mysore:

• This region was part of the Hoysala Empire and subsequently became a crucial province of the Vijayanagara Empire.

• It later emerged as an independent kingdom under the Wodeyar dynasty long after the Bahmani decline.

• Tiruchirapalli:

• Situated in central Tamil Nadu, this city was far south of the Krishna River boundary.

• It was a major stronghold for the Cholas and later the Nayaka governors of Vijayanagara.

Q57. Answer: (a) Part V

The correct answer is Part V.

Key Points

• The Parliament is the supreme legislative organ of the Union government in India, occupying a pre-eminent and central position in the Indian democratic political system due to the adoption of the parliamentary form of government.

• Articles 79 to 122 in Part V of the Constitution of India specifically deal with the organization, composition, duration, officers, procedures, privileges, and powers of the Parliament.

• Under Article 79, the Parliament of the Union consists of the President and two Houses: the Council of States (Rajya Sabha) and the House of the People (Lok Sabha).

• Part V, titled 'The Union', is the largest part of the Indian Constitution, covering Articles 52 to 151, which also include the Union Executive, the Union Judiciary (Supreme Court), and the Comptroller and Auditor-General of India.

• The Indian Parliament is a bicameral legislature, a feature inspired by the British Constitution, though the Indian President is not a member of either House, unlike the British Monarch who is a constituent part of the Parliament.

Additional Information

• Part VI

• Focuses on 'The States' and covers Articles 152 to 237, detailing the State Executive, State Legislature, and High Courts.

• Part VII

• Contained provisions related to States in Part B of the First Schedule; however, it was repealed by the 7th Constitutional Amendment Act, 1956, during the reorganization of states.

• Part VIII

• Deals with the administration of Union Territories through Articles 239 to 242, outlining the powers of the President and appointed administrators.

Q58. Answer: (a) V.D. Savarkar

The correct answer is V.D. Savarkar.

Key Points

• Vinayak Damodar Savarkar, popularly known as Veer Savarkar, along with his brother Ganesh Damodar Savarkar, founded the Abhinav Bharat Society in 1904.

• The organization originated from Mitra Mela, a secret revolutionary group established in Nasik in 1899, which was later renamed to Abhinav Bharat (Young India Society).

• It was modeled after Giuseppe Mazzini’s 'Young Italy' and functioned as a secret society focused on achieving Indian independence through armed rebellion and the assassination of British officials.

• The society had a significant presence in Maharashtra and London, where Savarkar continued his revolutionary activities while studying at Gray's Inn.

• The group was involved in the Nasik Conspiracy Case of 1909, following the assassination of the British District Magistrate A.M.T. Jackson by Anant Laxman Kanhere.

• The subsequent investigation led to the arrest of V.D. Savarkar in 1910, resulting in his deportation to the Cellular Jail in the

Andaman and Nicobar Islands for two life terms totaling 50 years.

Additional Information

• Khudiram Bose:

• He was a young revolutionary from Bengal and a member of the Anushilan Samiti.

• He was executed in 1908 for his role in the Muzaffarpur bombing attempt on Magistrate Douglas Kingsford.

• Shyamji Krishna Varma:

• An Indian revolutionary and lawyer who founded the India House and the Indian Home Rule Society in London in 1905.

• He published the journal 'The Indian Sociologist' to spread nationalist ideas among Indian students abroad.

• Lala Har Dayal:

• A key revolutionary figure who founded the Ghadar Party in San Francisco in 1913.

• His movement aimed to incite an armed uprising among Indian expatriates and soldiers against British rule during World War I.

Q59. Answer: (a) Bengaluru

The correct answer is Bengaluru.

Key Points

• The All Living Things Environmental Film Festival (ALT EFF) is India’s premier film festival dedicated exclusively to environmental issues, conservation, and sustainable living. In December 2025, the festival successfully concluded its annual edition with a significant physical presence in Bengaluru.

• Bengaluru served as a primary hub for the festival’s physical screenings and interactive sessions, utilizing prominent venues such as the Bangalore International Centre (BIC) to host filmmakers, environmentalists, and the general public.

• The 2025 edition focused on the theme of Collective Action and Climate Resilience, showcasing over 50 films from across the globe that highlighted the intersection of humanity and the natural world.

• The festival in Bengaluru was characterized by impactful panel discussions and Q&A sessions that addressed localized environmental challenges, such as urban water management, biodiversity loss in the Western Ghats, and the city’s evolving waste management systems.

• By integrating cinematic storytelling with academic and grassroots dialogue, the festival aimed to transform passive awareness into active environmental advocacy among the city’s diverse demographic.

Additional Information

• About ALT EFF:

• Founding and Vision: Founded in 2020, the festival was established to fill the gap in environmental communication in India, using film as a medium to reach audiences beyond traditional scientific or activist circles.

• Format: While the festival has a strong pan-India virtual presence, it has increasingly moved toward a hybrid model with flagship physical screenings in major cities like Mumbai, Delhi, and Bengaluru.

• Selection Criteria: The festival juries typically look for films that demonstrate high cinematographic quality combined with a rigorous scientific or social foundation regarding environmental crises.

• Global Reach: It often collaborates with international organizations and film institutes to bring global perspectives on the Anthropocene and Ecological Justice to Indian audiences.

Q60. Answer: (a) Space applications with SHAKTI

The correct answer is Space applications with SHAKTI.

Key Points

• The IRIS chip is a specialized semiconductor device developed through a high-profile collaboration between the Indian Space Research Organisation (ISRO) and the Indian Institute of Technology Madras (IIT-Madras).

• The core of this chip is based on the SHAKTI processor architecture, which represents India's first indigenously designed family of microprocessors.

• Specifically designed for space applications, the IRIS chip is engineered to handle the unique and harsh conditions of outer space, including extreme temperature fluctuations and high-energy radiation environments.

• The chip utilizes the RISC-V (Reduced Instruction Set Computer) open-source architecture, allowing for a customizable and secure hardware design that is not dependent on proprietary foreign technologies.

• The integration of SHAKTI into space-grade hardware like the IRIS chip is a major milestone for the Atmanirbhar Bharat (Self-Reliant India) initiative in the semiconductor and aerospace sectors.

• It is primarily used in satellite subsystems, such as the On-Board Computer (OBC), telemetry, and telecommand units, where high reliability and power efficiency are critical for mission success.

Additional Information

• SHAKTI Processor Project

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• Development: Developed by the RISE (Reconfigurable Intelligent Systems Engineering) group at IIT-Madras.

• Core Classes: The project includes various classes such as the E-class for tiny IoT devices and the C-class for controller applications, which are often the basis for the IRIS SoC.

• Strategic Importance: By using an indigenous core, ISRO ensures that the hardware is free from hidden vulnerabilities or 'backdoors' typically associated with commercial off-the-shelf components.

• RISC-V Ecosystem

• This is an open-standard Instruction Set Architecture (ISA) that provides the flexibility needed to add custom extensions for cryptography or radiation hardening without the heavy licensing fees of architectures like ARM.

• Incorrect Options Analysis

• Commercial smartphones: These devices generally use ARM-based processors from companies like Qualcomm or MediaTek that are optimized for high-speed multimedia and 5G connectivity rather than the specialized reliability of IRIS.

• Gaming consoles: These require massive GPU (Graphics Processing Unit) power and high clock speeds for 3D rendering, which is outside the functional scope of the IRIS space-grade processor.

• Automotive systems: While SHAKTI variants can be used in the automotive sector for engine control units (ECUs), the IRIS variant is specifically custom-built for the rigorous standards of ISRO missions.

Q61. Answer: (d) Dadabhai Naoroji

The correct answer is Dadabhai Naoroji.

Key Points

• Dadabhai Naoroji, widely known as the Grand Old Man of India, was a prominent nationalist leader and the first Indian to be elected to the British House of Commons in 1892.

• He authored the groundbreaking book Poverty and Un-British Rule in India, published in 1901, which provided a comprehensive economic critique of British imperialism.

• In this work, Naoroji introduced the Drain of Wealth theory, explaining how India's capital and resources were systematically transferred to Britain through home charges, pensions, and unfair trade policies.

• He was the first to attempt an estimation of India's National Income in 1867-68, calculating the per capita income to be merely 20 rupees, which highlighted the extreme deprivation of the Indian masses.

• His efforts shifted the focus of the Indian National Congress toward economic issues, eventually leading to the demand for Swaraj (Self-rule) during the Calcutta Session of 1906.

Additional Information

• Pherozeshah Mehta

• He was a leading moderate leader and one of the founding members of the Indian National Congress.

• Known as the Lion of Bombay, he played a crucial role in the Bombay Municipal Corporation and legal reforms.

• Bal Gangadhar Tilak

• A prominent extremist leader who declared Swaraj is my birthright and I shall have it.

• He used journals like Kesari and Mahratta to mobilize the masses and authored Gita Rahasya while in prison.

• Mahatma Gandhi

• The architect of India's non-violent independence movement, leading major campaigns like the Quit India Movement.

• His famous literary works include Hind Swaraj and his autobiography, The Story of My Experiments with Truth.

Q62. Answer: (d) Prime Minister

The correct answer is Prime Minister.

Key Points

• According to Article 74(1) of the Indian Constitution, there shall be a Council of Ministers with the Prime Minister at the head to aid and advise the President, who shall act in accordance with such advice.

• In the Parliamentary system of government followed in India, the Prime Minister is the Real Executive Authority (de facto executive), whereas the President is the Nominal Executive Authority (de jure executive).

• Under Article 75, the Prime Minister is appointed by the President, and other ministers are appointed by the President only on the advice of the Prime Minister.

• The Prime Minister plays a pivotal role in the Union Council of Ministers as he presides over its meetings, allocates and reshuffles various portfolios among the ministers, and can ask a minister to resign at any time.

• The resignation or death of the Prime Minister automatically dissolves the Council of Ministers, emphasizing his position as the keystone of the cabinet arch.

Additional Information

• President:

• As per Article 52, there shall be a President of India who is the First Citizen and the head of the Indian State.

• All executive actions of the Government of India are formally taken in his name under Article 53, though he acts on the advice of the Council of Ministers.

• Attorney General of India:

• Appointed by the President under Article 76, the Attorney General is the highest law officer in the country.

• While he has the right to participate in Parliamentary proceedings, he is not a member of the Union Council of Ministers.

• Union Home Minister:

• A key member of the Union Council of Ministers responsible for the Ministry of Home Affairs and internal security.

• The Home Minister functions under the overall leadership and direction of the Prime Minister.

Q63. Answer: (a) Gulamgiri

The correct answer is Gulamgiri.

Key Points

• Jyotirao Phule, a prominent social reformer from Maharashtra, wrote the book Gulamgiri (meaning slavery) in 1873.

• Phule dedicated his book to the American movement to free slaves, specifically to those Americans who had fought to abolish slavery during the American Civil War (1861−1865).

• By dedicating the book to the anti-slavery activists in America, Phule established a conceptual link between the condition of the lower castes (Shudras and Ati-Shudras) in India and the Black slaves in the United States.

• The book is written in a dialogue form between Jyotiba and a character named Dhondiba, critiquing the Brahmanical hegemony and the caste system in Indian society.

• Phule used this work to argue that the Aryans were foreigners who established a system of caste discrimination to subjugate the indigenous people of India.

Additional Information

• Satyarth Prakash:

• This book was written by Swami Dayanand Saraswati in 1875.

• It is a core text of the Arya Samaj and emphasizes the supreme authority of the Vedas while advocating for social reforms like the rejection of idol worship and ritualism.

• The Cultivator's Whipcord:

• Commonly known as Shetkarayacha Aasud, it was authored by Jyotirao Phule and published in 1883.

• The text highlights the systematic exploitation of Indian peasants by the British bureaucracy and moneylenders.

• Stripurushtulna:

• Written by Tarabai Shinde in 1882, it is considered one of the first modern feminist texts in India.

• It provides a sharp critique of the double standards applied to men and women in 19th-century patriarchal society.

• Satyashodhak Samaj:

• Founded by Jyotirao Phule on September 24, 1873, to promote education and social rights for oppressed classes and women.

Q64. Answer: (c) Ukraine

The correct answer is Ukraine.

Key Points

• On September 4, 2025, French President Emmanuel Macron announced that 26 nations had formally committed to providing postwar security guarantees to Ukraine.

• This significant declaration was made during a summit of the 'Coalition of the Willing' held at the Élysée Palace in Paris, which was attended by Ukrainian President Volodymyr Zelenskyy.

• The plan outlines two primary pillars: rebuilding Ukraine's military capacity without restriction and establishing an international 'reassurance force' to secure its territory once a ceasefire is reached.

• The coalition's forces will deploy across land, air, and sea corridors, acting as a direct strategic deterrent to prevent any future aggression against Ukraine.

Additional Information

• Incorrect Options Breakdown:

• Poland: A NATO member since 1999 that serves as a major logistical hub for Western aid, rather than the direct recipient of these postwar guarantees.

• Iran: A sovereign nation in Western Asia under heavy international observation, completely unrelated to this European-led defense pact.

• Palestine: A territory in the Middle East experiencing ongoing conflict, which is outside the scope of the European security framework discussed in Paris.

Q65. Answer: (b) To allow the OS to determine which application should open the file

The correct answer is To allow the OS to determine which application should open the file.

Key Points

• A file extension is a suffix consisting of a period followed by a few characters (e.g., .exe, .pdf, .txt) that is appended to the end of a filename in an Operating System like Microsoft Windows.

• The primary function of these extensions is to assist the OS in identifying the file format and the internal structure of the data stored within the file.

• Windows utilizes a mechanism called File Association to link specific extensions with their corresponding default applications; this ensures that when a user double-clicks a file, the correct software is launched automatically.

• The Windows Registry (specifically the HKEY_CLASSES_ROOT hive) acts as a database that maps these extensions to specific executable programs, facilitating seamless human-computer interaction.

• By identifying the file type, the system can determine which icon to display and which specific actions (like Open, Edit, or Print) are available in the Context Menu for that particular file.

Additional Information

• Evolution of File Extensions:

• The concept of extensions stems from the MS-DOS era, which followed the 8.3 filename convention (a name up to 8 characters and an extension up to 3 characters).

• While modern NTFS and exFAT file systems support much longer filenames, the extension remains the standard method for metadata identification in Windows.

• Common Extension Categories:

• Productivity: .xlsx (Excel), .pptx (PowerPoint), and .docx (Word) allow the OS to route documents to the Microsoft Office Suite.

• System & Execution: .dll (Dynamic Link Library) and .sys (System files) indicate files that are used by the system itself rather than user-facing applications.

• Media: Extensions like .mp3 (audio) and .mp4 (video) trigger media players or codecs for decompression and playback.

• User Control:

• Users can manually change associations via the Control Panel or Settings app, allowing them to choose a preferred browser for .html files or a specific editor for .py scripts.

• Although users can rename extensions, doing so does not convert the file's encoding; for example, renaming a .txt to .jpg will make the OS attempt to open it with an Image Viewer, which will fail to render the text data.

Q66. Answer: (b) Manner of election of the President of India

The correct answer is Manner of election of the President of India.

Key Points

• Article 368 of the Indian Constitution provides the procedure for constitutional amendments. While most amendments require a Special Majority (two-thirds of members present and voting and a majority of total membership), certain federal features require a more rigid process involving ratification by the legislatures of at least half of the States.

• The Manner of election of the President of India, covered under Articles 54 and 55, is explicitly listed under the proviso to Article 368(2). This is because the President is elected by an Electoral College that includes elected members of State Legislative Assemblies, making it a critical federal provision.

• The requirement for State Ratification ensures that the Union Parliament cannot unilaterally alter the federal structure or the balance of power between the center and the states. Other provisions requiring this include the Seventh Schedule, the Supreme Court and High Courts, and Article 368 itself.

Additional Information

• Other Rigid Provisions:

• Extent of executive power of the Union and the States (Articles 73 and 162).

• Representation of States in Parliament (provisions in the Fourth Schedule).

• Any change to the Lists in the Seventh Schedule (Union, State, and Concurrent Lists).

• Citizenship acquisition and termination:

• Provisions regarding Citizenship are governed by Part II of the Constitution and the Citizenship Act, 1955. Under Article 11, Parliament has the power to regulate citizenship by Simple Majority; thus, it does not require the rigid procedure of Article 368(2).

• Duration of Lok Sabha:

• The term of the House of the People is generally governed by Article 83. While changing the fundamental structure might require a Special Majority, it is not explicitly listed as a federal provision requiring State Ratification unless it interferes with the representation of states.

Q67. Answer: (a) .dll

The correct answer is .dll.

Key Points

• Dynamic Link Library (DLL) is a Microsoft implementation of the shared library concept in the Windows Operating System. It contains code and data that can be used by more than one program at the same time.

• Unlike an executable (.exe), a DLL cannot be run directly; it must be called by other code that is already executing. These files allow for modular programming, where developers can separate different components of a software into unique modules.

• The primary advantage of .dll files is memory efficiency. Because multiple applications can share a single copy of a DLL loaded into the RAM, the system avoids loading duplicate code for common tasks like printing or file management.

• DLLs facilitate dynamic linking, which means the link between an application and the library is established at runtime rather than when the application is compiled. This reduces the size of the application executable files.

Additional Information

• .drv (Device Driver):

• These files are specialized libraries used by the Operating System to communicate with hardware devices.

• They contain instructions that tell the OS how to interact with components like graphics cards, printers, or sound cards.

• .tmp (Temporary File):

• These are generated by applications or the OS to store information temporarily while a process is running or a new file is being created.

• They are usually deleted automatically once the task is finished or the program is closed to free up storage space.

• Benefits of DLL Files:

• Easier Maintenance: When a function within a DLL needs an update or a bug fix, only the DLL needs to be replaced, rather than reinstalling the entire software suite.

• Resource Sharing: DLLs allow for the sharing of resources like icons, strings, and dialog boxes across various Windows applications.

• Language Independence: A DLL written in C++ can be utilized by applications written in other languages like Visual Basic or C#.

Q68. Answer: (a) Bismillah Khan – Shehnai

The correct answer is Bismillah Khan - Shehnai.

Key Points

• Ustad Bismillah Khan was a legendary Indian musician who is credited with popularizing the Shehnai, a traditional wind instrument, and elevating it to the status of a classical concert instrument. He was honored with the Bharat Ratna in 2001. Hence, statement 1 is correct.

• Pandit Ravi Shankar was a world-renowned virtuoso and composer who was a master of the Sitar, not the Bansuri. He played a pivotal role in introducing Indian classical music to the Western world through collaborations with artists like George Harrison. Hence, statement 2 is incorrect.

• Ustad Zakir Hussain is an internationally acclaimed percussionist and composer known for his mastery over the Tabla. He is the son of the legendary Tabla player Ustad Alla Rakha and has received the Padma Vibhushan. Hence, statement 3 is incorrect.

• Pandit Shiv Kumar Sharma was a prominent Indian classical musician who specialized in the Santoor, a folk instrument from Jammu and Kashmir that he successfully modified for classical music. He was not associated with the Sarod. Hence, statement 4 is incorrect.

Additional Information

• Musical Instruments and Their Masters:

• Bansuri: This bamboo flute is most famously associated with maestros like Hariprasad Chaurasia and Pannalal Ghosh.

• Sarod: A fretless string instrument commonly associated with Ustad Amjad Ali Khan, Ali Akbar Khan, and Allauddin Khan.

• Sitar: Apart from Ravi Shankar, other notable players include Vilayat Khan and Nikhil Banerjee.

• Shehnai: This double-reed oboe is traditionally played during weddings and temple processions due to its considered auspicious sound.

Q69. Answer: (a) Two different bodies

The correct answer is Two different bodies.

Key Points

• According to Newton's Third Law of Motion, for every action, there is always an equal and opposite reaction.

• Action and reaction forces represent the mutual interaction between two objects; they never occur in isolation but always in pairs.

• The fundamental property of these forces is that the action force is exerted by the first body on the second, while the reaction force is exerted by the second body back on the first. Therefore, they act on two different bodies.

• Because these forces act on distinct objects, they do not result in a net force of zero on a single body. This is why a person can walk: the foot pushes the ground backward (action on ground), and the ground pushes the foot forward (reaction on person).

• These forces are simultaneous, meaning there is no time lag between the application of the action and the occurrence of the reaction.

Additional Information

• Properties of Action-Reaction Pairs:

• Direction: The forces act along the same line but in exactly opposite directions.

• Magnitude: The numerical value of the force exerted by object A on B is identical to the force exerted by object B on A.

• Nature of Force: Both forces are of the same physical nature; for instance, if the action is a magnetic force, the reaction must also be a magnetic force.

• Clarification of Incorrect Concepts:

• The same body: If action and reaction forces acted on the same body, they would cancel each other out, and the body would remain in its state of rest or uniform motion regardless of the force applied.

• State of Motion: These forces apply to all interactions regardless of whether the bodies are at rest or moving. The law is a universal principle of classical mechanics.

Q70. Answer: (a) 99^(th) Amendment

The correct answer is 99^(th) Amendment.

Key Points

• The 99^(th) Constitutional Amendment Act, 2014 was enacted to establish the National Judicial Appointments Commission (NJAC) to replace the existing Collegium system for appointing judges to the Supreme Court and High Courts of India.

• The act sought to amend Article 124(2) and Article 217(1) and inserted three new articles: Article 124A (Composition of NJAC), Article 124B (Functions of NJAC), and Article 124C (Power of Parliament to regulate procedures).

• The NJAC was designed as a six-member body consisting of the Chief Justice of India (Chairperson), two other senior-most judges of the Supreme Court, the Union Minister of Law and Justice, and two eminent persons.

• The two eminent persons were to be nominated by a committee consisting of the Prime Minister, the Chief Justice of India, and the Leader of the Opposition in the Lok Sabha.

• On October 16, 2015, in the Supreme Court Advocates-on-Record Association vs. Union of India case (also known as the Fourth Judges Case), a five-judge Constitution Bench struck down the amendment as unconstitutional by a 4:1 majority, ruling that it violated the Basic Structure of the Constitution regarding judicial independence.

Additional Information

• 76^(th) Amendment Act (1994):

• This amendment was passed to include the Tamil Nadu Reservation Act, 1994 in the Ninth Schedule of the Constitution.

• It was intended to protect the 69% reservation provided by the state government from judicial review after the Supreme Court Indra Sawhney ruling capped reservations at 50%.

• 102^(nd) Amendment Act (2018):

• It granted constitutional status to the National Commission for Backward Classes (NCBC), which was previously a statutory body.

• The amendment inserted Article 338B and Article 342A, empowering the President to identify and notify Socially and Educationally Backward Classes (SEBCs).

• 82^(nd) Amendment Act (2000):

• It amended Article 335 to restore the relaxation of qualifying marks and standards of evaluation for Scheduled Castes (SCs) and Scheduled Tribes (STs) in matters of promotion to government services.

• This amendment overturned a 1996 Supreme Court judgment that had curtailed such relaxations in promotions.

Q71. Answer: (a) PT – LG

The logic followed here is:

For PT - LG,

For RF - NB,

For MJ - IF,

For UG - QC,

Therefore, the letter-cluster pair that is different from the others is PT - LG.

Hence, the correct answer is 'Option 1'.

Q72. Answer: (a) QAI

The logic followed here is,

For QAI,

For OGY,

For PHZ,

For KCU,

Therefore, the letter cluster that is different from the others is QAI.

Hence, the correct answer is 'Option 1'.

Q73. Answer: (b) 5

The logic followed here is,

Therefore, the code for J is 5.

Hence, the correct answer is "Option 2"

Q74. Answer: (c) Neither conclusion (I) nor (II) follows

The least possible Venn diagram for the given statements is:

(I) Some apples are cups. - Doesn't follow (Their is no direct relation between apples and cups; maybe it is possible but not definite.)

(II) All cups are apples - Doesn't follow (Their is no direct relation between apples and cups; maybe it is possible but not definite.)

Neither conclusion (I) nor (II) follows.

Hence, the correct answer is "Option 3."

Q75. Answer: (b) US−OP

The logic followed here is,

Logic: The letters in the second cluster are obtained by subtracting 5 from the corresponding letters in the first cluster.

For XV-SQ,

For US-OP,

For TR-OM,

For PN-KI,

Therefore, the letter-cluster pair that is different from the others is US-OP.

Hence, the correct answer is 'Option 2'.

Q76. Answer: (c) H

Given: Seven people F, G, H, L, M, O and Q are sitting around a circular table, facing the centre of the table.

1. Only two people sit between Q and L when counted from the right of Q.

2. Only two people sit between L and O when counted from the left of O.

3. Only three people sit between Q and F when counted from the right of Q.

4. M sits to the immediate left of H.

The Final Arrangement is,

H sits third to the left of G.

Hence, the correct answer is "Option 3"

Q77. Answer: (a) 360

The logic followed here is:

• 135 + 15 = 150

• 150 + 30 = 180

• 180 + 45 = 225

• 225 + 60 = 285

• 285 + 75 = 360

Thus, the missing term in the series is 360.

Hence, the correct answer is 'Option 1';

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Q78. Answer: (b) (6, 37, 43)

The logic followed here is:

Logic:

1) Second number = (First number)² + 1

2) Third number = First number + Second number

For the first set (2, 5, 7):

=> (2)² + 1 = 4 + 1 = 5 (Second number)

=> 2 + 5 = 7 (Third number)

For the second set (3, 10, 13):

=> (3)² + 1 = 9 + 1 = 10 (Second number)

=> 3 + 10 = 13 (Third number)

Applying the same logic to the set (6, 37, 43):

=> (6)² + 1 = 36 + 1 = 37 (Second number)

=> 6 + 37 = 43 (Third number)

Hence, the correct answer is 'Option 2'.

Q79. Answer: (b) 7 km to the North

The logic followed here is,

• Mr. Yorly starts from Point A and drives 17 km towards East. He then takes a left turn, drives 18 km, turns left and drives 30 km.

• He then takes a left turn and drives 31 km.

• He then takes a left turn, drives 9 km, turns left and drives 6 km.

• He takes a final right turn, drives 4 km and stops at Point P

The Final Diagram,

The required travel is 7 km to the North.

Hence, the correct answer is "option 2"

Q80. Answer: (b) One

Given: Seven people, T, E, A, R, I, N, and G, are sitting in a row, facing north.

1. Only two people sit to the left of N.

2. Only three people sit between N and G.

3. Only one person sits between G and E.

4. I sits to the immediate left of R.

5. A is not an immediate neighbor of G

The final seating arrangement is:

From the arrangement, only G is sitting to the right of T.

Thus, there is One person sitting to the right of T.

Hence, the correct answer is "option 2"

Q81. Answer: (c) Neither conclusion (I) nor (II) follows

The least possible Venn diagram for the given statements is:

(I) Some Eagles are Peacocks - Doesn't Follow

There is no direct relation between eagles and peacock. So, may be it is possible but not definite. Hence, it is false)

(II) No Peacocks are Eagles - Doesn't Follow

There is no direct relation between eagles and peacock. So, may be it is possible but not definite. Hence, it is false)

Neither conclusion (I) nor (II) follows

Hence, the correct answer is "Option 3"

Q82. Answer: (a) Father's sister

Preparing the family tree diagram by using the following symbols:

As per the given information:

Symbol	•	−	×	÷
Meaning	Mother	Brother	Husband	Sister

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Given: A ÷ B × C + D − E ÷ F

The Family tree diagram,

Therefore, A is the sister of B, who is the father of F → A is the Father's sister of F.

Hence, the correct answer is 'Option 1'.

Q83. Answer: (a) se

The logic follows here,

Hence, the code for the " add " is se

Hence, the correct answer is "option 1"

Q84. Answer: (d) 150

The logic followed here is:

• 4 × 2 + 2 = 10

• 10 × 2 − 2 = 18

• 18 × 2 + 2 = 38

• 38 × 2 − 2 = 74

• 74 × 2 + 2 = 150

Thus, the missing term in the series is 150.

Hence, the correct answer is 'Option 4';

Q85. Answer: (b) One

The logic followed here is,

Logic: Each vowel in the word is changed to the letter immediately following it (+1), and each consonant is changed to the letter immediately preceding it (−1)

Given word : RADULAE

R	A	D	U	L	A	E
−1	+1	−1	+1	−1	+1	+1
Q	B	C	V	K	B	F

The new group of letters formed is: Q, B, C, V, K, B, F.

• B appears exactly twice in the new sequence.

• Therefore, the total count of letters appearing exactly twice is one.

Hence, the correct answer is "option 2"

Q86. Answer: (b) HM 3

The logic follows here,

KL 9 is related to IH −2,

PG 7 is related to NC −4,

Applying the same logic to JQ 14,

Hence, the correct answer is 'Option 2'.

Q87. Answer: (a) RTA

The logic follows here,

The term that comes in place of the question mark is RTA.

Hence the correct answer is "option 1"

Q88. Answer: (a) 8

BODMAS Table:

Given equation:3 A 42 B 14 C 29 D 22 = ?

A	B	C	D
÷	×	•	−

Replacing the alphabets with signs and applying BODMAS rule:

= 3 ÷ 42 × 14 + 29 − 22

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= (1/14) × 14 + 29 − 22
= 1 + 29 − 22
= 30 − 22
= 8
Hence, the correct answer is "option 1"

Q89. Answer: (b) JKM

The logic follows here,
Logic: Each letter in a group is shifted forward by 4 positions in the English alphabetical.
Combining the letters, we get the term JKM.
Hence, the correct answer is "option 2"

Q90. Answer: (a) Two

Given: Seven boxes, K, N, I, G, H, T and S, are kept one over the other, but not necessarily in the same order.
1. K is kept fourth from the top.
2. Only one box is kept between H and K.
3. S is kept at some place above K.
4. Only three boxes are kept between H and S.

Position	Box
7	
6	S
5	
4	K
3	
2	H
1	

1. I is kept immediately below S.
2. G is not kept immediately above or below H.
3. N is kept at one of the places above T.

Final Arrangement:

7	G
6	S
5	I
4	K
3	N
2	H
1	T

Thus, there are two boxes kept below N.
Hence, the correct answer is 'Option 1'.

Q91. Answer: (d) 21

Preparing the family tree diagram by using the following symbols:
As per the given information:
Deciphering the signs:

A	B	C	D
÷	×	•	−

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Given Equation: 7 A 7 C 20 B 2 = ? C 20

Applying the conditions and BODMAS rule:

= 7 ÷ 7 + 20 × 2 = ? + 20

= 1 + 20 × 2 = ? + 20

= 1 + 40 = ? + 20

= 41 = ? + 20

? = 41 − 20

? = 21

Hence, the correct answer is "option 4"

Q92. Answer: (a) X

Given: Seven boxes, A, U, V, W, X, Y and Z, are kept one over the other, but not necessarily in the same order.

1. Y is kept second from the bottom.
2. Only two boxes are kept between Y and V.
3. Only Z is kept between Y and U.

Position	Box
7	
6	
5	V
4	U
3	Z
2	Y
1	

1. A is kept on one of the positions before V but on one of the positions after W.
2. X is the only box left to be placed at the first position.

Final Arrangement:

7	W
6	A
5	V
4	U
3	Z
2	Y
1	X

Thus, the box kept first from the bottom is X.

Hence, the correct answer is "Option 1"

Q93. Answer: (a) SVT

The logic follows here,

By combining the results, the next term in the series is SVT.

Hence, the correct answer is "option 1"

Q94. Answer: (c) Four

Given:Seven boxes, F, G, H, I, J, K and L, are kept one over the other, but not necessarily in the same order.

1. J is kept at the fourth position from the top.
2. Only one box is kept above L.
3. I is kept immediately below L.

Position	Box

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7	
6	L
5	I
4	J
3	
2	
1	

1. K is kept at a position somewhere above J.
2. Only one box is kept between G and F.
3. H is the only remaining box.

Final Arrangement:

7	**K**
6	L
5	I
4	J
3	G / F
2	H
1	F / G

Thus, there are Four boxes between K and H.

Hence, the correct answer is 'Option 3"

Q95. Answer: (b) MJ - LP

The logic follows here,

For IJ - OP,

For MJ - LP,

For CD - IJ,

For ST - YZ,

Therefore, the letter-cluster pair that is different from the others is MJ - LP.

Hence, the correct answer is 'Option 2'.

Q96. Answer: (a) KNRL

The logic followed in this pattern is a consistent alphabetical shift where each letter is moved forward by 5 positions in the English alphabetical order.

For 'LOSM' related to 'QTXR':

L(12)	**O(15)**	**S(19)**	**M(13)**
+5 ↓	+5 ↓	+5 ↓	+5 ↓
Q(17)	T(20)	X(24)	R(18)

For 'ILPJ' related to 'NQUO':

I(9)	**L(12)**	**P(16)**	**J(10)**
+5 ↓	+5 ↓	+5 ↓	+5 ↓
N(14)	Q(17)	U(21)	O(15)

Applying the same logic to 'FIMG':

F(6)	**I(9)**	**M(13)**	**G(7)**
+5 ↓	+5 ↓	+5 ↓	+5 ↓

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K(11)	N(14)	R(18)	L(12)

Thus, FIMG is related to KNRL.

Hence, the correct answer is 'Option 1'.

Q97. Answer: (b) One

The logic followed here is:

Given Word: NOTFERN.

N	O	T	F	E	R	N
− 1	• 1	− 1	− 1	• 1	− 1	− 1
M	P	S	E	F	Q	M

The new group of letters formed is: M, P, S, E, F, Q, M.

There is one letter M that appears exactly twice in the new group.

Hence, the correct answer is "Option 2"

Q98. Answer: (b) Wife's mother

Preparing the family tree diagram by using the following symbols:

As per the given information:

Let us first decode the given symbols and then draw a family tree.

Symbol	×	≠	÷	Rs.
Meaning	Mother	Wife	Daughter	Father

Given: C ≠ D Rs. E × L ÷ M

From the above steps, C is the mother of E, and E is the wife of M. Therefore, C is the Wife's mother of M.

Hence, the correct answer is "Option 2".

Q99. Answer: (b) 53

BODMAS Table:

Given equation: 12 ÷ 4 + 9 × 3 − 8 = ?

Sign Interchange:

Original Sign	÷	•	×	−
New Sign	×	−	÷	•

After interchanging the signs, and applying the BODMAS rule

12 × 4 − 9 ÷ 3 + 8 = ?

= 12 × 4 − 9 ÷ 3 + 8

= 12 × 4 − 3 + 8

= 48 + 8 − 3

= 56 − 3

= 53

Hence, the correct answer is "option 2"

Q100. Answer: (a) None

Given : F M I H Y F Y E G K Y O N V K H Q T E K N

Required Conditions: Consonant - Vowel - Vowel.

(Left) F M I H Y F Y E G K Y O N V K H Q T E K N (Right)

There are None such vowels in the given series.

Hence, the correct answer is "Option 1"

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