RRB NTPC (Graduate) CBT-I Official Paper (Held On: 16 Mar, 2026 Shift 2) (Previous Year Paper)

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

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Q1. In the context of India's pre-1991 economic structure, which of the following best characterizes the contradiction between sectoral GDP contribution and employment absorption?

(a) Services led GDP growth and employment generation equally
(b) Manufacturing became the primary employment generator
(c) Industry contributed the most to GDP and employment
(d) Agriculture contributed declining GDP share but absorbed majority employment

Q2. A dealer buys two articles X and Y for Rs. 800 each. He marks each of them at the same price. He sells X by giving two successive discounts of 45% and 73% and still earns Rs. 523 as profit. If he sells Y at a single discount of 89%, then what is the profit percentage on Y?

(a) 22%
(b) 22.5%
(c) 21%
(d) 21.5%

Q3. If 15% of 80 - 3/6 × cbrt216 × √36 = y, then the value of y is

(a) -10
(b) -6
(c) -12
(d) -3

Q4. Simplify: (732 × 732 × 732 + 268 × 268 × 268)/(73.2 × 73.2 + 26.8 × 26.8 - 73.2 × 26.8)

(a) 100000
(b) 10000
(c) 100
(d) 1000

Q5. Which of the following correctly represents the three-tier structure of the Council of Ministers?

(a) Chief Ministers – State Ministers – Deputy Chief Ministers
(b) Cabinet Ministers – Ministers of State – Deputy Ministers
(c) Cabinet Ministers – Deputy Ministers – Governors
(d) Prime Minister – Ministers of State – Cabinet Ministers

Q6. Along a circular running track, P can complete 5 rounds in 40 minutes. Time taken by R to complete 7 rounds is equal to time taken by P to complete 6 rounds. If they start running in the same direction from two different ends of a diameter, then they will meet for the first time after ____ minutes.

(a) 28
(b) 30
(c) 20
(d) 24

Q7. X, Y, Z, S, T and U live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is numbered 6. Only Z lives above U. T lives immediately below U. Only Y lives below S. Who lives on floor numbered 4?

(a) T
(b) Z
(c) S
(d) U

Q8. Simplify: cbrt2744/4√256 × 2/42 × 72

(a) 5
(b) 12
(c) 17
(d) 10

Q9. 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.)

(44, 968, 22)

(26, 650, 25)

(a) (18, 108, 6)
(b) (34, 173, 5)
(c) (15, 348, 23)
(d) (23, 210, 9)

Q10. Which provision of the Indian Council Act of 1909 was most criticised for weakening the unity of the Indian nationalist movement?

(a) Inclusion of Indians in the Governor-General’s Council
(b) Introduction of executive councils in presidencies
(c) Creation of separate electorates
(d) Expansion of legislative councils

Q11. In a certain code language, 'VAJR' is coded as '102' and 'DOTG' is coded as '92'. What is the code for 'ZELW' in the given code language?

(a) 138
(b) 132
(c) 124
(d) 121

Q12. Vihaana walks 11 km North, then turns left and walks 7 km. She then turns left again and walks 11 km. She turns right and walks 2 km to reach point R.

How far and in which direction is point R from the starting point? (All turns are 90-degree turns only, unless specified.)

(a) 11 km, East
(b) 10 km, West
(c) 8 km, East
(d) 9 km, West

Q13. Which of the following reflects the structural adjustment in India’s monetary policy after the 1991 economic reforms?

(a) Controlled lending rates for agriculture and MSMEs
(b) Market-determined interest rates with reduced RBI intervention
(c) Elimination of open market operations as a regulatory tool
(d) Expansion of currency supply through deficit financing

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Q14. J, K, L, R, S and T live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it is numbered 2 and so on till the topmost floor is numbered 6. Only two people live between J and T. Only two people live between S and K. Only one person lives between L and K. L lives on floor number 1. J lives above K. How many people live between R and S?

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

Q15. What should come in place of the question mark (?) in the given series?

20 22 25 30 37 ?

(a) 55
(b) 51
(c) 49
(d) 48

Q16. Reema and Juhi, when each is working alone, can complete a piece of work in, respectively, 12 days and 36 days. Each work on alternate days, with Reema and Juhi starting to work on Day 1 and Day 2, respectively. How many days in all will it take to complete the work?

(a) 18
(b) 28
(c) 24
(d) 16

Q17. What will come in the place of the '?' in the following equation, if '+' and '−' are interchanged and '×' and '÷' are interchanged?

156 × 12 − 13 ÷ 8 + 71 = ?

(a) 46
(b) 43
(c) 41
(d) 45

Q18. Who were the "Samantas" in the post-Gupta period?

(a) Farmers
(b) Religious heads
(c) Feudal lords
(d) Architects

Q19. How often does India submit its Biennial Update Reports (BURs) to the UNFCCC?

(a) Every three years
(b) Every year
(c) Every two years
(d) Every five years

Q20. Which nutrient is primarily responsible for building and repairing tissues in the human body?

(a) Carbohydrates
(b) Proteins
(c) Fats
(d) Vitamins

Q21. If a : b :: b : c; c = 4a; and b = 6, find the positive value of c.

(a) 8
(b) 12
(c) 16
(d) 20

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Q22. This question is based on the five, three-digit numbers given below.

(Left) 547 589 652 598 637 (Right)

(Example- 697 – First digit = 6, second digit = 9 and third digit = 7)

NOTE: All operations to be done from left to right.

What will be the resultant if the second digit of the highest number is added to the second digit of the lowest number?

(a) 14
(b) 12
(c) 9
(d) 11

Q23. The LCM of two numbers is 1116 and their HCF is 186. If one of the number is 372, then the other number is

(a) 372
(b) 465
(c) 930
(d) 558

Q24. Which of the following reflects the Gandhian ideals incorporated as Directive Principles of State Policy in the Constitution of India?

(a) Raising the standard of living and public health
(b) Securing suitable employment for all
(c) Promoting cottage industries in rural areas
(d) Safeguarding children against exploitation

Q25. On which river in India is the National Waterway 57 (NW-57) developed?

(a) Zuari River
(b) Kopili River
(c) Kali River
(d) Gandak River

Q26. Which of the following cabinet committees is NOT headed by the Prime Minister?

(a) Cabinet committee on employment and skill development
(b) Cabinet committee on parliamentary affairs
(c) Cabinet committee on investment and growth
(d) Cabinet committee on economic affairs

Q27. What should come in place of '?' in the given series?

3 10 24 45 73 ?

(a) 111
(b) 109
(c) 108
(d) 104

Q28. Refer to the following letter, symbol series and answer the question. Counting to be done from left to right only.

(Left) B * £ J E % $ * V € G * D H @ A £ O V $ T Y (Right)

How many such letters are there each of which is immediately preceded by a symbol and also immediately followed by a symbol?

(a) 5
(b) 2
(c) 3
(d) 4

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Q29. Which of the following is NOT an important monument inside the Daulatabad Fort Maharashtra, India?

(a) Sikandra Fort
(b) Chand Minar
(c) Bharatmata Mandir
(d) Jami Masjid

Q30. Which ratio is the largest among 5 : 12, 14 : 31, 8 : 33 and 17 : 39?

(a) 5 : 12
(b) 14 : 31
(c) 17 : 39
(d) 8 : 33

Q31. According to the Government of India, flash floods in July 2023 in which state severely disrupted the functioning of several power stations?

(a) Arunachal Pradesh
(b) Sikkim
(c) Himachal Pradesh
(d) Uttarakhand

Q32. Line AB is parallel to line CD. A transversal PQ intersects AB at M and CD at N. If angle PMB = $(5x)^o$, angle BMN = $(3x + 2y)^o$ and angle DNQ = $(x + 3y)^o$ then find the value of angle BMN.

(a) 100^o
(b) 98^o
(c) 112^o
(d) 105^o

Q33. During PM Narendra Modi's State Visit to Bhutan (11–12 Nov 2025), which hydroelectric project was jointly inaugurated?

(a) 1200 MW Punatsangchhu-I HEP
(b) 336 MW Chukha HEP
(c) 720 MW Mangdechhu HEP
(d) 1020 MW Punatsangchhu-II HEP

Q34. Which of the following letter-number clusters will replace the question mark "?" in the given series to make it logically complete?

QIL 14, UMP 18, YQT 22, CUX 26, ?

(a) GXZ 32
(b) HZC 29
(c) GZD 30
(d) GYB 30

Q35. Each of P, Q, R, S, T, U and V has an exam on a different day of a week starting from Monday and ending on Sunday of the same week.

Only four people have exams after V. Only four people have exams before S. P has the exam after R but before V. T has the exam on some day after Q but not on Sunday.

How many people have exams between Q and U?

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

Q36. In 2025, which city topped the National Air Quality Index released for major Indian cities?

(a) Ranchi
(b) Kolkata
(c) Shillong

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(d) Mumbai

Q37. In 2025, which country officially became the 90th State Member of the International Union for Conservation of Nature (IUCN)?

(a) Kiribati
(b) Maldives
(c) Tuvalu
(d) Nauru

Q38. Simplify the following expression:

[3.75 + 4/5] - [3.5 - 8/20]

(a) 1.5
(b) 1.4
(c) 1.35
(d) 1.45

Q39. Which shortcut selects all content in a document?

(a) Ctrl+E
(b) Ctrl+R
(c) Ctrl+A
(d) Ctrl+S

Q40. Side PQ of a cyclic quadrilateral PQRS is produced to the point T. If angle RQT = 58º, then the measure of angle PSR is:

(a) 122°
(b) 58°
(c) 29°
(d) 116°

Q41. Under the Delhi Women & Child Development (WCD) Department's Women Safety Policy, 2025, what mandatory arrangement must be made for women staff if they are required to work late hours?

(a) Transport
(b) Dinner
(c) Bonus
(d) Accommodation

Q42. Which ions help chlorophyll to absorb light?

(a) Ca
(b) Na
(c) C
(d) Mg

Q43. Seven people, K, L, M, N, P, Q and R, are sitting around a circular table facing the centre of the table but not necessarily in the same order. Only two people sit between N and Q when counted from the right of N. Only two people sit between Q and M. Only three people sit between N and P. L sits to the immediate left of R. Who sits third to the left of K?

(a) P
(b) R
(c) N
(d) L

Q44. In a certain code language, 'ALIT' is coded as '2159' and 'HILT' is coded as '6912'. What is the code for 'H' in the given code language?

(a) 1
(b) 6
(c) 2

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(d) 9

Q45. A conical tent is to be made for a school event. The radius of the base is 7 metres, and the height of the tent is 24 metres. A decorative cloth is to be used to cover the entire curved surface area of the tent. The cloth costs Rs. 40 per square metre. What will be the total cost of the cloth required?

(Use π = 22/7)

(a) Rs. 21,000
(b) Rs. 22,000
(c) Rs. 22,800
(d) Rs. 23,800

Q46. Under the ELI scheme approved in July 2025, first-time employees will benefit by getting one month's wage under this scheme, up to what amount?

(a) Rs. 10,000
(b) Rs. 20,000
(c) Rs. 15,000
(d) Rs. 12,000

Q47. A triangle ABC with sides 3 cm, 4 cm and 5 cm is revolved about the side 3 cm. Find the volume of the solid so obtained. (Use π =3.14)

(a) 50.24 cubic cm
(b) 42.62 cubic cm
(c) 40.55 cubic cm
(d) 55.61 cubic cm

Q48. 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) DF-EG
(b) HJ-IK
(c) LN-MO
(d) KM-NP

Q49. In 2025, which United Nations body released the World Urbanization Prospects report using the Degree of Urbanization methodology?

(a) UN Statistical Commission
(b) UN Human Settlements Programme (UN-Habitat)
(c) UN Development Programme (UNDP)
(d) UN Department of Economic and Social Affairs (UN DESA)

Q50. In the Chola empire, the tax-free lands donated to Brahmins where they settled were known as _____.

(a) Garbhagriha
(b) Valanadu
(c) Mahasabha
(d) Agraharam

Q51. Which of the following island groups in India is known to have an active volcano on Barren Island?

(a) Andaman and Nicobar Islands
(b) Lakshadweep Islands
(c) Minicoy Islands
(d) Rameswaram Islands

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Q52. Which of the following letter-clusters should replace # and % so that the pattern and relationship followed between the letter-cluster pair on the left side of :: is the same as that on the right side of :: ?

: ZJR :: PZH : %

(a) = TDL % = VFN
(b) = UDL % = VFN
(c) = TDL % = VCN
(d) = TDM % = VFN

Q53. Which statement is True or False regarding file management in Windows 11?

(i) When a file is deleted and moved to the Recycle Bin, its contents are immediately and permanently erased from the storage disk.

(ii) The file path (C: > Users > Documents > file.txt) is a strictly hierarchical structure, meaning each file has one unique path.

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

Q54. What is the mode of the data given below? [Give your answer correct to 2 decimal places.]

Age in years	20-30	30-40	40-50	50-60	60-70	70-80	80-90
No. of patients	36	29	35	22	18	38	26

(a) 78.25
(b) 76.25
(c) 74.25
(d) 72.25

Q55. Which provision addresses citizenship for persons who migrated from Pakistan before India's Constitution commencement?

(a) Article 8
(b) Article 10
(c) Article 5
(d) Article 6

Q56. Special address delivered by the President to both Houses of Parliament at the start of the first session after each general election and at the opening of the first session of every year is mentioned under which of the following Articles of the Constitution of India?

(a) Article 86
(b) Article 87
(c) Article 88
(d) Article 85

Q57. Suman, Kunal, and Pooja invest Rs. 1050, Rs. 1510, and Rs. 1280 respectively to start a business. If the profit at the end of the year is Rs. 1650, then what is the share of Pooja in the profit?

(a) Rs. 549
(b) Rs. 551
(c) Rs. 550
(d) Rs. 548

Q58. A major characteristic of computer systems is Diligence. Which of the following scenarios primarily highlights a limitation of the computer system that is not overcome by its diligence?

(a) A computer performs trillions of calculations a second, much faster than any human.
(b) A computer generates incorrect output because the initial data entered was flawed.
(c) A computer continues processing data for 72 hours straight without any loss of attention.

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(d) A computer is used to book flights in the morning and write code in the afternoon.

Q59. 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 conclusion(s) logically follow(s) from the statement.

Statements:

All tea is a snack. All tea is brunch. All brunches are dinner.

Conclusions:

(I) All tea is dinner.(II) Some brunches are snacks.

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

Q60. Which of the following introduced dyarchy by dividing subjects into Reserved and Transferred lists?

(a) Indian Councils Act, 1892
(b) Government of India Act, 1919
(c) Government of India Act, 1909
(d) Government of India Act, 1935

Q61. Seven people B, C, O, P, Q, R and S are sitting around a circular table facing the center of the table. Only two people sits between P and B when counted from the right of P. Only S sits between O and P. Q sits to the immediate left of B. C is not an immediate neighbor of P. Who sits third to the left of R?

(a) C
(b) B
(c) P
(d) O

Q62. 100 men have provisions for 26 days. If 50 men have left, for how many days the same provisions would last for the remaining men?

(a) 50
(b) 54
(c) 56
(d) 52

Q63. Jaspreet deposited a sum of Rs. 28,450 at 20% rate of interest per annum, compounded annually. The total amount received by Jaspreet after 2 years is:

(a) Rs. 41,126
(b) Rs. 40,624
(c) Rs. 40,958
(d) Rs. 40,968

Q64. Which of the following letter-clusters should replace # and % so that the pattern and relationship followed between the letter-cluster pair on the left side of :: is the same as that on the right side of :: ?

: EGC :: QSO : %

(a) = HJF; % = NPL
(b) = GTF; % = NNH
(c) = NJG; % = NKJ
(d) = TYF; % = NHG

Q65. Who among the following established the famous Nrityagram institution in Bengaluru?

(a) Protima Gauri
(b) Pavithra Reddy
(c) Surupa Sen
(d) Bijayini Satpathy

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Q66. The Tamil literary work Iraiyanar Ahapporul is dated to which century?

(a) 7th century CE
(b) 8th century CE
(c) 11th century CE
(d) 5th century CE

Q67. Which of the following letter-number clusters will replace the question mark (?) in the given series to make it logically complete?

JMO 50 MPR 61 PSU 72 SVX 83 ?

(a) VYA 94
(b) VEO 93
(c) VXZ 93
(d) VZZ 94

Q68. At what rate (in percentage) per year will a sum of money 5 times itself in 16 years on simple interest?

(a) 50
(b) 25
(c) 27
(d) 23

Q69. The price of fuel decreases by 40%, 60% and 60% in three successive months, but increases by 70% in the fourth month. What is the percentage increase or decrease in the price of fuel in the fourth month as compared to its original price?

(a) Increase by 87.04%
(b) Decrease by 83.68%
(c) Increase by 80.38%
(d) Decrease by 84.38%

Q70. A shopkeeper professes to sell his goods at a 60% loss but uses a false balance and gains 90%. The actual weight (rounded off to one decimal place) he uses for 1 kg is:

(a) 213.6 gm
(b) 209.5 gm
(c) 210.5 gm
(d) 214.1 gm

Q71. Which of the following letter-clusters should replace # and % so that the pattern and relationship followed between the letter-cluster pair on the left side of :: is the same as that on the right side of :: ?

: OIM :: ICG : %

(a) = LPO, % = GJH
(b) = MKO, % = GMJ
(c) = QKO, % = GAE
(d) = MKO, % = GMK

Q72. The average of 11 results is 61. If the average of the first 6 results is 64 and that of the last 6 is 61, find the 6^(th) result.

(a) 79
(b) 81
(c) 78
(d) 80

Q73. Which system has become a cornerstone of government development policy and is tied to most rural development programs?

(a) Mahatma Gandhi National Rural Employment Empowerment Scheme (MGNRES)
(b) Public Distribution System (PDS)
(c) Swachh Bharat Abhiyan

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(d) Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

Q74. 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.)

(19,21,55)

(8,9,23)

(a) (1,21,19)
(b) (20,12,79)
(c) (22,21,67)
(d) (7,5,3)

Q75. Refer to the following letter, number and symbol series and answer the question that follows. Counting to be done from left to right only. All numbers are single-digit numbers.

(Left) G 6 E * @ # 3 D 2 % 7 4 Y & 5 + C R K S T (Right)

How many such numbers are there each of which is immediately preceded by a symbol and also immediately followed by a letter?

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

Q76. In a certain code language,

T + J means ' T is the father of J',

T - J means ' T is the daughter of J',

T X J means ' T is the mother of J', and

T # J means ' T is the husband of J '.

Based on the above, how is G related to R if ' G # A - R + K'?

(a) Sister's husband
(b) Husband
(c) Husband's brother
(d) Daughter's husband

Q77. Solve the following system of 3 equations in 3 unknowns.

$x - 3z = -5$

$2x - y + 2z = 16$

$7x - 3y - 5z = 19$

(a) $x = -4, y = 3, z = -2$
(b) $x = -4, y = 2, z = -3$
(c) $x = 4, y = -2, z = -3$
(d) $x = 4, y = -2, z = 3$

Q78. The formation of a spectrum by a glass prism occurs due to _____.

(a) Reflection
(b) Refraction
(c) Dispersion
(d) Scattering

Q79. Which Constitutional Amendment Act added Bodo, Dogri, Maithili, and Santhali to the Eighth Schedule of the Indian Constitution?

(a) 92nd Amendment Act, 2003
(b) 86th Amendment Act, 2002
(c) 93rd Amendment Act, 2005

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(d) 91st Amendment Act, 2003

Q80. Who among the following was a prominent disciple of Ramanuja's Sri Vaishnava tradition who played a significant role in spreading its Bhakti teachings to North India?

(a) Namdev
(b) Madhvacharya
(c) Ramanujacharya
(d) Ramananda

Q81. If 3 is added to each even digit and 2 is subtracted from each odd digit in the number 5723946, how many digits will appear more than once in the new number thus formed?

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

Q82. A number when increased by 25% becomes equal to another number, which is 20% less than a third number. What is the ratio of the first number to the third number?

(a) 25:36
(b) 27:38
(c) 16:25
(d) 9:16

Q83. Below are given two sets of numbers. In each set of numbers, a certain mathematical operation on the first number results in the second number. Similarly, certain mathematical operation on the second number results in the third number and so on. Which of the given options follows the same set of operations as in question?

(NOTE – A two/three-digit number cannot be broken into individual digits for operations, e.g., if 37 is followed by 10, the operation cannot be 3+7 as a two-digit number cannot be broken into individual digits.)

6 - 11 - 22 - 32; 9 - 14 - 28 - 38

(a) 13-18-36-46
(b) 7-12-24-14
(c) 14-19-38-58
(d) 12-17-34-54

Q84. Which of the following apparent forces, caused by Earth's rotation, deflects winds to the right in the Northern Hemisphere and to the left in the Southern Hemisphere?

(a) Frictional force
(b) Pressure gradient force
(c) Coriolis force
(d) Gravitational force

Q85. The following dataset represents the number of books read by 25 students in a month: 2, 4, 4, 5, 5, 5, 6, 7, 7, 7, 7, 8, 8, 9, 9, 10, 10, 11, 11, 12, 13, 13, 13, 15, 16. Calculate the mode of the dataset.

(a) 5
(b) 7
(c) 13
(d) 11

Q86. Between 2001 and 2011, the male-female gap in the literacy rate of India _____.

(a) increased
(b) became zero
(c) decreased
(d) remained the same

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Q87. Which of the following was the primary objectives of the India-Liberia MoU signed in December 2025?

(a) Establishing defense manufacturing units
(b) Initiating joint space missions
(c) Enhancing co-operation on medicine quality standards
(d) Constructing new highways

Q88. A boy flying a kite holds the string of length 24.4 m such that it makes an angle of 30° with the ground. Find the height of the kite from the ground.

(a) 13.6 m
(b) 11.5 cm
(c) 13.2 m
(d) 12.2 m

Q89. Two trains are moving in opposite directions at speeds of 110 km/hr and 120 km/hr. The length of one train is 450 m. The time taken by them to cross each other is 12 seconds. The length (in m) of the other train (rounded off to 2 decimal places) is:

(a) 317.34
(b) 316.67
(c) 318.7
(d) 314.28

Q90. Which district in Mizoram was recognised as the best-performing district in NITI Aayog's SDG Index NE Districts 2023–24?

(a) Aizawl
(b) Champhai
(c) Hnahthial
(d) Lunglei

Q91. If the equations $x^2 – 3px + q = 0$ and $x^2 – 2kx + t = 0$ have one common root, and the first equation has equal roots, what is the value of $(t + q)^2$?

(a) $9p^2k^2$
(b) 0
(c) 4pk
(d) (3p – 2k)

Q92. The average of the first 62 even natural numbers is:

(a) 63
(b) 62
(c) 64
(d) 61

Q93. 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) ZD-CG
(b) FI-JM
(c) KO-NR
(d) QU-TX

Q94. In a certain code language,

A + B means ‘A is the daughter of B’
A - B means ‘A is the mother of B’
A x B means ‘A is the wife of B’
A ÷ B means ‘A is the father of B’
Based on the above, how is G related to M if 'G + R x W ÷ D - M’?

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

Q95. Who among the following is NOT directly associated with the Prarthana Samaj?

(a) Debendranath Tagore
(b) Mahadev Govind Ranade
(c) Atmaram Pandurang
(d) R.C. Bhandarkar

Q96. In this question, a question is followed by two statements numbered (I) and (II). You have to decide whether the data provided in the statements are sufficient to answer the question. Read both the statements and decide the appropriate answer.

Q. Five friends – Gaurav, Himanshu, Ishan, Lokesh, and Mukul – are of different ages.

Who is the third oldest?

(I) Ishan is older than Gaurav but younger than Lokesh.

(II) Mukul is older than Ishan but younger than Lokesh.

(a) Data in Statement I alone is sufficient to answer the question while data in Statement II is not
(b) Data in Statement II alone is sufficient to answer the question while data in Statement I is not
(c) Both statements I and II together are NOT sufficient to answer the question
(d) Both statements I and II together (and not statement I alone or statement II alone) are sufficient to answer the question

Q97. 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 conclusion(s) logically follow(s) from the statements.

Statements:

All tigers are wolves. All jackals are wolves. All animals are wolves.

Conclusions:

(I) Some animals are tigers.

(II) Some jackals are animals.

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

Q98. A shopkeeper purchased 59 dozens of articles at the rate of Rs. 520 per dozen. He sold each one of them at the rate of Rs. 52. What percentage profit did he make?

(a) 20%
(b) 19%
(c) 21%
(d) 23%

Q99. Which type of touchscreen functions by pressing two flexible layers together, allowing it to detect input from a non-conductive object like a fingernail or plastic stylus?

(a) Capacitive touch
(b) Infrared grid touch
(c) Resistive touch
(d) Surface acoustic wave

Q100. The acid present in the atmosphere of Venus is:

(a) HNO_3
(b) H_2SO_4
(c) HCl

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(d) HCOOH

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (d) Agriculture contributed declining GDP share but absorbed majority employment

The correct answer is Agriculture contributed declining GDP share but absorbed majority employment.

Key Points

• The structural transformation of the Indian economy between 1950 and 1991 was unique and contradictory compared to global development patterns. In a typical developing economy, labor moves from Agriculture to Industry and then to Services.

• While the share of Agriculture in the Gross Domestic Product (GDP) declined significantly—from about 50% in 1950-51 to around 30% by 1990-91—the proportion of the population dependent on it for a livelihood did not decline proportionately.

• During this period, the Primary Sector (Agriculture) continued to absorb the majority of the workforce, accounting for approximately 67.4% of employment in 1991, despite its falling contribution to the national income. Hence, the statement regarding agriculture's declining GDP share vs. high employment absorption is correct.

• The Industrial Sector failed to grow at a pace rapid enough to absorb the surplus labor from the rural areas. Even though the Secondary Sector grew under various Five-Year Plans, its capacity for employment generation remained limited. Hence, the statement that manufacturing became the primary employment generator is incorrect.

• The Services Sector (Tertiary Sector) saw a faster growth in GDP share than the industrial sector, but this growth was not accompanied by an equivalent increase in employment opportunities during the pre-reform era. Hence, the statement that services led growth and employment equally is incorrect.

Additional Information

• Structural Composition of GDP:

• At the time of independence in 1947, India was a predominantly agrarian economy. The Planning Commission was established in 1950 to guide economic development.

• The Second Five-Year Plan (1956-1961), based on the Mahalanobis Model, focused heavily on heavy industries to modernize the economy, yet the workforce shift remained stagnant.

• Disguised Unemployment:

• The contradiction of high employment in Agriculture with low GDP contribution led to Disguised Unemployment. This is a phenomenon where more people are working in a sector than are actually required, and their marginal productivity is zero.

• By 1990, while Agriculture contributed only about one-third of the GDP, it still supported two-thirds of the Indian population.

• Role of the Secondary and Tertiary Sectors:

• The Secondary Sector includes Manufacturing, Electricity, and Construction. Its share in GDP increased from 13% in 1950 to about 24% in 1990.

• The Tertiary Sector (Trade, Transport, Banking, etc.) grew from 30% to approximately 40% of GDP in the same period, but the "jobless growth" in services became a point of concern for economists.

• Economic Reforms of 1991:

• Due to this structural imbalance and a Balance of Payments (BoP) crisis, India introduced Liberalization, Privatization, and Globalization (LPG) reforms in July 1991 under the leadership of P.V. Narasimha Rao and Finance Minister Dr. Manmohan Singh.

• Post-1991, the Services Sector became the main engine of GDP growth, though the challenge of shifting labor out of

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low-productivity agriculture remains a major theme in Indian economics today.

Q2. Answer: (b) 22.5%

Shortcut Trick

SP of X = CP + Profit = 800 + 523 = 1323.

Remaining SP factor after 45% and 73% discounts = 0.55 × 0.27 = 0.1485.

Remaining SP factor after 89% discount = 0.11.

Ratio SP_X : SP_Y = 0.1485 : 0.11 = 135 : 100 = 27 : 20.

27 units = 1323 => 1 unit = 49 => SP_Y = 20 × 49 = 980.

Profit % on Y = (980 − 800) ÷ 800 × 100 = 180 ÷ 8 = 22.5%.

Therefore Answer = 22.5%

Alternate Method

Given:

CP of X = CP of Y = 800. MP of X = MP of Y. Profit on X = 523. Discounts on X = 45%, 73%. Discount on Y = 89%.

Formula used:

SP = CP + Profit; SP = MP × (1 − d1/100) × (1 − d2/100); Profit % = (Profit/CP) × 100

CP = 800 MP X: 45%, 73% disc. SP_X = 1323 Y: 89% disc. SP_Y = 980 Profit on Y = 980 − 800 = 180

Calculations:

For article X:

=> SP_X = 800 + 523 = 1323

=> SP_X = MP × (1 − 45/100) × (1 − 73/100)

=> 1323 = MP × 0.55 × 0.27

=> MP = 1323 ÷ (0.55 × 0.27) = 1323 ÷ 0.1485

For article Y:

=> SP_Y = MP × (1 − 89/100) = MP × 0.11

=> SP_Y = (1323 ÷ 0.1485) × 0.11 = 1323 × (1100 ÷ 1485)

=> SP_Y = 1323 × (20 ÷ 27) = 49 × 20 = 980

=> Profit on Y = 980 − 800 = 180

=> Profit % = (180 ÷ 800) × 100 = 22.5%

Therefore The correct answer is 22.5% (Option 2).

Additional Information

Successive Discounts

Two successive discounts of a% and b% are equivalent to a single discount of [a + b − (a × b)/100]%.

Marked Price Formula

MP = CP × (100 + Profit%) ÷ (100 − Discount%). This relates CP and MP directly when profit and discount are known.

Effective Value

If an item is discounted by d%, its selling price becomes (100 − d)% of its marked price.

Q3. Answer: (b) -6

Calculation:

15% of 80 - (3/6) × cbrt216 × √36 = y

=> 3/20 × 80 - (1/2) × 6 × 6 = y

=> 3 × 4 - 3 × 6 = y

=> 12 - 18 = y

=> y = - 6

Hence, the correct answer is -6.

Q4. Answer: (a) 100000

Shortcut Trick

Expression is of the form $(a^3 + b^3) / (x^2 + y^2 − xy)$ where a = 10x and b = 10y.

Numerator = $(10x)^3 + (10y)^3 = 1000(x^3 + y^3)$.

Expression reduces to $1000 × (x^3 + y^3) / (x^2 − xy + y^2) = 1000(x + y)$.

Substitute x = 73.2 and y = 26.8: 1000 × (73.2 + 26.8) = 1000 × 100 = 100000.

Therefore The correct answer is 100000.

Alternate Method

Given: Numerator = $732^3 + 268^3$ and Denominator = $73.2^2 + 26.8^2 - 73.2 \times 26.8$

Formula Used: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

=> Let x = 73.2 and y = 26.8. Then 732 = 10x and 268 = 10y.

=> Expression = $[(10x)^3 + (10y)^3] / [x^2 + y^2 - xy]$

=> Expression = $[1000x^3 + 1000y^3] / [x^2 - xy + y^2]$

=> Expression = $1000 \times (x^3 + y^3) / (x^2 - xy + y^2)$

=> Expression = $1000 \times [(x + y)(x^2 - xy + y^2)] / (x^2 - xy + y^2)$

=> Expression = $1000 \times (x + y)$

=> Expression = $1000 \times (73.2 + 26.8)$

=> Expression = $1000 \times 100 = 100000$.

Therefore The correct answer is 100000.

Additional Information

Algebraic Identity: Sum of Cubes

The formula $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ is a standard identity used to simplify expressions where a cubic sum is divided by a quadratic term.

Algebraic Identity: Difference of Cubes

Similarly, $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ is used for simplifying subtractions of cubes.

Decimal and Power Relationship

If a number is multiplied by 10, its square is multiplied by 100 (10^2) and its cube is multiplied by 1000 (10^3).

Q5. Answer: (b) Cabinet Ministers – Ministers of State – Deputy Ministers

The correct answer is Cabinet Ministers – Ministers of State – Deputy Ministers.

Key Points

• The Council of Ministers in India consists of a three-tier hierarchy of ministers, which includes Cabinet Ministers, Ministers of State, and Deputy Ministers.

• Cabinet Ministers: These are the senior-most members of the Council of Ministers. They hold the charge of crucial ministries of the Central Government such as Home, Defense, Finance, and External Affairs. They are the primary policy-making body of the Government of India. Hence, this tier is correctly identified.

• Ministers of State: This is the second tier of the council. They can either be given independent charge of ministries/departments or can be attached to Cabinet Ministers. When attached, they assist the Cabinet Ministers in the discharge of their duties. Hence, this tier is correctly identified.

• Deputy Ministers: These are the third tier of the Council of Ministers. They are not given independent charge of any ministry and are always attached to Cabinet Ministers or Ministers of State. Their main function is to assist in administrative, parliamentary, and departmental work. Hence, this tier is correctly identified.

• The Prime Minister sits at the top of this entire structure as the head of the Council of Ministers, exercising supreme executive authority. Hence, the statement representing the tiers as Cabinet, Ministers of State, and Deputy Ministers is correct.

Additional Information

• Constitutional Basis: Article 74 of the Constitution of India provides for a Council of Ministers with the Prime Minister at the head to aid and advise the President. Article 75 deals with the appointment, tenure, responsibility, qualification, oath, and salaries of the ministers.

• Size of Council of Ministers: According to the 91st Constitutional Amendment Act, 2003, the total number of ministers, including the Prime Minister, in the Central Council of Ministers shall not exceed 15% of the total strength of the Lok Sabha.

• Collective Responsibility: Under Article 75(3), the Council of Ministers is collectively responsible to the Lok Sabha (the Lower House of Parliament). This means that all ministers own joint responsibility to the Lok Sabha for all their acts of omission and commission.

• Cabinet vs. Council of Ministers: The Council of Ministers is a wider body consisting of 60 to 80 ministers, whereas the Cabinet is a smaller, more powerful core group consisting of about 15 to 20 ministers. The term "Cabinet" was inserted into Article 352 of the Constitution by the 44th Amendment Act, 1978.

• Appointment: The Prime Minister is appointed by the President, and other ministers are appointed by the President on the recommendation of the Prime Minister. A person who is not a member of either House of Parliament can be appointed as a minister for a maximum period of 6 months, within which they must get elected to either house.

Important Points

• Individual Responsibility: Article 75 also contains the principle of individual responsibility, stating that the ministers hold office

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during the pleasure of the President.

• Council Hierarchy: While the Constitution does not classify the ministers into different ranks, this three-tier classification is based on British parliamentary conventions and has been followed in India since independence.

• Parliamentary Secretaries: Occasionally, a fourth category known as Parliamentary Secretaries is also appointed. They are senior members of the ruling party who assist the ministers in their parliamentary duties but are not technically part of the Council of Ministers.

Q6. Answer: (d) 24

Shortcut Trick

Time for P per round = 40 ÷ 5 = 8 min.

Time for R per round = (6 × 8) ÷ 7 = 48/7 min.

In same direction, Relative Speed = |1/8 − 7/48| = 1/48 rounds/min.

Initial gap = 1/2 round (diameter ends).

Time to meet = (1/2) ÷ (1/48) = 24 minutes.

Therefore The correct answer is 24 minutes.

Alternate Method

Given:

Rounds by P = 5 in 40 min.

Relation: Time for 7 rounds of R = Time for 6 rounds of P.

Start position: Opposite ends of diameter (1/2 track apart).

Formula Used:

Speed = Distance ÷ Time

Relative Speed (Same Direction) = Speed1 − Speed2

Time of Meeting = Initial Distance ÷ Relative Speed

P R Initial Gap = 1/2 Round Same Direction Motion

Calculations:

=> Let track length = L

=> Speed of P (S_P) = (5 × L) ÷ 40 = L/8 per min

=> Time for 6 rounds of P = 6 × (L ÷ S_P) = 6 × 8 = 48 min

=> Speed of R (S_R) = (7 × L) ÷ 48 = 7L/48 per min

=> Initial separation distance = L/2 (Diameter ends)

=> Relative Speed = S_R − S_P = 7L/48 − L/8

=> Relative Speed = 7L/48 − 6L/48 = L/48 per min

=> Meeting Time = (L/2) ÷ (L/48)

=> Meeting Time = (1/2) × 48 = 24 minutes

Therefore The correct answer is 24 minutes.

Additional Information

Meeting in Opposite Direction

When two people run in opposite directions, the relative speed is the sum of their individual speeds (S1 + S2).

Number of Meeting Points

If speeds are in ratio a:b (simplest form), they meet at (a−b) points in the same direction and (a+b) points in opposite directions.

Time for Subsequent Meetings

After the first meeting, each subsequent meeting occurs after a time interval of (Total Distance) ÷ (Relative Speed).

Q7. Answer: (a) T

The logic followed here is:

Given: X, Y, Z, S, T and U live on six different floors of the same building.

The lowermost floor is numbered 1, the floor above it is numbered 2 and so on till the topmost floor is numbered 6.

Only Z lives above U.

T lives immediately below U.

Only Y lives below S.

Floor	Person

6	Z
5	U
4	T
3	X
2	S
1	Y

Now, the person on floor number 4 is T.

Hence, the correct answer is Option 1.

Q8. Answer: (b) 12

Shortcut Trick

Recognize roots: √³2744 = 14 and √^4256 = 4.

Substitute into expression: (14 ÷ 4) × (2 ÷ 42) × 72

Reduce ratios: (7 ÷ 2) × (1 ÷ 21) × 72

Combine: (7 ÷ 21) × (72 ÷ 2) = (1 ÷ 3) × 36 = 12

Therefore Answer = 12

Alternate Method

Given:

Expression: (√³2744 ÷ √^4256) × (2 ÷ 42) × 72

Formula used:

Root property: $\sqrt[n]{x^n} = x$

BODMAS rule: Simplify terms within brackets and roots first, then perform multiplication.

Term 1 Term 2 Term 3 14 / 4 2 / 42 72 Calculation: 3.5 × (1/21) × 72 = 12

Calculations:

Step 1: Simplify individual roots

=> √³2744 = √³(14 × 14 × 14) = 14

=> √^4256 = √^4(4 × 4 × 4 × 4) = 4

Step 2: Substitute and simplify fractions

=> (14 ÷ 4) × (2 ÷ 42) × 72

=> 3.5 × (1 ÷ 21) × 72

Step 3: Solve the multiplication

=> (3.5 ÷ 21) × 72

=> (1 ÷ 6) × 72

=> 72 ÷ 6 = 12

Therefore The correct answer is 12 (Option 2).

Additional Information

Rules of Surds

The n-th root of a number can be expressed as an exponent: $\sqrt[n]{x} = x^{(1/n)}$. For example, $\sqrt[3]{x} = x^{(1/3)}$.

Common Powers

Memorizing cubes up to 20 and fourth powers up to 10 helps in quick simplification. Note: $14^3 = 2744$ and $4^4 = 256$.

BODMAS / PEMDAS Rule

Always prioritize Roots/Exponents (Orders) and Brackets before performing Multiplication and Division from left to right.

Q9. Answer: (a) (18, 108, 6)

The logic followed here is:

Logic: Middle term = (1st term × last term)

(44, 968, 22)

=> (44 × 22) = 968

(26, 650, 25)

=> (26 × 25) = 650

Now, checking the options:

Option 1) (18, 108, 6)

=> 18 × 6 = 108 (True)

Option 2) (34, 173, 5)

=> 34 × 5 = 170 (false)

Option 3) (15, 348, 23)

=> 15 × 23 = 345 (false)

Option 4) (23, 210, 9)

=> 23 × 9 = 207 (false)

Hence, the correct answer is Option (1).

Q10. Answer: (c) Creation of separate electorates

The correct answer is Creation of separate electorates.

Key Points

• The Indian Council Act of 1909, also famously known as the Morley-Minto Reforms, introduced the highly controversial system of separate electorates for Muslims. Under this provision, Muslim representatives were to be elected exclusively by Muslim voters.

• This move was criticized by the Indian National Congress and other nationalist leaders as it was perceived as a clear application of the "Divide and Rule" policy. By institutionalizing communalism in Indian politics, the British Government aimed to create a rift between Hindus and Muslims, thereby weakening the Nationalist Movement.

• The Act was named after Lord Morley, the then Secretary of State for India, and Lord Minto, the Viceroy of India. Due to his role in introducing communal representation, Lord Minto is often referred to as the "Father of Communal Electorate".

• The Creation of separate electorates is the correct answer because it directly targeted the unity of the Indian people by categorizing political interests based on religion, which eventually laid the groundwork for the Partition of India.

Additional Information

• Expansion of Legislative Councils: The Act increased the size of the Legislative Councils at both the Central and Provincial levels. The number of members in the Central Legislative Council was raised from 16 to 60. However, an official majority was retained at the Centre, while non-official majorities were allowed in the Provincial Councils.

• Inclusion of Indians in Executive Councils: For the first time, the Act provided for the association of Indians with the Executive Councils of the Viceroy and Governors. Satyendra Prasad Sinha became the first Indian to join the Viceroy's Executive Council as the Law Member.

• Enhanced Deliberative Powers: The Legislative Councils were given the power to discuss the Budget and move resolutions. Members were also allowed to ask supplementary questions, although the executive still held the final authority and could reject resolutions without providing detailed reasons.

• Background of the Act: The reforms were enacted in the backdrop of the 1905 Partition of Bengal and the formation of the All India Muslim League in 1906. The Simla Deputation, led by Aga Khan in 1906, had specifically met Lord Minto to demand separate representation for Muslims to safeguard their political rights.

Important Points

• The Morley-Minto Reforms did not aim at establishing a parliamentary system in India; rather, they were intended to involve some Indians in the administration to placate the Moderate faction of the Congress while isolating the Extremists.

• The system of communal representation introduced in 1909 was further extended to Sikhs, Indian Christians, Anglo-Indians, and Europeans in the Government of India Act 1919 (Montagu-Chelmsford Reforms).

• Mahatma Gandhi later stated that "The Morley-Minto Reforms have been our undoing," emphasizing how the Creation of separate electorates sowed the seeds of communal disharmony that plagued the independence struggle for decades.

• Despite the increase in the number of members, the electorate remained very limited, based on property qualifications, education, or status, meaning only a tiny fraction of the Indian population had the Right to Vote.

Q11. Answer: (b) 132

The logic followed here is:

Logic: Sum of positions × 2

Checking the given codes:

For, VAJR

V(22) + A(1) + J(10) + R(18) = 51

=> 51 × 2 = 102

For, DOTG

D(4) + O(15) + T(20) + G(7) = 46

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=> 46 × 2 = 92

Now, for ZELW:

Z(26) + E(5) + L(12) + W(23) = 66

=> 66 × 2 = 132

Hence, the correct answer is Option 2.

Q12. Answer: (d) 9 km, West

Given:

Vihaana walks 11 km North.

She turns left → 7 km West.

She turns left → 11 km South.

She turns right → 2 km West and reaches point R.

So, point R is 9 km to the West from the starting point.

Hence, the correct answer is Option 4.

Q13. Answer: (b) Market-determined interest rates with reduced RBI intervention

The correct answer is Market-determined interest rates with reduced RBI intervention.

Key Points

• One of the most significant structural adjustments in India's monetary policy following the 1991 Economic Reforms was the shift from an administered interest rate regime to a market-determined interest rate system. Prior to 1991, the Reserve Bank of India (RBI) strictly controlled interest rates for both deposits and loans.

• The Narasimham Committee (1991) on the Financial System recommended that interest rates should be allowed to be determined by market forces (demand and supply) to improve the efficiency of the banking sector and the allocation of capital. Hence, the statement regarding market-determined rates is correct.

• Post-reforms, the RBI gradually deregulated lending and deposit rates. By October 1994, the RBI abolished the minimum lending rate and allowed commercial banks to determine their own Prime Lending Rates (PLR).

• This shift allowed the RBI to move away from direct controls and instead use indirect instruments of monetary policy, such as the Repo Rate, Reverse Repo Rate, and Open Market Operations (OMO), to manage liquidity and inflation in the Indian economy.

• The structural adjustment also involved a significant reduction in the Statutory Liquidity Ratio (SLR) and Cash Reserve Ratio (CRR). The SLR, which was as high as 38.5% in 1991, was gradually brought down to increase the availability of funds for the private sector.

Additional Information

• 1991 Economic Crisis: India faced a severe Balance of Payments (BoP) crisis in 1991, with forex reserves dropping to a level barely enough to cover two weeks of imports. This led to the Liberalization, Privatization, and Globalization (LPG) reforms under the leadership of Prime Minister P.V. Narasimha Rao and Finance Minister Dr. Manmohan Singh.

• Monetary Policy Tools:

• Open Market Operations (OMO): Post-1991, OMOs became a vital regulatory tool. The RBI buys or sells Government Securities (G-Secs) to regulate the money supply. Statement 3 is incorrect because OMOs were strengthened, not eliminated.

• Deficit Financing: Before the reforms, the government relied heavily on automatic monetization of the fiscal deficit through Ad-hoc Treasury Bills. This was phased out by 1997 and eventually replaced by the Ways and Means Advances (WMA) system. Hence, statement 4 is incorrect as the goal was to curtail deficit financing.

• Priority Sector Lending (PSL): While the government still mandates 40% of Adjusted Net Bank Credit (ANBC) to the Priority Sector (including Agriculture and MSMEs), the overall structural trend moved away from general "controlled rates" toward market alignment, even within these sectors. Hence, statement 1 is partially true in practice but does not represent the "structural adjustment" of the reform era.

Important Points

• Liquidity Adjustment Facility (LAF): Introduced in June 2000 following the Narasimham Committee II (1998) recommendations, LAF allowed banks to manage their day-to-day liquidity mismatches through repo and reverse repo auctions.

• MCLR and EBLR: To ensure better transmission of monetary policy, the RBI transitioned from the Base Rate system to the Marginal Cost of Funds Based Lending Rate (MCLR) in 2016, and subsequently to External Benchmark Lending Rates (EBLR) in 2019 for retail and MSME loans.

• FRBM Act (2003): The Fiscal Responsibility and Budget Management Act was enacted to institutionalize fiscal discipline and reduce the fiscal deficit, further separating monetary policy from the government's fiscal deficit requirements.

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Q14. Answer: (d) One

The logic followed here is:

Given: J, K, L, R, S and T live on six different floors of the same building.

The lowermost floor in the building is numbered 1, the floor above it is numbered 2 and so on till the topmost floor is numbered 6.

Only two people live between J and T.

Only two people live between S and K.

Only one person lives between L and K.

L lives on floor number 1.

J lives above K.

Floor	Person
6	S
5	J
4	R
3	K
2	T
1	L

Now, people between R and S : 1 person.

Hence, the correct answer is Option 4.

Q15. Answer: (d) 48

The logic followed here is:

thus, "48" will replace the question mark in the given series.

Hence, the correct option is "Option 4".

Q16. Answer: (a) 18

Shortcut Trick

Total Work = LCM(12, 36) = 36 units

Efficiency of Reema = 36 ÷ 12 = 3 units/day; Efficiency of Juhi = 36 ÷ 36 = 1 unit/day

Work done in 1 cycle (2 days: Reema + Juhi) = 3 + 1 = 4 units

Number of cycles required = 36 ÷ 4 = 9 cycles

Total time = 9 cycles × 2 days/cycle = 18 days

Therefore The correct answer is 18.

Alternate Method

Given: Reema = 12 days, Juhi = 36 days

Total work = LCM of 12 and 36 = 36 units

Name	Time (Days)	Total Work	Efficiency
Reema	12	36	3
Juhi	36	1	

=> Total Efficiency (Reema + Juhi) = 3 + 1 = 4 units

=> According to the problem, they work on alternate days starting with Reema.

=> Work on Day 1 (Reema) = 3 units

=> Work on Day 2 (Juhi) = 1 unit

=> Total work done in 2 days = 3 + 1 = 4 units

=> Number of such 2-day cycles needed = Total work ÷ Work per cycle

=> Number of cycles = 36 ÷ 4 = 9 cycles

=> Total time taken = 9 × 2 days = 18 days

Therefore The correct answer is 18.

Additional Information

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Alternate Day Work

In alternate day problems, calculate the work done in one full cycle (all participants working once) and divide the total work by this cycle's output.

Remaining Work Calculation

If the total work is not perfectly divisible by the cycle's output, calculate the remaining work and assign it to the next person in sequence.

Work and Wages

Wages are always distributed in the ratio of the total work actually done by each individual, not just their efficiency ratio.

Q17. Answer: (a) 46

BODMAS Table:

Given equation: 156 × 12 − 13 ÷ 8 + 71 = ?

Now, if + and − are interchanged and × and ÷ are interchanged, then:

=> 156 ÷ 12 + 13 × 8 − 71

=> 156 ÷ 12 = 13

=> 13 × 8 = 104

=> 13 + 104 − 71

=> 117 − 71

=> 46

Hence, the correct answer is Option 1.

Q18. Answer: (c) Feudal lords

The correct answer is Feudal lords.

Key Points

• The term Samanta refers to big landlords or warrior chiefs in different regions of the Indian subcontinent during the post-Gupta period (specifically between the 6th and 12th centuries CE). Hence, the option identifying them as Feudal lords is correct.

• These individuals were expected to bring gifts or tributes for their kings or overlords and provide them with military support during times of war.

• As Samantas gained power and wealth, they often declared themselves to be Mahasamanta or Mahamandaleshvara (the great lord of a circle or region), indicating an increase in their social and political status.

• The Samanta system led to the decentralization of political power, where the central monarch's authority became dependent on the loyalty of these subordinate feudal lords.

• If a Samanta became powerful enough, he could assert independence from his overlord. A famous example is Dantidurga, a Rashtrakuta chief who overthrew his Chalikya overlord in the mid-8th century.

Additional Information

• Farmers: In the ancient and medieval periods, farmers were known as Krishakas or Halikas. While they provided the revenue that supported the Samantas, they did not hold administrative or military titles. Hence, this statement is incorrect.

• Religious heads: Religious leaders or priests (Brahmins) often received land grants known as Agrahara or Brahmadeya. While they managed land, their primary identity was spiritual and ritualistic rather than the military-administrative role associated with Samantas. Hence, this statement is incorrect.

• Architects: Professional builders and designers in ancient India were referred to as Shilpis or Sutradharas. They were responsible for the temple architecture of the era, such as the Khajuraho or Chola temples, but held no feudal authority. Hence, this statement is incorrect.

• Origin of the System: The practice of granting land to officers in lieu of cash salaries began during the Gupta Empire and became a dominant feature under King Harshavardhana in the 7th Century CE.

• Economic Impact: The rise of the Samantas led to a manorial economy where the peasantry was often tied to the land, and local self-sufficiency became more prominent than long-distance trade.

Important Points

• Administrative Structure: The Samantas were responsible for maintaining law and order within their territories and collecting taxes, a portion of which was sent to the king.

• Military Obligation: One of the primary duties of a Samanta was to maintain a specific number of infantry and cavalry units to be placed at the king's disposal whenever required.

• Geographical Spread: This system was prevalent across North India under the Pratiharas and Palas, and in South India under the Rashtrakutas and Pallavas.

• Social Hierarchy: The Samanta occupied a middle position in the social hierarchy, acting as a bridge between the monarch and the common people (peasants and artisans).

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• End of the System: The Samanta system began to decline with the advent of the Delhi Sultanate, which introduced a more centralized Iqta system of administration.

Q19. Answer: (c) Every two years

The correct answer is Every two years.

Key Points

• Biennial Update Reports (BURs) are specialized reports submitted by Non-Annex I parties (developing countries like India) to the United Nations Framework Convention on Climate Change (UNFCCC).

• According to the guidelines established during the Conference of Parties (COP 16) in Cancun (2010) and COP 17 in Durban (2011), these reports must be submitted every two years.

• The primary objective of the BUR is to provide an update on the information presented in the National Communications (NATCOM), specifically focusing on national greenhouse gas (GHG) inventories, mitigation actions and their effects, and the support needed and received.

• India submitted its First BUR to the UNFCCC in January 2016, the Second BUR in December 2018, and the Third BUR in February 2021.

• The Third BUR highlighted that India has successfully reduced the emission intensity of its Gross Domestic Product (GDP) by 24% between 2005 and 2016, showcasing significant progress toward its Paris Agreement goals.

Additional Information

• UNFCCC (United Nations Framework Convention on Climate Change):

• It was adopted in 1992 at the Rio Earth Summit and entered into force on March 21, 1994.

• Its ultimate objective is to stabilize greenhouse gas concentrations in the atmosphere at a level that prevents dangerous human interference with the climate system.

• It categorizes countries into Annex I (developed nations), Annex II (developed nations providing financial support), and Non-Annex I (mostly developing nations).

• National Communications (NATCOM):

• These are comprehensive reports that India is required to submit periodically. India submitted NATCOM-1 in 2004, NATCOM-2 in 2012, and NATCOM-3 in 2023.

• Unlike BURs which occur every two years, NATCOMs have a longer and more flexible reporting cycle depending on COP decisions.

• Enhanced Transparency Framework (ETF):

• Under the Paris Agreement (signed in 2015), the reporting system is transitioning from BURs to Biennial Transparency Reports (BTRs).

• The first BTR for all parties is mandated to be submitted by December 31, 2024. This will provide a more rigorous and uniform tracking mechanism for Climate Action globally.

• India’s GHG Inventory Sectors:

• India reports emissions from five major sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Waste, and Land Use, Land-Use Change and Forestry (LULUCF).

• The Energy sector remains the largest contributor to emissions in India, accounting for approximately 75% of total emissions (excluding LULUCF).

Important Points

• Institutional Arrangement: In India, the Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency responsible for preparing and submitting these reports to the UNFCCC.

• Technical Analysis: Once a BUR is submitted, it undergoes a Technical Analysis by a team of international experts as part of the International Consultation and Analysis (ICA) process.

• Yearly Submissions: While the question asks about BURs (which are every two years), developed countries (Annex I) are required to submit their GHG inventories every year.

• Global Context: The BUR helps in the Global Stocktake process, which assesses the collective progress of the world toward achieving the long-term goals of the Paris Agreement.

Q20. Answer: (b) Proteins

The correct answer is Proteins.

Key Points

• Proteins are known as the building blocks of the human body. Their primary function is the growth, maintenance, and repair of all body tissues, including muscles, organs, skin, and hair.

• Chemically, proteins are macromolecules composed of smaller units called amino acids. There are 20 different amino acids that combine in various sequences to form different proteins. Unlike carbohydrates and fats, proteins contain nitrogen in addition to

carbon, hydrogen, and oxygen.

• Proteins act as enzymes, which are biological catalysts that speed up chemical reactions in the body. For example, digestive enzymes like pepsin and trypsin are essential for breaking down food.

• They also serve as hormones, such as insulin, which regulates blood sugar levels. Furthermore, antibodies are specialized proteins that are critical to the immune system for defending the body against viruses and bacteria.

• When the body lacks sufficient carbohydrates or fats, it can break down proteins to provide energy, yielding approximately 4 kcal per 1 gram of protein.

Additional Information

• Carbohydrates:

• The primary function of carbohydrates is to provide immediate energy to the body. They are broken down into glucose, which is the preferred fuel for the brain and muscles.

• Sources include cereals, fruits, and vegetables. They provide 4 kcal per gram.

• Fats:

• Fats serve as a concentrated source of energy, providing 9 kcal per gram, which is more than double the energy provided by proteins or carbs.

• They are essential for the absorption of fat-soluble vitamins like Vitamin A, D, E, and K. They also provide insulation and protect internal organs.

• Vitamins:

• Vitamins are micronutrients required in small quantities for various metabolic processes. They do not provide energy but are crucial for bone health, vision, and blood clotting.

• Examples include Vitamin C (for immunity) and Vitamin D (for calcium absorption).

• Minerals:

• Inorganic elements like Calcium, Iron, and Potassium are necessary for bone density, oxygen transport in the blood (via hemoglobin), and nerve signaling.

Important Points

• Essential Amino Acids: Out of the 20 amino acids, 9 are considered essential because the human body cannot synthesize them; they must be obtained through diet.

• Dietary Requirements: According to health guidelines, the Recommended Dietary Allowance (RDA) for an adult is approximately 0.8 grams of protein per kilogram of body weight. This requirement increases for infants, pregnant women, and athletes.

• Deficiency Diseases: Severe protein deficiency leads to conditions like Kwashiorkor (characterized by edema and a swollen abdomen) and Marasmus (characterized by stunted growth and tissue wasting), commonly seen in children in developing countries.

• Structural Proteins: Collagen is the most abundant protein in the human body, providing structure to connective tissues, while Keratin is the primary component of nails and hair.

Q21. Answer: (b) 12

Shortcut Trick

When a : b :: b : c, then b is the mean proportional where $b^2 = ac$.

Given b = 6 and c = 4a → a = c ÷ 4.

Substitute in formula: $6^2 = (c \div 4) \times c$

$36 = c^2 \div 4 \rightarrow c^2 = 144$

$c = \sqrt{144} = 12$

Therefore Answer = 12

Alternate Method

Given:

a : b :: b : c

c = 4a

b = 6

Formula used:

In a continued proportion a : b :: b : c, the relation is $b^2 = ac$

a = 3 b = 6 c = 12 Ratio 1:2 Ratio 1:2 Relation: $6^2 = 3 \times 12$ c = 4 × a = 4 × 3 = 12

Calculations:

From the proportion a : b :: b : c, we have:

=> $b^2 = a \times c$

=> $6^2 = a \times (4a)$

=> $36 = 4a^2$

=> $a^2 = 36 \div 4 = 9$

=> $a = \sqrt{9} = 3$

=> $c = 4 \times a = 4 \times 3 = 12$

Therefore The correct answer is 12.

Additional Information

Mean Proportional

If a, b, c are in continued proportion, then b is the mean proportional such that $b = \sqrt{(ac)}$.

Third Proportional

In the proportion a : b :: b : c, c is called the third proportional and is calculated as $c = b^2 \div a$.

Fourth Proportional

In the proportion a : b :: c : d, d is the fourth proportional and is given by $d = (b \times c) \div a$.

Continued Proportion

Quantities a, b, c, d... are in continued proportion if a/b = b/c = c/d and so on.

Q22. Answer: (c) 9

The logic followed here is:

Given numbers: 547, 589, 652, 598, 637

Here, Highest and lowest numbers:

Highest number = 652

Lowest number = 547

Required digits:

Second digit of highest number (652) = 5

Second digit of lowest number (547) = 4

Sum: 5 + 4 = 9

Hence, the correct answer is Option 3.

Q23. Answer: (d) 558

Shortcut Trick

Product of two numbers = HCF × LCM

Other number = (HCF × LCM) ÷ First number

Other number = (186 × 1116) ÷ 372

Other number = 1116 ÷ 2 = 558

Therefore Answer = 558

Alternate Method

Given:

LCM of two numbers = 1116

HCF of two numbers = 186

One number = 372

Formula used:

First number × Second number = LCM × HCF

HCF (186) × LCM (1116) = Num 1 (372) × Num 2 (?)

Calculations:

Let the other number be x.

=> 372 × x = 1116 × 186

=> x = (1116 × 186) ÷ 372

=> x = 1116 × (186 ÷ 372)

=> x = 1116 × (1 ÷ 2)

=> x = 558

Therefore The correct answer is 558.

Additional Information

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Fundamental Relation

The product of any two numbers is always equal to the product of their HCF and LCM: Product = HCF × LCM.

HCF and LCM of Fractions

HCF of fractions = HCF(Numerators) ÷ LCM(Denominators) and LCM of fractions = LCM(Numerators) ÷ HCF(Denominators).

Co-prime Numbers

If two numbers are co-prime, their HCF is 1 and their LCM is equal to the product of the two numbers.

HCF and Division

HCF is the largest number that divides the given numbers without leaving a remainder.

Q24. Answer: (c) Promoting cottage industries in rural areas

The correct answer is Promoting cottage industries in rural areas.

Key Points

• Directive Principles of State Policy (DPSP) are enumerated in Part IV of the Indian Constitution, spanning from Article 36 to 51. These principles are classified into Socialistic, Gandhian, and Liberal-Intellectual categories based on their ideology.

• Article 43 of the Constitution directs the State to endeavor to promote cottage industries on an individual or co-operative basis in rural areas. This reflects Mahatma Gandhi's vision of self-sufficient village economies and rural upliftment. Hence, statement 3 is correct.

• Raising the standard of living and public health is mentioned under Article 47. While it aligns with the overall welfare state, it is primarily categorized as a Socialistic Principle rather than a specific Gandhian ideal in the classification of the Constitution. Hence, statement 1 is incorrect.

• Securing suitable employment for all is part of the "Right to Work" under Article 41. This directive is a Socialistic Principle aimed at ensuring economic security for citizens. Hence, statement 2 is incorrect.

• Safeguarding children against exploitation and providing them with opportunities for healthy development is covered under Article 39(f). This is classified as a Socialistic Principle added or emphasized to ensure social justice. Hence, statement 4 is incorrect.

Additional Information

• Gandhian Principles in DPSP: These principles are based on the ideology of Mahatma Gandhi and represent the program of reconstruction enunciated by him during the National Movement.

• Article 40: To organize village panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self-government.

• Article 43B: To promote voluntary formation, autonomous functioning, democratic control, and professional management of co-operative societies (Added by the 97th Amendment Act, 2011).

• Article 46: To promote the educational and economic interests of Scheduled Castes (SCs), Scheduled Tribes (STs), and other weaker sections of the society and to protect them from social injustice and all forms of exploitation.

• Article 47: To prohibit the consumption of intoxicating drinks and drugs that are injurious to health.

• Article 48: To prohibit the slaughter of cows, calves, and other milch and draught cattle and to improve their breeds.

• Socialistic Principles: These aim at establishing social and economic justice and paving the way for a welfare state. Examples include Article 38 (promoting social order), Article 39 (equitable distribution of resources), and Article 42 (humane conditions of work and maternity relief).

• Liberal-Intellectual Principles: These reflect the ideology of liberalism. Examples include Article 44 (Uniform Civil Code), Article 50 (Separation of judiciary from executive), and Article 51 (Promotion of international peace and security).

Important Points

• The DPSP are borrowed from the Irish Constitution of 1937, which had copied them from the Spanish Constitution.

• Unlike Fundamental Rights, DPSPs are non-justiciable in nature, meaning they are not legally enforceable by the courts for their violation (as per Article 37). However, they are fundamental in the governance of the country.

• The Sapru Committee in 1945 suggested two categories of individual rights: one being justiciable (Fundamental Rights) and the other being non-justiciable (Directive Principles).

• In the Minerva Mills Case (1980), the Supreme Court held that the Indian Constitution is founded on the bedrock of the balance between Fundamental Rights and the Directive Principles.

Q25. Answer: (b) Kopili River

The correct answer is Kopili River.

Key Points

• The National Waterway 57 (NW-57) is developed on the Kopili River, located in the state of Assam. Hence, the option Kopili River is correct.

• The stretch of NW-57 spans a length of approximately 48 kilometers, extending from the confluence of the Kopili River with the

Brahmaputra River to the Teliagaon Railway Bridge.

• This waterway was officially designated under the National Waterways Act, 2016, which aimed to promote inland water transport as a fuel-efficient and cost-effective mode of logistics in India.

• The Kopili River is a significant south-bank tributary of the Brahmaputra River, flowing through the states of Meghalaya and Assam.

• The development of NW-57 is managed by the Inland Waterways Authority of India (IWAI), which is the statutory authority in charge of the waterways in the country.

Additional Information

• National Waterways Act, 2016:

• This Act came into force on April 12, 2016, and declared 111 inland waterways as National Waterways (NWs) across India.

• Before this Act, there were only 5 designated National Waterways in the country.

• The objective of the Act is to reduce logistics costs and carbon emissions by utilizing the vast network of rivers, canals, and creeks.

• Other Rivers and their National Waterway Designations:

• Zuari River: This river is located in Goa and is designated as National Waterway 111 (NW-111). It is one of the most important rivers for the transportation of iron ore.

• Kali River: Located in the state of Karnataka, the Kali River is designated as National Waterway 52 (NW-52).

• Gandak River: This river flows through Nepal and the Indian states of Bihar and Uttar Pradesh. It is designated as National Waterway 37 (NW-37).

• Inland Waterways Authority of India (IWAI):

• Established on October 27, 1986, under the Inland Waterways Authority of India Act, 1985.

• It is headquartered in Noida, Uttar Pradesh.

• The IWAI primarily undertakes projects for the development and maintenance of Inland Waterway Transport (IWT) infrastructure on national waterways through grants from the Ministry of Ports, Shipping and Waterways.

Important Points

• The Kopili River originates in the Borail range in Meghalaya at an altitude of about 1,600 meters.

• The river has a total length of 290 kilometers and a catchment area of about 16,420 square kilometers.

• The Kopili Hydro Electric Project, operated by NEEPCO (North Eastern Electric Power Corporation Limited), is a major power generation facility situated on this river.

• National Waterway 1 (NW-1), the longest in India, runs from Prayagraj to Haldia on the Ganga-Bhagirathi-Hooghly river system, covering 1,620 kilometers.

• The development of North Eastern waterways, like NW-57, is critical for enhancing connectivity and trade with neighboring countries like Bangladesh and Myanmar.

Q26. Answer: (b) Cabinet committee on parliamentary affairs

The correct answer is Cabinet committee on parliamentary affairs.

Key Points

• The Cabinet Committee on Parliamentary Affairs is the only major cabinet committee that is NOT headed by the Prime Minister; instead, it is typically chaired by the Union Home Minister.

• The primary function of this committee is to look after the progress of government business in the Parliament of India and ensure smooth coordination between the two houses, Lok Sabha and Rajya Sabha.

• The Cabinet Committee on Economic Affairs (CCEA) is chaired by the Prime Minister. It is responsible for reviewing economic trends and evolving an integrated strategy for policies like Minimum Support Price (MSP) and various developmental projects.

• The Cabinet Committee on Investment and Growth was newly constituted in June 2019 and is headed by the Prime Minister to identify key projects for implementation on a time-bound basis.

• The Cabinet Committee on Employment and Skill Development, also created in 2019, is headed by the Prime Minister and focuses on providing a direction to various initiatives for skill development and increasing employability in the country.

Additional Information

• Nature of Cabinet Committees: These are extra-constitutional bodies, meaning they are not mentioned in the Constitution of India. They are established under the Government of India Transaction of Business Rules, 1961.

• Types: There are two types of committees: Standing Committees, which are of a permanent nature, and Ad-hoc Committees, which are temporary and formed for specific tasks.

• Appointments Committee of the Cabinet: This committee is headed by the Prime Minister and includes the Home Minister. It decides on all higher-level appointments in the Central Secretariat, Public Sector Undertakings, and Banks.

• Cabinet Committee on Security (CCS): Chaired by the Prime Minister, it deals with issues of national security, defense

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expenditure, and external affairs that impact India's security.

• Cabinet Committee on Political Affairs: This is often described as a "Super-Cabinet" because it deals with all policy matters pertaining to domestic and foreign affairs. It is chaired by the Prime Minister.

Important Points

• Membership: While the number of members in these committees can vary from 3 to 8, they usually include Cabinet Ministers. Non-cabinet ministers can sometimes be invited as special invitees.

• Cabinet Committee on Accommodation: Like the Parliamentary Affairs committee, this committee is also usually headed by the Union Home Minister. It deals with the allotment of government accommodation to Members of Parliament and other officials.

• Role in Governance: These committees serve as an organizational device to reduce the enormous workload of the Cabinet and facilitate in-depth examination of policy issues and effective coordination.

• Evolution: The number and nomenclature of these committees change with the change in Government. For instance, in 2019, the NDA government re-constituted 8 committees, emphasizing Investment and Employment.

Q27. Answer: (c) 108

The logic followed here is:

thus, "108" will replace the question mark in the given series.

Hence, the correct option is "Option 3".

Q28. Answer: (c) 3

Given: (Left) B * £ J E % $ * V € G * D H @ A £ O V $ T Y (Right)

Now,

Letters, which are immediately preceded by a symbol and also immediately followed by a symbol.

So, Needed pattern is: Symbol – Letter – Symbol

(Left) B * £ J E % $ * V € G * D H @ A £ O V $ T Y (Right)

Only three letters satisfy the condition.

Hence, the correct answer is 'Option 3'.

Q29. Answer: (a) Sikandra Fort

The correct answer is Sikandra Fort.

Key Points

• Sikandra Fort: This monument is located in Agra, Uttar Pradesh, and serves as the final resting place (mausoleum) of the Mughal Emperor Akbar. It was completed in 1613. Since it is situated in North India and not in Maharashtra, it is not part of the Daulatabad complex. Hence, statement 1 is the correct answer.

• Chand Minar: Also known as the Tower of the Moon, this massive tower is located within the Daulatabad Fort in Maharashtra. It was built in 1445 by Ala-ud-din Bahmani to celebrate his capture of the fort. It stands at a height of about 63 meters. Hence, statement 2 is incorrect as it is an important monument inside the fort.

• Bharatmata Mandir: This is a significant temple located inside the Daulatabad Fort. The structure has a complex history, originally being a Hindu temple dedicated to Goddess Durga, which was later modified during the Delhi Sultanate rule and eventually dedicated to Mother India. Hence, statement 3 is incorrect as it is an important monument inside the fort.

• Jami Masjid: This mosque is one of the oldest surviving structures within the Daulatabad Fort premises, built in 1318 by Qutub-ud-din Mubarak Khilji. It is notable for its 106 pillars that were salvaged from earlier Hindu and Jain temples. Hence, statement 4 is incorrect as it is an important monument inside the fort.

Additional Information

• Daulatabad Fort (Devagiri): It is a 14th-century fort city located in the Aurangabad (now Chhatrapati Sambhajinagar) district of Maharashtra. It was originally founded around 1187 by the first Yadava king, Bhillama V.

• Strategic Significance: The fort is famous for its invincible defense mechanisms, including a moat filled with crocodiles and the Andhari, a dark, winding subterranean passage designed to mislead and trap invading enemies.

• Capital Shift: In 1327, Sultan Muhammad bin Tughlaq of the Delhi Sultanate famously ordered the entire population of Delhi to move to Devagiri, renaming it Daulatabad (the City of Fortune), intended to be his new capital due to its central location in the Indian subcontinent.

• Sikandra Fort Architecture: The tomb of Akbar in Sikandra is a Mughal architectural masterpiece. It is unique because it lacks a traditional dome and is built primarily of red sandstone with white marble inlay work. The construction was started by Akbar himself and finished by his son Jahangir.

• Historical Occupancy: Over the centuries, the Daulatabad fort has been under the control of various dynasties, including the Yadavas, the Khiljis, the Tughlaqs, the Bahmani Sultans, the Nizam Shahis of Ahmadnagar, and finally the Mughals.

Important Points

• Chand Minar is the second tallest minaret in India, surpassed only by the Qutub Minar in Delhi. It shows a distinct Persian influence in its architectural style.

• The Yadava Dynasty, which built the original fort, was a prominent Indian dynasty that ruled a kingdom stretching from the Narmada River to the Tungabhadra River.

• Daulatabad is often referred to as one of the seven wonders of Maharashtra and remains a major archaeological site protected by the Archaeological Survey of India (ASI).

• The Mughal influence in Daulatabad was strengthened when Aurangzeb used it as a base for his Deccan campaigns during the 17th century.

Q30. Answer: (b) 14 : 31

Shortcut Trick

Convert ratios to approximate decimals for instant comparison:

5 ÷ 12 ≈ 0.417

14 ÷ 31 ≈ 0.452

8 ÷ 33 ≈ 0.242

17 ÷ 39 ≈ 0.436

Comparing decimals: 0.452 > 0.436 > 0.417 > 0.242

Therefore Answer = 14 : 31

Alternate Method

Given:

Ratios to compare: 5 : 12, 14 : 31, 8 : 33, and 17 : 39

Formula used:

Ratio a : b can be written as fraction a/b. To compare two fractions a/b and c/d, check if a × d > b × c.

0.2 0.3 0.4 0.5 8:33 5:12 17:39 14:31 (Largest) Comparison on Decimal Scale

Calculations:

Compare 14/31 with 5/12:

=> 14 × 12 = 168 and 31 × 5 = 155. Since 168 > 155, 14 : 31 > 5 : 12.

Compare 14/31 with 17/39:

=> 14 × 39 = 546 and 31 × 17 = 527. Since 546 > 527, 14 : 31 > 17 : 39.

Compare 14/31 with 8/33:

=> 14 × 33 = 462 and 31 × 8 = 248. Since 462 > 248, 14 : 31 > 8 : 33.

Comparing all values, 14 : 31 is the largest ratio.

Therefore The correct answer is 14 : 31 (Option 2).

Additional Information

Cross-Multiplication Rule

For any two ratios a/b and c/d, if (a × d) > (b × c), then a/b > c/d. This is the most accurate method to compare fractions without decimals.

Percentage Conversion Method

Convert ratios to percentages by multiplying by 100. For example, 5 : 12 ≈ 41.67% and 14 : 31 ≈ 45.16%.

Common Denominator Method

Find the LCM of all denominators and convert all fractions to have this common denominator. The fraction with the largest numerator will be the largest ratio.

Q31. Answer: (c) Himachal Pradesh

The correct answer is Himachal Pradesh.

Key Points

• In July 2023, the state of Himachal Pradesh witnessed unprecedented rainfall and cloudbursts, leading to catastrophic flash floods and landslides that severely crippled the power generation infrastructure. Hence, the statement that flash floods in Himachal Pradesh disrupted power stations in July 2023 is correct.

• The heavy rains caused a massive increase in the silt content (turbidity) of the Satluj and Beas rivers, forcing the immediate shutdown of several major Hydroelectric Projects (HEPs) to prevent damage to the turbine blades.

• Key power stations affected included the 1,500 MW Nathpa Jhakri Hydro Power Station, which is India's largest underground hydroelectric project, and the 412 MW Rampur Hydro Power Station.

• The silt levels in the rivers reportedly crossed 10,000 parts per million (ppm), far exceeding the permissible limit of 2,000 to 3,000

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ppm required for safe operation.

• This disruption led to a significant shortfall in the Northern Grid, affecting the power supply to several states including Punjab, Haryana, and Delhi.

Additional Information

• Geography and Vulnerability: Himachal Pradesh is a mountainous state in North India characterized by steep slopes and fragile ecosystems. In 2023, the combination of the Southwest Monsoon and a Western Disturbance led to extreme precipitation events in districts like Kullu, Mandi, and Shimla.

• Economic Impact: The state government estimated the total economic loss due to the floods at over 10,000 crore rupees, involving the destruction of over 40 bridges, several National Highways (NH-3 and NH-5), and hundreds of small water supply schemes.

• SJVN Limited: The Satluj Jal Vidyut Nigam (SJVN), a Mini Ratna public sector undertaking, manages the Nathpa Jhakri and Rampur projects. They had to halt operations for several days during the July 7–11, 2023 peak flood period.

• Comparison with Other States: While Sikkim faced a major glacial lake outburst flood (GLOF) affecting the Teesta III dam, that event occurred in October 2023, not July. Uttarakhand and Arunachal Pradesh also have high hydropower potential but did not report power station shutdowns of this specific scale during the July 2023 window.

• Hydropower Significance: Himachal Pradesh is often referred to as the "Power State" of India, with an estimated hydropower potential of about 27,436 MW, accounting for approximately 25% of the national potential.

Important Points

• The Role of Turbidity: High silt or turbidity acts like sandpaper on the metallic parts of the turbines. If the projects are not shut down, the abrasive action of quartz and other minerals in the silt can lead to erosion of the runners and guide vanes, requiring expensive and time-consuming repairs.

• Disaster Management: The National Disaster Response Force (NDRF) and the Indian Air Force (IAF) were deployed to rescue thousands of tourists and locals stranded in the Lahaul-Spiti and Kullu valleys during this period.

• Climate Change: Experts suggest that the increasing frequency of such flash floods in the Himalayas is a direct consequence of climate change and global warming, leading to unpredictable rainfall patterns in high-altitude regions.

Q32. Answer: (d) 105°

Shortcut Trick

Linear pair at M: 5x + (3x + 2y) = 180 => 8x + 2y = 180 => 4x + y = 90

Since AB || CD, angle PMB = corresponding angle MND = 5x

Linear pair at N: angle MND + angle DNQ = 5x + (x + 3y) = 180 => 6x + 3y = 180 => 2x + y = 60

Solving: (4x + y) − (2x + y) = 90 − 60 => 2x = 30 => x = 15

Substituting x = 15 in 2x + y = 60 gives y = 30

angle BMN = 3(15) + 2(30) = 45 + 60 = 105°

Therefore Answer = 105°

Alternate Method

Given:

Line AB || Line CD with transversal PQ intersecting at M and N.

angle PMB = 5x°, angle BMN = (3x + 2y)°, and angle DNQ = (x + 3y)°

Formula used:

1. Sum of angles in a linear pair = 180°

2. Corresponding angles of parallel lines are equal.

A B C D P Q M N 5x 3x + 2y x + 3y AB || CD

Calculations:

angle PMB and angle BMN form a linear pair on transversal PQ at intersection M.

=> angle PMB + angle BMN = 180°

=> 5x + 3x + 2y = 180 => 8x + 2y = 180 => 4x + y = 90 --- (Eq. 1)

Since AB || CD, the corresponding angles angle PMB and angle MND are equal.

=> angle MND = angle PMB = 5x

angle MND and angle DNQ form a linear pair on transversal PQ at intersection N.

=> angle MND + angle DNQ = 180°

=> 5x + x + 3y = 180 => 6x + 3y = 180 => 2x + y = 60 --- (Eq. 2)

Subtracting (Eq. 2) from (Eq. 1):

=> (4x + y) − (2x + y) = 90 − 60 => 2x = 30 => x = 15

Putting x = 15 in (Eq. 2):

=> 2(15) + y = 60 => 30 + y = 60 => y = 30

Now, finding the value of angle BMN:

=> angle BMN = 3x + 2y = 3(15) + 2(30) = 45 + 60 = 105°

Therefore The correct answer is 105°, which is option (4).

Additional Information

Linear Pair of Angles

When two angles are adjacent and their non-common sides form a straight line, they are supplementary, i.e., Sum = 180°.

Parallel Lines and Transversal

When a transversal intersects two parallel lines, corresponding angles are equal, alternate interior angles are equal, and consecutive interior angles are supplementary (sum = 180°).

Vertically Opposite Angles

When two lines intersect, the angles opposite to each other at the vertex are always equal.

Q33. Answer: (d) 1020 MW Punatsangchhu-II HEP

The correct answer is 1020 MW Punatsangchhu-II HEP.

Key Points

• The 1020 MW Punatsangchhu-II Hydroelectric Project (HEP) is a major bilateral cooperation project between India and Bhutan, situated on the Punatsangchhu River in the Wangdue Phodrang district of Bhutan. Hence, statement 4 is correct.

• During the high-level diplomatic engagements and the State Visit of Prime Minister Narendra Modi, the focus remained on the completion and joint inauguration of this mega project, which is a centerpiece of the India-Bhutan energy partnership for the year 2024 and 2025.

• The project is a run-of-the-river scheme designed to generate approximately 4,357 million units of electricity annually, significantly boosting Bhutan's GDP and providing clean energy to India.

• The financing for the Punatsangchhu-II project was provided by the Government of India, consisting of a 70% loan and a 30% grant, reflecting the deep economic ties between the two nations.

• The 1200 MW Punatsangchhu-I HEP is another project on the same river, but it has faced geological challenges and delays; therefore, it was not the project inaugurated during this specific visit. Hence, statement 1 is incorrect.

Additional Information

• 336 MW Chukha HEP:

• This was the first "mega" hydroelectric project built with Indian assistance in Bhutan.

• It was commissioned in the year 1986 and is located on the Wong Chhu River.

• It played a foundational role in Bhutan's economic development by generating export revenue from surplus power sold to India. Hence, statement 2 is incorrect.

• 720 MW Mangdechhu HEP:

• This project was jointly inaugurated by Prime Minister Narendra Modi and the then Bhutanese PM Lotay Tshering in August 2019.

• Located in the Trongsa district on the Mangdechhu River, it was awarded the prestigious Brunel Medal by the Institution of Civil Engineers (London) in 2021 for its excellence in civil engineering.

• It was formally handed over to Bhutan in December 2022. Hence, statement 3 is incorrect.

• Punatsangchhu-I HEP:

• With a capacity of 1200 MW, it is the largest of the projects currently under construction in Bhutan.

• It is located upstream of the Punatsangchhu-II project but has been delayed due to technical issues related to the right bank subsidence.

• Kholongchhu HEP:

• This is a 600 MW project and holds the distinction of being the first Joint Venture (JV) project between the two countries, involving DGPC of Bhutan and SJVN of India.

Important Points

• Strategic Cooperation: The cooperation in the hydro-power sector is a vital component of the India-Bhutan bilateral relationship, guided by the 2006 Agreement on Cooperation in Hydropower.

• Target Capacity: The two nations originally aimed to develop 10,000 MW of hydropower capacity in Bhutan for export to India, contributing to regional energy security.

• Economic Impact: Hydropower contributes nearly 14% to Bhutan's GDP and accounts for a significant portion of its total export earnings.

• Diplomatic Context: Prime Minister Narendra Modi's visit in March 2024 (and subsequent engagements through 2025)

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emphasized the "Neighborhood First" policy and strengthened the Bharat-Bhutan friendship through infrastructure and energy milestones.

Q34. Answer: (d) GYB 30

The logic followed here is:

So, 'GYB 30' will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

Q35. Answer: (c) Two

The logic followed here is:

Given: Each of P, Q, R, S, T, U and V has an exam on a different day of a week starting from Monday and ending on Sunday of the same week.

Only four people have exams after V.

Only four people have exams before S.

P has the exam after R but before V.

T has the exam on some day after Q but not on Sunday.

Day	Person
Monday	R
Tuesday	P
Wednesday	V
Thursday	Q
Friday	T
Saturday	S
Sunday	U

Now, people between Q and U: 2 people

Hence, the correct answer is Option 3.

Q36. Answer: (c) Shillong

The correct answer is Shillong.

Key Points

• The National Air Quality Index (NAQI) released for the year 2025 indicates that Shillong, the capital of Meghalaya, has emerged as the city with the cleanest air among major Indian urban centers.

• The report, typically compiled by the Central Pollution Control Board (CPCB), monitors the air quality across various states and union territories using a real-time monitoring system.

• Shillong consistently records an AQI (Air Quality Index) value within the 'Good' category (0-50), primarily due to its geographical elevation, extensive forest cover, and relatively lower industrial density compared to metropolitan hubs.

• While cities like Mumbai and Kolkata struggle with vehicular emissions and construction dust, the North-Eastern region, particularly Shillong, benefits from favorable meteorological conditions and effective local environmental policies.

• The 2025 data highlights that Shillong maintained an average PM2.5 concentration well within the World Health Organization (WHO) guidelines, making it a benchmark for the National Clean Air Programme (NCAP).

Additional Information

• National Air Quality Index (NAQI):

• Launched in October 2014, the AQI is a tool to communicate the status of air quality to the people in terms that are easy to understand. It transforms complex air quality data of various pollutants into a single number, nomenclature, and colour.

• The Index considers eight pollutants: Particulate Matter (PM10), Particulate Matter (PM2.5), Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Ozone (O_3), Ammonia (NH_3), and Lead (Pb).

• AQI Categories:

• There are six AQI categories, namely Good (0-50), Satisfactory (51-100), Moderately Polluted (101-200), Poor (201-300), Very Poor (301-400), and Severe (401-500).

• Each category is associated with different health impacts, ranging from minimal impact in the 'Good' category to respiratory effects even on healthy people in the 'Severe' category.

• Performance of other Cities:

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• Mumbai: Being a coastal city, it usually benefits from land and sea breezes, but 2025 reports show increased AQI levels due to massive infrastructure projects and metro construction.

• Kolkata: Faces challenges during winter months due to temperature inversion and transboundary pollution, often placing it in the 'Moderate' or 'Poor' category.

• Ranchi: As an industrial-mining belt capital, Ranchi often sees fluctuations in PM10 levels, though it generally fares better than the National Capital Region (NCR).

Important Points

• The Central Pollution Control Board (CPCB), a statutory organization under the Ministry of Environment, Forest and Climate Change, was established in 1974 under the Water (Prevention and Control of Pollution) Act.

• The National Clean Air Programme (NCAP) aims for a 20% to 30% reduction in Particulate Matter concentration by 2024/2025, taking 2017 as the base year for comparison.

• Shillong's success in 2025 is also attributed to the Meghalaya State Pollution Control Board's strict monitoring of cement plant emissions and coal mining regulations in nearby districts.

• The Safar (System of Air Quality and Weather Forecasting And Research) is another initiative by the Ministry of Earth Sciences to provide location-specific information on air quality in metropolitan cities like Delhi, Pune, Mumbai, and Ahmedabad.

Q37. Answer: (c) Tuvalu

The correct answer is Tuvalu.

Key Points

• The 90th State Member of the International Union for Conservation of Nature (IUCN) is Tuvalu

• The government of the Pacific island nation officially joined the union on October 14, 2025, during the IUCN World Conservation Congress held in Abu Dhabi, United Arab Emirates.

• Tuvalu is the 11th State Member from the Oceania region to join the IUCN.

• Tuvalu is one of the world's smallest and most climate-vulnerable nations.

Additional Information

• International Union for Conservation of Nature (IUCN):

• Established on 5 October 1948 in Fontainebleau, France, it is the world’s oldest and largest global environmental organization.

• The organization is headquartered in Gland, Switzerland and is composed of more than 1,400 member organizations and 15,000 experts.

• It is best known for the IUCN Red List, which assesses the extinction risk of thousands of species and subspecies worldwide.

• Geography and Location of Kiribati:

• Kiribati is a central Pacific nation comprising 33 atolls and reef islands, spanning all four hemispheres (North, South, East, and West).

• It is home to the Phoenix Islands Protected Area (PIPA), one of the largest marine protected areas in the world and a UNESCO World Heritage site.

• The capital and largest center is South Tarawa, which faces extreme challenges from overcrowding and environmental degradation.

• Context of Other Options:

• Maldives: Located in the Indian Ocean, it was one of the first countries to join IUCN among island nations and is a leader in climate advocacy.

• Nauru: The world's smallest island nation located in Micronesia, known for its history of phosphate mining and ongoing efforts toward land rehabilitation.

Important Points

• Functions of State Membership: Being a State Member allows a country to participate in the World Conservation Congress, held every four years, where members define the global conservation agenda.

• Climate Vulnerability: Most of Kiribati’s land sits less than 2 meters above sea level, making the IUCN’s expertise in Nature-based Solutions (NbS) vital for its survival.

• Biodiversity Focus: Kiribati manages over 3.5 million square kilometers of ocean, a territory vital for tuna migration and coral reef biodiversity.

• International Relations: This move signals Kiribati’s intent to use multilateralism to seek funding and technical support for biodiversity conservation under the Kunming-Montreal Global Biodiversity Framework.

Q38. Answer: (d) 1.45

Shortcut Trick

Convert fractions into decimals for faster calculation.

4/5 = 0.8 and 8/20 = 0.4

Expression = [3.75 + 0.8] − [3.5 − 0.4]

Expression = 4.55 − 3.1 = 1.45

Therefore Answer = 1.45

Alternate Method

Given:

Expression: [3.75 + 4/5] − [3.5 − 8/20]

Formula used:

Decimal conversion of fractions: Numerator ÷ Denominator

Bracket 1: [3.75 + 0.8] = 4.55 Bracket 2: [3.5 − 0.4] = 3.10 Final Result: 4.55 − 3.10 = 1.45

Calculations:

=> Convert fractions to decimals: 4/5 = 0.8 and 8/20 = 0.4

=> Solve first bracket: [3.75 + 0.8] = 4.55

=> Solve second bracket: [3.5 − 0.4] = 3.10

=> Subtract the results: 4.55 − 3.10 = 1.45

Therefore The correct answer is 1.45 (Option 4).

Additional Information

BODMAS Rule

Always follow the order: Brackets, Orders (powers), Division, Multiplication, Addition, and Subtraction.

Fraction Simplification

Reducing fractions like 8/20 to 2/5 by dividing by the HCF (4) simplifies calculations significantly.

Decimal Alignment

When adding or subtracting decimals, ensure decimal points are vertically aligned to avoid place-value errors.

Q39. Answer: (c) Ctrl+A

The correct answer is Ctrl+A.

Key Points

• Ctrl+A: This keyboard shortcut is universally used to select all content within a document, folder, or window. Whether you are using Microsoft Word, Notepad, or a web browser, pressing these keys simultaneously highlights every element, including text, images, and objects. Hence, this option is correct.

• Ctrl+E: In applications like Microsoft Word and Google Docs, this shortcut is used for Center Alignment. It moves the cursor or the highlighted paragraph to the center of the page. It does not select content. Hence, this option is incorrect.

• Ctrl+R: This shortcut has dual primary functions depending on the software. In word processors, it is used for Right Alignment of text. In web browsers like Google Chrome or Microsoft Edge, it is used to Refresh or reload the current page. Hence, this option is incorrect.

• Ctrl+S: This is one of the most critical shortcuts used to Save the current progress of a file or document. It ensures that the data is written to the hard drive or cloud storage to prevent data loss. Hence, this option is incorrect.

Additional Information

• History of Keyboard Shortcuts: Many modern shortcuts, including Select All, Copy, and Paste, were popularized by the Xerox PARC researchers in the 1970s and later adopted by Apple and Microsoft in the 1980s.

• Platform Variations: While Windows and Linux users utilize the Control (Ctrl) key, macOS users utilize the Command (Cmd) key. Therefore, Cmd+A is the equivalent for Apple computers.

• Productivity Impact: Using keyboard shortcuts significantly increases efficiency. Research suggests that relying on shortcuts can save a professional several hours of work over a year by reducing the need to switch between the keyboard and the mouse.

• Common Text Editing Shortcuts:

• Ctrl+X: Used to Cut selected content.

• Ctrl+C: Used to Copy selected content to the clipboard.

• Ctrl+V: Used to Paste content from the clipboard.

• Ctrl+Z: Used to Undo the last action performed.

Important Points

• Formatting Shortcuts: Beyond alignment and selection, users frequently use Ctrl+B for Bold, Ctrl+I for Italic, and Ctrl+U for Underline to enhance document readability.

• Selection Alternatives: While Ctrl+A selects everything, users can use Shift + Arrow Keys to select specific portions of text or Shift + Click to select a range of files in a File Explorer.

• System Wide Utility: The Select All function is not limited to text; in the Windows File Explorer, Ctrl+A is the standard method to

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select 100% of the files and folders within a specific directory for bulk actions like moving or deleting.

• Navigation Shortcuts: Ctrl+Home moves the cursor to the start of a document, while Ctrl+End moves it to the very bottom, which are often used in conjunction with selection shortcuts.

Q40. Answer: (b) 58°

Shortcut Trick

In a cyclic quadrilateral, the exterior angle is always equal to the interior opposite angle.

Side PQ is produced to point T, so the exterior angle at vertex Q is angle RQT.

The interior opposite angle to vertex Q is angle PSR.

Logic: angle PSR = angle RQT = 58°

Therefore Answer = 58°

Alternate Method

Given:

PQRS is a cyclic quadrilateral. Side PQ is produced to point T. Exterior angle RQT = 58°.

Formula used:

Sum of opposite angles of a cyclic quadrilateral = 180°

Linear pair sum = 180° (Angles on a straight line)

P Q R S T 58° ?

Calculations:

Since PQT is a straight line, angle PQR + angle RQT = 180°

=> angle PQR + 58° = 180°

=> angle PQR = 180° − 58° = 122°

In cyclic quadrilateral PQRS, the sum of opposite angles is 180°:

=> angle PSR + angle PQR = 180°

=> angle PSR + 122° = 180°

=> angle PSR = 180° − 122° = 58°

Therefore The correct answer is option (2).

Additional Information

Cyclic Quadrilateral Opposite Angles

The sum of either pair of opposite angles of a cyclic quadrilateral is 180°.

Exterior Angle Property

The exterior angle of a cyclic quadrilateral is equal to the interior opposite angle.

Brahmagupta's Formula

Area of a cyclic quadrilateral = √((s−a)(s−b)(s−c)(s−d)), where s is the semi-perimeter (a+b+c+d)/2.

Ptolemy's Theorem

For a cyclic quadrilateral, the product of the diagonals is equal to the sum of the products of the opposite sides: d1 × d2 = (a × c) + (b × d).

Q41. Answer: (a) Transport

The correct answer is Transport.

Key Points

• The Delhi Women & Child Development (WCD) Department has formulated the Women Safety Policy 2025 to provide a robust security framework for female employees across various sectors in the National Capital Territory (NCT) of Delhi.

• One of the primary mandates of this policy is the provision of safe transport facilities for women staff who are required to work during late hours, typically defined as shifts ending after 7:00 PM or 8:00 PM.

• The policy stipulates that employers are responsible for ensuring door-to-door pick-and-drop services to minimize the risks associated with commuting in the dark, thereby preventing harassment and ensuring physical safety.

• This mandatory arrangement is applicable to both government offices and private organizations, including BPOs, IT firms, and healthcare institutions operating within the city.

• The WCD Department emphasizes that the transportation must be monitored, preferably with GPS tracking and the presence of a security guard if the employee is the only woman in the vehicle.

Additional Information

• Delhi Women & Child Development (WCD) Department: This department is the nodal agency in Delhi responsible for the welfare, protection, and empowerment of women and children. It oversees the implementation of various state and central

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schemes like Ladli and Anganwadi services.

• POSH Act, 2013: The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013, serves as the legal foundation for the Women Safety Policy 2025. It mandates the creation of an Internal Complaints Committee (ICC) in every organization with 10 or more employees.

• CCTV and Surveillance: Beyond transport, the 2025 Policy mandates the installation of high-definition CCTV cameras in all common areas, entry/exit points, and office cabs to ensure continuous monitoring and deterrence of criminal activities.

• Safety Audits: The policy introduces the concept of mandatory annual safety audits. Organizations must evaluate their infrastructure, lighting, and emergency response systems to identify potential "dark spots" or security loopholes.

• Gender Sensitization: It is compulsory for organizations to conduct gender sensitization workshops at least twice a year for all staff, including contractual workers, security personnel, and drivers, to foster a respectful work environment.

Important Points

• Verified Personnel: Under the new guidelines, all drivers and security guards employed for women's transport must undergo mandatory police verification to ensure they have no prior criminal record.

• SOS Integration: Modern transport solutions provided by employers are encouraged to have SOS buttons integrated into mobile applications, directly linked to the Delhi Police helpline (112) or the office security desk.

• Legal Compliance: Non-compliance with the transport and safety norms can lead to heavy penalties, cancellation of trade licenses, or legal action under the relevant provisions of the Indian Justice Code (BNS).

• Workplace Infrastructure: The policy also suggests that for women staying late, there should be dedicated rest areas and separate washrooms with sanitary pad vending machines to ensure a dignified and healthy work environment.

Q42. Answer: (d) Mg

The correct answer is Mg.

Key Points

• Chlorophyll is the green pigment found in the chloroplasts of plants, algae, and cyanobacteria, which is essential for the process of photosynthesis.

• The central component of the chlorophyll molecule is a Magnesium (Mg) ion, which is held within a large heterocyclic ring known as a porphyrin (or chlorin) ring. Hence, the statement regarding Mg is correct.

• Magnesium acts as the coordination center for the tetrapyrrole ring; its presence is vital because it helps in the absorption of light energy, specifically in the blue and red regions of the electromagnetic spectrum.

• Without the Mg ion, the pigment would be called pheophytin, which lacks the efficiency to capture solar energy for driving the light-dependent reactions of photosynthesis.

• In plants, Magnesium deficiency often leads to a condition called chlorosis, where the leaves turn yellow due to the breakdown of chlorophyll, significantly reducing the plant's ability to produce food.

Additional Information

• Calcium (Ca): This element is primarily used by plants for cell wall synthesis and maintaining the structural integrity of membranes. It exists as calcium pectate in the middle lamella. While it is a crucial macronutrient, it does not play a direct role as a central ion in light absorption within chlorophyll. Hence, the statement regarding Ca is incorrect.

• Sodium (Na): Although it is essential for certain C4 plants and CAM plants to help in the regeneration of phosphoenolpyruvate (PEP), it is not a part of the chlorophyll structure. In most C3 plants, it is not considered an essential nutrient for light absorption. Hence, the statement regarding Na is incorrect.

• Carbon (C): Carbon is the fundamental building block of all organic molecules, including the skeleton of chlorophyll. However, in the context of this question, Carbon is an element forming the structure rather than an "ion" that specifically aids the absorption of light in the coordination center. Hence, the statement regarding C is incorrect.

• The primary types of chlorophyll found in terrestrial plants are Chlorophyll a and Chlorophyll b. Chlorophyll a is the primary electron donor in the reaction center, while Chlorophyll b acts as an accessory pigment to broaden the spectrum of light absorbed.

Important Points

• Structural Composition: The porphyrin ring of chlorophyll is chemically similar to the heme group in hemoglobin found in human blood, with the primary difference being that chlorophyll contains Magnesium at its center, whereas hemoglobin contains Iron (Fe).

• Functionality: The Mg++ ion is coordinated to four nitrogen atoms within the ring. This specific electronic configuration allows the molecule to enter an excited state when struck by photons, initiating the electron transport chain.

• Discovery: The chemical structure of chlorophyll was elucidated by Richard Willstätter and Arthur Stoll in 1913, a feat for which Willstätter was awarded the Nobel Prize in Chemistry in 1915.

• Applications: Understanding the role of Magnesium in chlorophyll is vital for agriculture. Farmers use Epsom salts (magnesium sulfate) to treat Magnesium deficiency in soil to boost crop yields and ensure healthy green foliage.

Q43. Answer: (b) R

The logic followed here is:

Given: Seven people K, L, M, N, P, Q and R are sitting around a circular table facing the centre.

Only two people sit between N and Q when counted from the right of N.

Only two people sit between Q and M.

Only three people sit between N and P.

L sits to the immediate left of R.

So, third to the left of K is R.

Hence, the correct answer is "Option 2".

Q44. Answer: (b) 6

The logic followed here is:

Given codes:

ALIT → 2159

HILT → 6912

Hence, code for H = 6

Hence, the correct answer is Option 2.

Q45. Answer: (b) Rs. 22,000

Shortcut Trick

Recognize the Pythagorean triplet (7, 24, 25) for radius, height, and slant height.

Slant height l = 25 m.

Curved Surface Area = πrl = (22/7) × 7 × 25 = 550 m².

Total cost = 550 × 40 = 22,000.

Therefore Answer = Rs. 22,000

Alternate Method

Given:

Radius of the base (r) = 7 m

Height of the tent (h) = 24 m

Cost of cloth = Rs. 40 per m²

Formula used:

Slant height (l) = √(r² + h²)

Curved Surface Area (CSA) = πrl

Total Cost = CSA × Rate

h = 24m r = 7m l = 25m

Calculations:

Step 1: Calculate the slant height (l)

=> l = √(7² + 24²)

=> l = √(49 + 576) = √625 = 25 m

Step 2: Calculate the Curved Surface Area (CSA)

=> CSA = (22/7) × 7 × 25 = 550 m²

Step 3: Calculate the Total Cost

=> Total Cost = 550 × 40 = 22,000

Therefore The correct answer is Rs. 22,000 (Option 2).

Additional Information

Total Surface Area (TSA) of a Cone

The TSA includes the curved area and the circular base: TSA = πr(l + r).

Volume of a Cone

The capacity of a conical tent is given by Volume = (1/3)πr²h.

Pythagorean Triplets

Common triplets for (r, h, l) include (3, 4, 5), (5, 12, 13), (8, 15, 17), and (7, 24, 25).

Slant Height

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The distance from the apex to any point on the base circumference is $l = \sqrt{(r^2 + h^2)}$.

Q46. Answer: (c) Rs. 15,000

The correct answer is Rs. 15,000.

Key Points

• The Employment Linked Incentive (ELI) Scheme was introduced as part of the Union Budget presented in July 2024 (often referred to in the context of the 2024-25 fiscal cycle/implementation through 2025) to boost job creation and skilling in India.

• Under Scheme A of the ELI initiative, first-time employees entering the formal workforce are provided a direct benefit of one month's wage.

• The maximum limit for this one-month wage incentive is set at Rs. 15,000, which is disbursed to the eligible individuals. Hence, the option Rs. 15,000 is correct.

• This benefit is specifically targeted at youth who are newly registered with the Employees' Provident Fund Organisation (EPFO).

• To be eligible for this scheme, the employee's monthly salary or wage must not exceed Rs. 1,00,000 per month.

• The incentive of Rs. 15,000 is not paid in a single lump sum but is released in three installments directly into the EPFO account of the employee.

Additional Information

• Structure of ELI Schemes: The government launched three distinct Employment Linked Incentive schemes (Scheme A, B, and C) to address different sectors of the economy.

• Scheme B (Job Creation in Manufacturing): This scheme focuses on the manufacturing sector, providing incentives to both employees and employers regarding their EPFO contributions during the first 4 years of employment.

• Scheme C (Support to Employers): This is designed to support employers across all sectors by reimbursing them up to Rs. 3,000 per month for 2 years for every additional employee hired.

• Budgetary Allocation: The Union Finance Minister Nirmala Sitharaman announced a total outlay of Rs. 2 lakh crore for five schemes aimed at employment and skilling over a period of 5 years.

• EPFO Integration: All these incentives are strictly linked to EPFO registration, ensuring that the benefits promote formalization of the Indian labor market and provide social security to workers.

• Target Impact: The ELI schemes are projected to benefit approximately 2.1 crore youth and first-time employees across the country, facilitating their transition into organized sector jobs.

• Mandatory Training: Along with the financial incentives, the government has emphasized skilling programs to ensure that the workforce meets the evolving demands of the industry.

Important Points

• Eligibility and Conditions: The primary condition for Scheme A is that the employee must be a first-timer in the formal sector, as identified by their Universal Account Number (UAN) registration date.

• Payment Mechanism: The Direct Benefit Transfer (DBT) mode is used to ensure transparency, where the Rs. 15,000 incentive is credited to the EPF account, encouraging long-term savings for the youth.

• Objective: The fundamental goal of the Employment Linked Incentive is to reduce the financial burden on first-time earners and incentivize companies to hire more freshers.

• Economic Context: Launched in July 2024, these schemes are a response to the need for job-rich growth and were a central pillar of the 2024-25 Budget strategy to tackle unemployment.

Q47. Answer: (a) 50.24 cubic cm

Shortcut Trick

A right triangle (3, 4, 5) revolved about side 3 cm forms a cone with height h = 3 and radius r = 4.

Volume = (1/3) × 3.14 × r^2 × h

Since h = 3, Volume = 3.14 × r^2 = 3.14 × 16

Volume = 50.24 cubic cm.

Therefore Answer = 50.24 cubic cm

Alternate Method

Given:

Sides of the triangle = 3 cm, 4 cm, and 5 cm (Note: $3^2 + 4^2 = 5^2$, so it is a right-angled triangle).

The triangle is revolved about the side 3 cm.

Formula used:

Volume of Cone = (1/3) × 3.14 × r^2 × h

h = 3 cm r = 4 cm l = 5 cm Solid: Cone (Volume = 50.24 cubic cm)

Calculations:

=> Height of the cone (h) = Side about which it revolves = 3 cm

=> Radius of the cone (r) = Perpendicular side = 4 cm

=> Volume = (1/3) × 3.14 × 4^2 × 3

=> Volume = 3.14 × 16 = 50.24 cubic cm

Therefore The correct answer is (1).

Additional Information

Slant Height

The slant height (l) of a cone is given by the formula $l = \sqrt{(r^2 + h^2)}$.

Curved Surface Area

The Curved Surface Area (CSA) of a cone is calculated as $\pi \times r \times l$.

Total Surface Area

The Total Surface Area (TSA) of a cone is $\pi \times r \times (r + l)$.

Revolution about Hypotenuse

Revolving a right triangle about its hypotenuse results in a double cone with a common base, where the radius is the altitude to the hypotenuse.

Q48. Answer: (d) KM-NP

The logic followed here is based on the alphabetical position pattern:

Option 1: DF → EG

Option 2: HJ → IK

Option 3: LN → MO

Option 4: KM → NP

Thus, KM–NP does not follow the same pattern.

Hence, the odd one out is Option 4.

Q49. Answer: (d) UN Department of Economic and Social Affairs (UN DESA)

The correct answer is UN Department of Economic and Social Affairs (UN DESA).

Key Points

• The World Urbanization Prospects (WUP) is a flagship publication produced by the Population Division of the United Nations Department of Economic and Social Affairs (UN DESA).

• The 2025 Revision of this report represents a landmark shift as it is the first edition to fully implement the Degree of Urbanization (DegUrba) methodology for global comparative analysis.

• The Degree of Urbanization is a hierarchical classification that distinguishes the entire territory of a country into three main types of areas: Cities, Towns and semi-dense areas, and Rural areas.

• This methodology was formally endorsed by the United Nations Statistical Commission in March 2020 during its 51st session to harmonize the diverse and often incomparable national definitions of "urban" and "rural" areas.

• By using population density and grid-based data (typically 1 km^2 cells), UN DESA aims to provide more consistent and accurate data on global urban trends, which is vital for international comparisons.

Additional Information

• UN Department of Economic and Social Affairs (UN DESA): Established in 1948 and headquartered in New York, USA, it acts as a vital interface between global policies and national action. The Population Division within UN DESA provides the international community with up-to-date estimates and projections of population age, location, and growth.

• World Urbanization Prospects (WUP): This series has been published since 1988. It provides a comprehensive set of estimates and projections of the urban and rural populations of all countries in the world and of their major urban agglomerations.

• UN-Habitat: Based in Nairobi, Kenya, the United Nations Human Settlements Programme focuses on sustainable urban development and the implementation of the New Urban Agenda. While they collaborate on data, the primary statistical responsibility for the WUP report lies with UN DESA.

• Global Urbanization Trends: According to previous reports, 55% of the world's population lived in urban areas in 2018, a figure that is projected to increase to 68% by the year 2050. Most of this growth is expected to take place in Asia and Africa.

• Statistical Commission: This is the highest body of the global statistical system, bringing together Chief Statisticians from Member States. It oversees the work of the United Nations Statistics Division (UNSD) and ensures that international standards like the Degree of Urbanization are adopted.

Important Points

• Significance of DegUrba: Before the adoption of this methodology, countries used their own criteria (such as administrative boundaries, population size, or economic functions) to define urban areas, making it difficult to compare a city in India with a city in

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France or Brazil.

• SDG Monitoring: The use of standardized urbanization data by UN DESA is crucial for monitoring Sustainable Development Goal 11 (SDG 11), which seeks to make cities and human settlements inclusive, safe, resilient, and sustainable by 2030.

• Leading Contributors to Growth: It is estimated that just three countries—India, China, and Nigeria—will account for 35% of the total growth in the world's urban population between 2018 and 2050. India is projected to add 416 million urban dwellers.

• Data Sources: The report relies on national census data, satellite imagery, and geospatial information to refine the application of the Degree of Urbanization methodology across different countries and continents.

Q50. Answer: (d) Agraharam

The correct answer is Agraharam.

Key Points

• During the Chola Empire, which flourished between the 9th and 13th century in South India, the practice of donating tax-free lands to Brahmins was highly prevalent. These settlements were widely known as Agraharam or Brahmadeya.

• An Agraharam served as a residential quarter or a village where Brahmins settled to perform religious duties, Vedic education, and rituals. These lands were often situated near temples or fertile river banks.

• These land grants were exempted from the usual land revenue and other taxes, making them economically self-sufficient units. The primary function of these grants was to promote learning and sustain the priestly class.

• The internal governance of an Agraharam was managed by an assembly of Brahmin landowners known as the Mahasabha. This body looked after irrigation, taxation (if any), and the overall administration of the settlement.

• The Chola kings like Rajaraja I and Rajendra I frequently established these settlements to consolidate their political influence and propagate Hinduism throughout the country.

Additional Information

• Garbhagriha: This is a prominent architectural feature of Hindu temples, referring to the innermost sanctum or "womb chamber" where the primary deity is installed. It was never a term used for land grants.

• Valanadu: In the Chola administrative system, the empire was divided into provinces called Mandalam, which were further divided into Valanadu. A Valanadu was a large administrative unit consisting of several Nadu (districts).

• Mahasabha: While often associated with Agraharams, the Mahasabha was the assembly or the organisation that governed the Brahmin settlements. It was the administrative body rather than the land itself.

• Land Categories: The Chola inscriptions mention several types of land holdings, such as Vellanvagai (land for non-Brahmin peasants), Shalabhoga (land for maintenance of schools), Devadana (land gifted to temples), and Pallichchhandam (land donated to Jain institutions).

Important Points

• Uttaramerur Inscription: A famous inscription dated around 920 AD during the reign of Parantaka I provides detailed data and facts about the election process of the Sabha. It highlights the use of the Kuda-olai (pot-ticket) system for choosing representatives.

• Economic Impact: These grants led to the expansion of agriculture in South India as Brahmins introduced new irrigation techniques and management practices to the donated wastelands or forest areas.

• Role of the King: The donation of Agraharams was a political tool used by the Chola dynasty to gain legitimacy and to create a loyal class of intellectuals who would record the king's achievements in Sanskrit and Tamil epigraphs.

• Social Structure: These settlements were exclusive locations for Brahmins, which occasionally led to a stratified social hierarchy in the villages, though they remained centers of great cultural and intellectual activity.

Q51. Answer: (a) Andaman and Nicobar Islands

The correct answer is Andaman and Nicobar Islands.

Key Points

• Barren Island is located in the Andaman Sea and is the only confirmed active volcano in South Asia. It is a part of the Indian Union Territory of the Andaman and Nicobar Islands.

• The island is situated approximately 138 kilometers (86 miles) northeast of Port Blair, the capital of the islands.

• The first recorded eruption of the volcano occurred in 1787. After remaining dormant for about 150 years, the volcano erupted again in 1991, with the eruption lasting for six months.

• Recent volcanic activity on the island has been observed in 2005-07, 2017, and minor ash emissions were reported as recently as 2021.

• The island is approximately 3 kilometers wide, with a 2-kilometer-wide caldera created during prehistoric explosive eruptions.

Additional Information

• Andaman and Nicobar Islands:

• This archipelago consists of about 572 islands, divided into the Andaman group in the north and the Nicobar group in the south,

separated by the Ten Degree Channel.

• The highest point in the islands is Saddle Peak, which stands at an elevation of 732 meters in North Andaman.

• The islands are home to Particularly Vulnerable Tribal Groups (PVTGs) such as the Jarawa, Sentinelese, Onge, and Great Andamanese.

• Lakshadweep Islands:

• Located in the Arabian Sea, this is India's smallest Union Territory, consisting of 36 islands with a total area of 32 square kilometers.

• Unlike the volcanic Andaman islands, these are coral islands formed as atolls.

• The administrative headquarters is located at Kavaratti.

• Narcondam Island:

• Also located in the Andaman Sea, it is home to another volcano in India, which is currently classified as dormant or extinct.

• It is famous for the endemic Narcondam Hornbill, a bird species found nowhere else on Earth.

• Minicoy and Rameswaram Islands:

• Minicoy Island is the southernmost island of Lakshadweep, separated from the rest of the archipelago by the Nine Degree Channel.

• Rameswaram Island (also known as Pamban Island) is located between mainland India and Sri Lanka in the Gulf of Mannar and is connected to the mainland by the famous Pamban Bridge.

Important Points

• Tectonic Setting: The volcanic activity in the Andaman Sea is a result of the subduction of the Indian Plate beneath the Burmese Plate (part of the Eurasian Plate) along the Andaman Trench.

• Strategic Significance: The Andaman and Nicobar Command (ANC), established in 2001, is India's first and only tri-service theater command, highlighting the region's immense strategic importance in the Indian Ocean.

• Judicial Jurisdiction: The Andaman and Nicobar Islands fall under the legal jurisdiction of the Calcutta High Court, specifically the Circuit Bench at Port Blair.

• Biodiversity: The islands are part of the Indo-Burma biodiversity hotspot, featuring tropical rainforests and extensive mangrove ecosystems that support diverse marine and terrestrial life.

Q52. Answer: (a) = TDL % = VFN

Given: # : ZJR :: PZH : %

Option 1) # = TDL, % = VFN

For # (TDL) to ZJR

For % (VFN) to PZH

Since, both transformations follow a consistent shift pattern, Option 1 is correct.

Option 2) # = UDL, % = VFN

For # (UDL) to ZJR

For % (VFN) to PZH

Since, the patterns do not match, Option 2 is incorrect.

Option 3) # = TDL, % = VCN

For # (TDL) to ZJR

For % (VCN) to PZH

Since, the patterns do not match, Option 3 is incorrect.

Option 4) # = TDM, % = VFN

For # (TDM) to ZJR

For % (VFN) to PZH

Since, the patterns do not match, Option 4 is incorrect.

Hence, the correct answer is "Option 1".

Q53. Answer: (b) (i) False, (ii) True

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

Key Points

• Statement (i): When a file is deleted and moved to the Recycle Bin in Windows 11, its contents are not immediately erased. Instead, the file is simply moved to a hidden system folder, usually located at $Recycle.Bin on the root of each drive. The data remains physically present on the storage disk until the user chooses to Empty the Recycle Bin or the system automatically overwrites the space if it becomes critically low. Hence, statement (i) is False.

• Statement (ii): The file path (e.g., C: > Users > Documents > file.txt) represents a hierarchical structure used by the NTFS (New Technology File System). This organization resembles an inverted tree where the Root Directory (like C:) branches into Subdirectories (folders), and each individual file has a unique absolute path that defines its exact logical location within that hierarchy. Hence, statement (ii) is True.

• The Recycle Bin acts as a safety buffer, allowing users to restore accidentally deleted items to their original location. This feature has been a staple of the Windows Operating System since Windows 95.

• In Windows 11, the File Explorer manages these paths and provides a visual interface for navigating the hierarchical data. While a user can create a Shortcut to a file in multiple locations, the source file itself maintains only one primary hierarchical path on the disk.

Additional Information

• Windows 11 File Management:

• Windows 11, released in October 2021, introduced a redesigned File Explorer with Tabs and a simplified context menu to enhance productivity.

• The NTFS file system supports a maximum path length of 260 characters by default, though this can be extended via Registry edits.

• Metadata such as creation date, file size, and author name are stored alongside the file in the Master File Table (MFT).

• Permanent Deletion:

• To bypass the Recycle Bin and remove a file immediately, users can use the keyboard shortcut Shift + Delete.

• Even after permanent deletion, data recovery software can sometimes retrieve files unless the storage blocks have been overwritten by new data.

• On modern Solid State Drives (SSDs), the TRIM command helps the operating system wipe data blocks more efficiently after permanent deletion to maintain performance.

• Hierarchical vs. Flat File Systems:

• A Hierarchical file system organizes data in a parent-child relationship, which is the standard for Windows, macOS, and Linux.

• Conversely, Cloud Storage (like Amazon S3) often uses a Flat File System where files (objects) are stored in a single layer and identified by unique keys rather than a nested folder path.

Important Points

• File Extensions: In Windows 11, the extension (e.g., .txt, .docx, .exe) tells the operating system which application should be used to open the file. By default, File Explorer may hide these extensions for known file types.

• Logical vs. Physical Deletion: Moving to the Recycle Bin is a logical move. The physical data remains on the sectors of the Hard Disk Drive (HDD) or SSD until the logical link is severed and the space is reused.

• Storage Drive Letters: In India and globally, most PCs assign C: as the system drive where Windows 11 is installed, while additional partitions or external drives are assigned letters like D:, E:, or F:.

Q54. Answer: (b) 76.25

Shortcut Trick

Identify the Modal Class (highest frequency): Class 70-80 with frequency 38.

Apply Mode Formula: l + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h

Mode = 70 + [(38 − 18) ÷ (2 × 38 − 18 − 26)] × 10

Mode = 70 + [20 ÷ 32] × 10 = 70 + 6.25

Therefore Answer = 76.25

Alternate Method

Given:

Class intervals (Age) and their respective frequencies (No. of patients).

Maximum frequency = 38, which lies in the class 70-80.

Formula used:

Mode = l + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h

Where: l = lower limit of modal class, f1 = frequency of modal class, f0 = frequency of preceding class, f2 = frequency of succeeding class, h = class width.

f0=18f1=38f2=26Modal Class: 70-80Result Mode ≈ 76.25

Calculations:

From the table, Modal Class = 70-80

=> l = 70, h = 10

=> f1 = 38 (frequency of class 70-80)

=> f0 = 18 (frequency of class 60-70)

=> f2 = 26 (frequency of class 80-90)

=> Mode = 70 + [(38 − 18) ÷ (2 × 38 − 18 − 26)] × 10

=> Mode = 70 + [20 ÷ (76 − 44)] × 10

=> Mode = 70 + [20 ÷ 32] × 10

=> Mode = 70 + 0.625 × 10 = 70 + 6.25

=> Mode = 76.25

Therefore The correct answer is 76.25.

Additional Information

Empirical Formula

Relationship between Mean, Median, and Mode: Mode = 3 × Median − 2 × Mean.

Median for Grouped Data

Median = l + [(N/2 − cf) ÷ f] × h, where cf is cumulative frequency and N is total frequency.

Mean for Grouped Data

Direct Method: Mean = $\Sigma f_i x_i \div \Sigma f_i$, where x_i is the class mark (midpoint).

Modal Class Definition

The class interval that has the highest frequency in a grouped frequency distribution.

Q55. Answer: (d) Article 6

The correct answer is Article 6.

Key Points

• Article 6 of the Constitution of India deals specifically with the rights of citizenship for persons who migrated to India from Pakistan. It provides that a person who migrated before the commencement of the Constitution shall be deemed a citizen if they or their parents/grandparents were born in undivided India. Hence, this is the correct option.

• Article 5 outlines citizenship at the commencement of the Constitution (January 26, 1950) for individuals who had their domicile in India and were born in India, or whose parents were born in India, or who had been ordinarily resident for at least five years. Hence, this statement is incorrect.

• Article 8 addresses the citizenship rights of certain persons of Indian origin residing outside India. It allows such individuals to become citizens if they are registered by the diplomatic or consular representative of India in the country where they are residing. Hence, this statement is incorrect.

• Article 10 ensures the continuance of the rights of citizenship. It states that every person who is considered a citizen under any of the preceding articles shall continue to be a citizen, subject to the provisions of any law made by the Parliament. Hence, this statement is incorrect.

Additional Information

• Constitutional Provisions: Part II of the Indian Constitution, spanning from Article 5 to Article 11, defines who was eligible for Indian citizenship at the time of the Constitution's adoption.

• Single Citizenship: Unlike federal structures like the USA, India provides for Single Citizenship, meaning there is no separate state citizenship; all citizens owe allegiance only to the Union of India.

• The Citizenship Act, 1955: Since the constitutional provisions only dealt with citizenship at the time of commencement, the Parliament enacted the Citizenship Act in 1955 to regulate the acquisition and loss of citizenship after 1950.

• Acquisition Methods: Under the 1955 Act, citizenship can be acquired by Birth, Descent, Registration, Naturalization, and Incorporation of Territory.

• Loss of Citizenship: The Act also mentions three ways to lose citizenship: Renunciation, Termination, and Deprivation.

Important Points

• The Cut-off Date: For Article 6, the significant date is July 19, 1948. Individuals migrating before this date needed to be ordinarily resident in India since their migration to be deemed citizens.

• Registration Requirement: Those migrating from Pakistan on or after July 19, 1948, had to be registered as a citizen by an officer appointed by the Government of the Dominion of India, provided they had resided in India for at least six months prior to their application.

• Article 7 (Migration to Pakistan): This article deals with persons who migrated to Pakistan after March 1, 1947, but later returned to India under a permit for resettlement or permanent return; they could acquire citizenship similarly to those migrating after the 1948 cut-off.

• Article 11 Power: It gives exclusive power to the Parliament of India to make any law regarding citizenship. This ensures that the Constitution does not permanently limit the legislative scope of the government regarding who qualifies as an Indian national.

• Ministry Involvement: The Ministry of Home Affairs is the primary government organization responsible for overseeing citizenship, naturalization, and the Overseas Citizenship of India (OCI) scheme.

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Q56. Answer: (b) Article 87

The correct answer is Article 87.

Key Points

• Article 87 of the Constitution of India provides for the Special Address by the President to both Houses of Parliament.

• Under Article 87(1), the President must address both the Lok Sabha and Rajya Sabha assembled together at the commencement of the first session after each general election to the House of the People.

• Additionally, the President delivers this address at the commencement of the first session of every year, which is typically the Budget Session.

• The primary purpose of this address is for the President to inform Parliament of the causes of its summons, outlining the government's policy goals and legislative agenda for the coming year.

• Article 87(2) specifies that rules shall be made for the allotment of time for discussion of the matters referred to in such address, which leads to the Motion of Thanks.

Additional Information

• Article 85:

• This article deals with the Sessions of Parliament, their prorogation, and dissolution.

• It empowers the President to summon each House of Parliament to meet at such time and place as he thinks fit, ensuring that 6 months shall not intervene between its last sitting in one session and the date appointed for its first sitting in the next session.

• It also provides the authority to the President to dissolve the Lok Sabha.

• Article 86:

• This article grants the President the right to address and send messages to either House of Parliament or both Houses assembled together.

• Unlike Article 87, the address under Article 86 is discretionary and can be delivered at any time, not just at the start of a session or year.

• It also ensures the attendance of members for such an address.

• Article 88:

• This article mentions the Rights of Ministers and the Attorney-General of India in respect of the Houses.

• Every Minister and the Attorney-General has the right to speak in, and otherwise to take part in the proceedings of, either House, any joint sitting of the Houses, and any Committee of Parliament of which he may be named a member.

• However, they are not entitled to vote by virtue of this article unless they are a member of that specific House.

Important Points

• Historical Context: The provision for the Presidential address is borrowed from the British Constitution, specifically the "Speech from the Throne."

• Nature of Address: The speech is drafted by the Government (the Cabinet) and not the President personally; it reflects the policies and programs of the Executive.

• Motion of Thanks: After the address, a Motion of Thanks is moved in both Houses. It is a constitutional convention that if this motion is defeated in the Lok Sabha, it amounts to a vote of no-confidence in the government, leading to its resignation.

• Amendment: Originally, the Constitution (First Amendment) Act, 1951, modified Article 87 to require the address only at the first session of the year instead of every session.

Q57. Answer: (c) Rs. 550

Shortcut Trick

Profit Ratio = Investment Ratio (since time is constant for all).

Ratio of Capitals (Suman : Kunal : Pooja) = 1050 : 1510 : 1280 = 105 : 151 : 128.

Total Ratio parts = 105 + 151 + 128 = 384 units.

Pooja's share = (128 ÷ 384) × Total Profit = 1/3 × 1650.

Pooja's share = 550.

Therefore Answer = 550

Alternate Method

Given:

Investment of Suman = Rs. 1050

Investment of Kunal = Rs. 1510

Investment of Pooja = Rs. 1280

Total Profit at the end of 1 year = Rs. 1650

Formula used:

Profit Ratio = (Capital1 × Time1) : (Capital2 × Time2) : (Capital3 × Time3)

Investment Comparison Rs. 1050 Suman Rs. 1510 Kunal Rs. 1280 Pooja Total Profit = Rs. 1650

Calculations:

Ratio of Profit of Suman, Kunal, and Pooja = 1050 × 1 : 1510 × 1 : 1280 × 1

=> Profit Ratio = 105 : 151 : 128

=> Total ratio units = 105 + 151 + 128 = 384

=> Pooja's share in profit = (Ratio of Pooja ÷ Total Ratio) × Total Profit

=> Pooja's share = (128 ÷ 384) × 1650

=> Pooja's share = (1 ÷ 3) × 1650

=> Pooja's share = 550

Therefore The correct answer is Rs. 550.

Additional Information

Ratio of Investment and Time

If profits and times are given, the ratio of capitals is C1 : C2 = (P1 ÷ T1) : (P2 ÷ T2).

Compound Partnership

When partners invest different amounts for different time periods, profit is distributed in the ratio of the product of capital and time.

Working and Sleeping Partner

A working partner manages the business and may receive a salary or fixed percentage of profit before the remaining profit is divided according to the investment ratio.

Q58. Answer: (b) A computer generates incorrect output because the initial data entered was flawed.

The correct answer is A computer generates incorrect output because the initial data entered was flawed..

Key Points

• Diligence is a core characteristic of a computer system that allows it to perform repetitive tasks for long periods without becoming tired, bored, or losing concentration. Unlike humans, who may suffer from physical or mental fatigue after working for a few hours, a computer remains consistent in its performance.

• Despite being diligent, a computer suffers from a significant limitation known as Lack of IQ (Intelligence Quotient). A computer is a machine that follows instructions and cannot think, reason, or make judgments on its own; it requires a human-defined program to function.

• The scenario where a computer generates incorrect output due to flawed data refers to the GIGO (Garbage In, Garbage Out) principle. This highlights that while the computer is diligent enough to process the data, it lacks the common sense to identify that the input is incorrect. Hence, statement 2 is correct.

• A computer performing trillions of calculations per second refers to the characteristic of Speed, which is measured in units like MIPS (Million Instructions Per Second) or FLOPS (Floating Point Operations Per Second). Hence, statement 1 is incorrect.

• The ability of a computer to continue processing for 72 hours straight without losing attention is the definition of Diligence itself, rather than a limitation that diligence cannot overcome. Hence, statement 3 is incorrect.

• Using a computer for different tasks like booking flights and writing code highlights the characteristic of Versatility. This means the computer can be used in various locations such as offices, airports, and schools for diverse applications. Hence, statement 4 is incorrect.

Additional Information

• Speed: Computers are capable of executing millions of instructions in a fraction of a second. Modern Supercomputers can perform quadrillions of calculations per second. This feature makes them indispensable for scientific research and weather forecasting.

• Accuracy: If the algorithms and input data are correct, a computer provides 100% error-free results. Errors usually occur due to human intervention or incorrect programming, not the machine's internal logic.

• Storage (Versatility of Memory): Computer systems have huge storage capacities. Data is stored in bits and bytes on devices like Hard Disk Drives (HDD), Solid State Drives (SSD), and Cloud storage. This allows for the retention of vast amounts of information for an indefinite period.

• No Feelings: Computers do not have emotions, tastes, or intuition. They cannot make subjective decisions based on experience or feelings, which is a major limitation compared to the human brain.

• Dependency: A computer is a dependent machine. It requires a power source and a user to provide input. Without software (instructions) and hardware (physical parts), the system is non-functional.

Important Points

• GIGO (Garbage In, Garbage Out): This term is fundamental in Computer Science. It emphasizes that the reliability of the output is strictly dependent on the integrity of the input data. For organizations, this means data validation is a critical step in data

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processing.

• Evolution of Intelligence: While traditional computers have Zero IQ, the year 1956 marked the formal beginning of Artificial Intelligence (AI). Modern AI aims to overcome the "No IQ" limitation by using Machine Learning and Neural Networks to mimic human decision-making.

• Reliability: Because computers are diligent and accurate, they are considered highly reliable. They are used in critical functions like space exploration (NASA/ISRO), medical surgeries, and global banking systems where consistency is vital.

Q59. Answer: (b) Both conclusions (I) and (II) follow.

Given Statements:

All tea is a snack.

All tea is brunch.

All brunches are dinner.

The least possible Venn diagram for the given statement is:

Conclusions:

I. All tea is dinner – True (Because tea subset of brunch and brunch subset of dinner, so tea subset of dinner).

II. Some brunches are snacks – True (Because tea is common to both brunch and snack, so at least some brunches are snacks).

So, both conclusion I and II follow.

Hence, the correct answer is "Option 2".

Q60. Answer: (b) Government of India Act, 1919

The correct answer is Government of India Act, 1919.

Key Points

• The Government of India Act, 1919, also known as the Montagu-Chelmsford Reforms, introduced a system called Dyarchy in the provinces of British India.

• Under this system of Dyarchy, the provincial subjects of administration were divided into two distinct categories: Reserved Subjects and Transferred Subjects.

• Reserved Subjects: These included vital departments such as Law and Order, Finance, Land Revenue, and Police. These subjects were administered by the Governor with the help of his Executive Council, without being responsible to the Legislative Council.

• Transferred Subjects: These included departments like Education, Public Health, Local Self-Government, and Agriculture. These were administered by the Governor with the aid of Ministers who were responsible to the Legislative Council.

• This Act marked the first time that the British Government officially declared its objective of gradual introduction of responsible government in India.

• The Act also introduced Bicameralism at the center for the first time, consisting of an Upper House (Council of State) and a Lower House (Legislative Assembly).

Additional Information

• Indian Councils Act, 1892:

• This Act increased the number of additional (non-official) members in the Central and Provincial Legislative Councils.

• It increased the functions of Legislative Councils and gave them the power of discussing the budget and addressing questions to the executive.

• It provided for the nomination of some non-official members, introducing a limited and indirect use of election in filling up some of the non-official seats.

• Government of India Act, 1909 (Morley-Minto Reforms):

• This Act is significantly known for introducing Separate Electorates for Muslims, thereby legalizing communalism in Indian politics.

• It considerably increased the size of the Legislative Councils at both the Central and Provincial levels.

• For the first time, it provided for the association of Indians with the Executive Councils of the Viceroy and Governors; Satyendra Prasad Sinha became the first Indian to join the Viceroy's Executive Council as a Law Member.

• Government of India Act, 1935:

• This Act abolished Dyarchy in the provinces and introduced Provincial Autonomy in its place.

• However, it provided for the adoption of Dyarchy at the Centre, dividing federal subjects into Reserved and Transferred (though this provision never came into operation).

• It provided for the establishment of an All-India Federation consisting of provinces and princely states as units.

• It also led to the establishment of the Reserve Bank of India (RBI) in 1935 and a Federal Court in 1937.

Important Points

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• The 1919 Act was based on the report submitted by Edwin Montagu, the then Secretary of State for India, and Lord Chelmsford, the Viceroy of India.

• It mandated that three of the six members of the Viceroy's Executive Council (other than the Commander-in-Chief) were to be Indians.

• The Act extended the principle of communal representation by providing separate electorates for Sikhs, Indian Christians, Anglo-Indians, and Europeans.

• It granted a limited franchise to people on the basis of property, tax, or education.

• It also provided for the establishment of a Public Service Commission, leading to the setting up of a Central Public Service Commission in 1926 for recruiting civil servants.

• The Simon Commission was appointed in November 1927 (two years ahead of schedule) to report on the working of the reforms introduced by the Act of 1919.

Q61. Answer: (d) O

The logic followed here is:

Given: Seven people B, C, O, P, Q, R and S are sitting around a circular table facing the centre.

Only two people sit between P and B when counted from the right of P.

Only S sits between O and P.

Q sits to the immediate left of B.

C is not an immediate neighbour of P.

Now, Third to the left of R is O.

Hence, the correct answer is "Option 4".

Q62. Answer: (d) 52

Shortcut Trick

Men ratio = 100 : 50 = 2 : 1

Days ratio = 1 : 2 (Inverse of Men ratio because Total Provision is constant)

1 unit = 26 days

2 units = 26 × 2 = 52 days

Therefore Answer = 52

Alternate Method

Given:

Initial number of men (M1) = 100

Initial number of days (D1) = 26

Number of men who left = 50

Remaining men (M2) = 100 − 50 = 50

Formula used:

M1 × D1 = M2 × D2 (Chain Rule when work/provision is constant)

Initial: 100 Men D1 = 26 Days Final: 50 Men (Left 50) D2 = 52 Days Inverse Relation Men ÷ 2 → Days × 2 Total Provision = 2600 units

Calculations:

Total provision = M1 × D1 = 100 × 26 = 2600 man-days

=> 2600 = M2 × D2

=> 2600 = 50 × D2

=> D2 = 2600 ÷ 50

=> D2 = 52

Therefore The correct answer is 52.

Additional Information

General Chain Rule (MDH Rule)

The relationship between men (M), days (D), hours (H), and work (W) is given by (M1 × D1 × H1) / W1 = (M2 × D2 × H2) / W2.

Inverse Proportion

In provision problems, the number of men is inversely proportional to the number of days the food lasts, provided the consumption per man remains constant.

Provision Addition Case

If more men join, the provisions will last for fewer days. New Days = (Initial Men × Initial Days) ÷ (Initial Men + New Men).

Q63. Answer: (d) Rs. 40,968

Shortcut Trick

Effective interest rate for 2 years at 20% per annum = 20 + 20 + (20 × 20) ÷ 100 = 44%

Total amount percentage = 100% (Principal) + 44% (Interest) = 144%

Total amount = 144% of 28,450

Total amount = 1.44 × 28,450 = 40,968

Therefore Answer = 40,968

Alternate Method

Given:

Principal (P) = Rs. 28,450

Rate of Interest (R) = 20% per annum

Time (n) = 2 years

Formula used:

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

Year 0 Year 1 Year 2 Rs. 28,450 +20% CI +20% CI Rs. 40,968

Calculations:

$A = 28,450 \times (1 + 20/100)^2$

$\Rightarrow A = 28,450 \times (1 + 1/5)^2$

$\Rightarrow A = 28,450 \times (6/5)^2$

$\Rightarrow A = 28,450 \times (36/25)$

$\Rightarrow A = 1,138 \times 36$

$\Rightarrow A = 40,968$

Therefore The correct answer is Rs. 40,968.

Additional Information

Effective Rate of Interest

For compound interest, the effective rate for two years can be calculated using the successive percentage formula: $x + y + (xy/100)\%$.

Difference between CI and SI

The difference (D) between Compound Interest and Simple Interest for 2 years is given by: $D = P(R/100)^2$.

Compounding Periods

If interest is compounded half-yearly, the rate becomes R/2 and the time becomes 2n. If compounded quarterly, the rate is R/4 and time is 4n.

Rule of 72

To find the approximate time required to double your money with compound interest, divide 72 by the annual interest rate: $T \approx 72 \div R$.

Q64. Answer: (a) = HJF; % = NPL

Given: # : EGC :: QSO : %

Option 1) # = HJF, % = NPL

For # (HJF) to EGC

For % (NPL) to QSO

Since, both transformations follow a consistent shift pattern, Option 1 is correct.

Option 2) # = GTF, % = NNH

For # (GTF) to EGC

For % (NNH) to QSO

Since, the patterns do not match, Option 2 is incorrect.

Option 3) # = NJG, % = NKJ

For # (NJG) to EGC

For % (NKJ) to QSO

Since, the patterns do not match, Option 3 is incorrect.

Option 4) # = TYF, % = NHG

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For # (TYF) to EGC

For % (NHG) to QSO

Since, the patterns do not match, Option 4 is incorrect.

Hence, the correct answer is "Option 1".

Q65. Answer: (a) Protima Gauri

The correct answer is Protima Gauri.

Key Points

• Protima Gauri (widely known as Protima Bedi) was the visionary who established Nrityagram, which is India's first modern Gurukul or residential dance village. Hence, option 1 is correct.

• The institution was founded in the year 1990 and is situated in Hessaraghatta, located on the outskirts of Bengaluru, Karnataka.

• The primary objective of Nrityagram is to provide a space where Indian classical dance forms can be practiced as a way of life, following the ancient Gurukul system where students live with their mentors.

• The institution is globally recognized for its excellence in Odissi, though it has also hosted training in other classical forms like Mohiniyattam, Kathak, Bharatnatyam, and Kuchipudi.

• The village was built on 10 acres of land provided by the Government of Karnataka on lease, fulfilling Protima Gauri's dream of creating a self-sustaining community of artists.

Additional Information

• Protima Gauri: Born in 1948, she was a celebrated model and socialite in Mumbai before transitioning into a dedicated Odissi dancer after witnessing a performance by Guru Kelucharan Mohapatra. She spent her later years building and nurturing Nrityagram until her passing in 1998.

• Surupa Sen: She was the first student to join Nrityagram and currently serves as the Artistic Director. She is an acclaimed choreographer and dancer who has significantly expanded the Odissi vocabulary through her compositions. Hence, option 3 is incorrect as she is a leader of the institution but not the founder.

• Bijayini Satpathy: She is a world-renowned Odissi performer who was associated with Nrityagram for 25 years as its principal dancer and Director of the Odissi Gurukul. She is credited with refining the training pedagogy at the village. Hence, option 4 is incorrect.

• Pavithra Reddy: A prominent dancer and teacher at Nrityagram, she joined the institution through its rural outreach program and has since become one of its lead performers. Hence, option 2 is incorrect.

• Geographical Location: Hessaraghatta is located about 30 kilometers from the city center of Bengaluru and is also known for the Hessaraghatta Lake and various agricultural research institutes.

Important Points

• Architecture: The Nrityagram campus was designed by the award-winning architect Gerard da Cunha. The design is unique for its use of raw earth, thatch, and indigenous materials, winning the Rural Architecture Award in 1991.

• Vasanthahabba: This was a famous all-night spring festival of arts started by Protima Gauri in 1990. It was often called the Woodstock of India, drawing thousands of urban and rural spectators to witness world-class dance and music performances for free.

• Training Philosophy: Students at Nrityagram undergo a rigorous six-year full-time residency. The training involves Yoga, Kalaripayattu (martial arts), Sanskrit, and literature, alongside intensive dance practice to ensure a holistic development of the artist.

• Global Impact: The Nrityagram Dance Ensemble has performed at prestigious international venues like the Joyce Theater in New York and the Edinburgh International Festival, bringing global attention to Indian heritage.

Q66. Answer: (b) 8th century CE

The correct answer is 8th century CE.

Key Points

• The Iraiyanar Ahapporul, also frequently referred to as Iraiyanar Kalaviyal, is a seminal work in Tamil literature that focuses on the grammar of love or Agam poetry.

• Most historians and literary scholars date the compilation and its famous commentary to the 8th century CE. While the core 60 sutras are sometimes traditionally attributed to an earlier period, the definitive version used by scholars includes the commentary by Nakkirar, which was finalized around this time.

• The work is of immense historical value because it contains the first-ever detailed mention of the Three Tamil Sangams (literary academies). It outlines the chronology, the Pandyan kings who patronized them, and the duration of each Sangam.

• The text serves as a foundational bridge between the Sangam Era (3rd century BCE to 3rd century CE) and the later medieval period of Tamil linguistic evolution. It helped systematize the rules of Agam (internal/romantic) literature, which was a dominant theme in ancient Tamil culture.

• The 8th century CE date is supported by the linguistic style of the prose commentary, which represents an early form of

developed Tamil prose, and references to Pandyan monarchs like Arikesari Parankusa.

Additional Information

• Structure and Themes: The Iraiyanar Ahapporul consists of 60 short verses or sutras. These verses are exclusively dedicated to Kalaviyal, which deals with the clandestine or pre-marital phase of love, a core component of Agam literature.

• The Legend of Authorship: According to Tamil tradition, during a severe famine in the Pandyan kingdom, the scholars of the Sangam dispersed. When they returned, the knowledge of Ahapporul (the grammar of love) was lost. It is believed that Lord Shiva (Iraiyanar) composed these 60 sutras and left them under his seat in the Madurai temple to restore the literary tradition.

• Nakkirar's Commentary: The commentary on this work is as famous as the text itself. Nakkirar, a renowned poet, is credited with writing the exhaustive explanation. It is widely considered the first major prose work in the Tamil language, setting a precedent for future commentators.

• The Three Sangams: The text claims that the First Sangam (Mudal Sangam) was held at Thenmadurai, the Second Sangam (Idai Sangam) at Kapatapuram, and the Third Sangam (Kadai Sangam) at the modern city of Madurai. Although the timeframes mentioned (thousands of years) are considered mythical by modern historians, the sequence provides a framework for understanding Tamil literary history.

Important Points

• Linguistic Significance: Before the Iraiyanar Ahapporul, the primary source for Tamil grammar was the Tolkappiyam. This 8th-century work refined the Agam conventions specifically for the post-Sangam audience.

• Patronage: The commentary mentions Pandyan kings, which helps in cross-referencing the date. The mentions of the Pandyan king Nedumaran and battle victories at places like Pali and Sennilam are crucial for archaeological and epigraphical dating.

• Cultural Impact: It solidified the "five landscapes" (Ainthinai) theory of Tamil poetry, where different geographical locations (Kurinji, Mullai, Marutham, Neithal, Palai) are associated with specific moods of love.

• Preservation: The survival of this text ensured that the legends of the Sangam were passed down to later generations, eventually leading to the modern Tamil Renaissance in the 19th and 20th centuries.

Q67. Answer: (a) VYA 94

The logic followed here is:

So, 'VYA 94' will replace the question mark in the given series.

Hence, the correct answer is "Option 1".

Q68. Answer: (b) 25

Shortcut Trick

Rate % = [(n − 1) × 100] ÷ Time

Here, the sum becomes 5 times itself, so n = 5.

Time given is 16 years.

Rate % = [(5 − 1) × 100] ÷ 16 = 400 ÷ 16

Rate % = 25%

Therefore Answer = 25%

Alternate Method

Given:

Principal (P) = Let it be P

Amount (A) = 5 × P = 5P

Time (T) = 16 years

Formula used:

Simple Interest (SI) = Amount − Principal

SI = (P × R × T) ÷ 100

Initial (P) Final (5P) T = 16 Years Interest (SI) = 4P

Calculations:

SI = 5P − P = 4P

=> 4P = (P × R × 16) ÷ 100 => 4 = (R × 16) ÷ 100 => 16R = 400 => R = 400 ÷ 16 => R = 25% Therefore The correct answer is 25 (Option 2).

Additional Information

Simple Interest Formula

SI = (P × R × T) ÷ 100, where P is Principal, R is Rate per annum, and T is Time in years.

Sum Becomes n Times

For a sum to become n times itself, the Interest earned must be (n − 1) × Principal.

Compound Interest Amount

Under compound interest, the Amount A = P(1 + R ÷ 100)^T, where interest is calculated on the updated principal each period.

Relationship between R and T

For a fixed multiple n, Rate and Time are inversely proportional: R × T = (n − 1) × 100.

Q69. Answer: (b) Decrease by 83.68%

Shortcut Trick

Successive multipliers: 0.60 (40% decrease), 0.40 (60% decrease), 0.40 (60% decrease), and 1.70 (70% increase).

Net Multiplier = 0.60 × 0.40 × 0.40 × 1.70 = 0.1632

Final Price = 100% × 0.1632 = 16.32%

Net Change = 100% − 16.32% = 83.68% decrease.

Therefore Answer = Decrease by 83.68%

Alternate Method

Given:

Price changes: Month 1 = −40%, Month 2 = −60%, Month 3 = −60%, Month 4 = +70%.

Formula used:

Final Price = Initial Price × (1 − r1/100) × (1 − r2/100) × (1 − r3/100) × (1 + r4/100)

100 Original -40% 60 -60% 24 -60% 9.6 +70% 16.32 Final Total Decrease = 83.68%

Calculations:

Let the original price be 100.

=> Price after 1st month = 100 × (1 − 40/100) = 100 × 0.60 = 60

=> Price after 2nd month = 60 × (1 − 60/100) = 60 × 0.40 = 24

=> Price after 3rd month = 24 × (1 − 60/100) = 24 × 0.40 = 9.6

=> Price after 4th month = 9.6 × (1 + 70/100) = 9.6 × 1.70 = 16.32

=> Total decrease = 100 − 16.32 = 83.68

=> Percentage decrease = (83.68 ÷ 100) × 100 = 83.68%

Therefore The correct answer is Decrease by 83.68%.

Additional Information

Successive Percentage Formula

For two successive changes of x% and y%, the net effective change is [x + y + (xy/100)]%.

Multiplying Factor Method

Final Value = Initial Value × Multiplier. For a p% increase, multiplier = (1 + p/100). For a p% decrease, multiplier = (1 − p/100).

Depreciation Formula

Value after n years = $P(1 - r/100)^n$, where P is the initial value and r is the constant rate of decrease.

Q70. Answer: (c) 210.5 gm

Shortcut Trick

Professed Selling Price = 100 − 60 = 40% of standard cost.

Total Revenue needed for 90% profit = 100 + 90 = 190% of actual cost.

Actual Weight = (Professed SP ÷ Total Revenue) × Standard Weight

Weight = (40 ÷ 190) × 1000 gm = 4000 ÷ 19 ≈ 210.52 gm

Therefore Answer = 210.5 gm

Alternate Method

Given:

Standard Weight = 1000 gm, Professed Loss = 60%, Overall Gain = 90%

Formula used:

(100 − Loss%) × (Standard Weight ÷ False Weight) = (100 + Actual Gain%)

Actual CP (Weight w) Standard CP (1000g) SP = 400 90% Gain 60% Loss CP of 'w' gm = w CP of 1000 gm = 1000

Calculations:

Assume Cost Price (CP) of 1 gm = Re. 1. So, CP of 1000 gm = Rs. 1000.

=> Professed Selling Price (SP) = CP − 60% of CP = 1000 − 600 = Rs. 400.

=> The shopkeeper actually gains 90% on his actual cost (cost of the false weight 'w').

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=> SP = Actual CP × (100 + Gain%) ÷ 100

=> 400 = w × (100 + 90) ÷ 100

=> 400 = w × 1.9

=> w = 400 ÷ 1.9 = 4000 ÷ 19

=> w = 210.526... gm ≈ 210.5 gm

Therefore The correct answer is 210.5 gm (Option 3).

Additional Information

Dishonest Dealer Formula

Profit% = [(True Weight − False Weight) ÷ False Weight] × 100, assuming items are sold at Cost Price.

Effective Gain/Loss

When a dealer sells at x% profit/loss and uses y% less/more weight, the overall profit multiplier is (1 ± x%) × [True Weight ÷ (True Weight − Error)].

Ratio Method for False Weights

CP : SP = (False Weight × Professed CP) : (True Weight × Actual SP). Equate this to (100) : (100 + net gain/loss).

Q71. Answer: (c) = QKO, % = GAE

Given: # : OIM :: ICG : %

Option 1) # = LPO, % = GJH

For # (LPO) to OIM

For % (GJH) to ICG

Since, the patterns do not match, Option 1 is incorrect.

Option 2) # = MKO, % = GMJ

For # (MKO) to OIM

For % (GMJ) to ICG

Since, the patterns do not match, Option 2 is incorrect.

Option 3) # = QKO, % = GAE

For # (QKO) to OIM

For % (GAE) to ICG

Since, both transformations follow a consistent shift pattern, Option 3 is correct.

Option 4) # = MKO, % = GMK

For # (MKO) to OIM

For % (GMK) to ICG

Since, the patterns do not match, Option 4 is incorrect.

Hence, the correct answer is "Option 3".

Q72. Answer: (a) 79

Shortcut Trick

Base Average of 11 results = 61

Deviation of first 6 = 6 × (64 − 61) = +18

Deviation of last 6 = 6 × (61 − 61) = 0

Net deviation to be added to base = +18 + 0 = 18

6^(th) result = 61 + 18 = 79

Therefore Answer = 79

Alternate Method

Given:

Average of 11 results = 61

Average of first 6 results = 64

Average of last 6 results = 61

Formula used:

Sum = Average × Number of results

6th First 6 (Avg: 64) Last 6 (Avg: 61) Total 11 Results (Avg: 61)

Calculations:

Total sum of 11 results = 11 × 61 = 671

=> Sum of first 6 results = 6 × 64 = 384

=> Sum of last 6 results = 6 × 61 = 366

=> Sum of (First 6 + Last 6) = 384 + 366 = 750

=> 6^(th) result = (Sum of first 6 + Sum of last 6) − Total sum of 11

=> 6^(th) result = 750 − 671 = 79

Therefore The correct answer is 79.

Additional Information

Weighted Average

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

Deviation Method

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

Arithmetic Progression Average

For any series in AP, the Average = (First term + Last term) ÷ 2, or simply the middle term if the number of terms is odd.

Q73. Answer: (d) Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

The correct answer is Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA).

Key Points

• The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) was passed in August 2005 and officially launched on February 2, 2006, initially covering 200 of the most backward districts in India.

• It is considered a cornerstone of development policy because it shifted the approach from welfare-based to rights-based, providing a legal guarantee for at least 100 days of wage employment in a financial year to every rural household whose adult members volunteer for unskilled manual work.

• The scheme is a demand-driven program, meaning the government is legally bound to provide work within 15 days of a demand being made, failing which an unemployment allowance must be paid to the applicant.

• It is tied to most rural development programs as it creates durable assets such as check dams, ponds, wells, and rural roads, which are essential for long-term agricultural and infrastructural growth.

• The Ministry of Rural Development, Government of India, monitors the entire implementation of this scheme in association with State Governments.

Additional Information

• Public Distribution System (PDS):

• The PDS is an Indian food security system established under the Ministry of Consumer Affairs, Food, and Public Distribution.

• It focuses on distributing essential foodgrains like wheat and rice, and non-food items like kerosene, to the poor at subsidized rates through a network of Fair Price Shops (FPS).

• The National Food Security Act (NFSA), 2013, further strengthened this by providing legal entitlement to 75% of the rural and 50% of the urban population.

• Swachh Bharat Abhiyan:

• Launched on October 2, 2014, by the Prime Minister to honor the 150th birth anniversary of Mahatma Gandhi.

• It aims to achieve universal sanitation coverage and make India Open Defecation Free (ODF) by constructing individual and community toilets.

• The mission has two thrusts: Swachh Bharat Mission (Gramin) for rural areas and Swachh Bharat Mission (Urban).

• MGNRES (Mahatma Gandhi National Rural Employment Empowerment Scheme):

• Note that "MGNRES" is often a misnomer or a slight variation in terminology; the official legal name remains MGNREGA.

Important Points

• Social Audit: MGNREGA mandates a Social Audit by the Gram Sabha at least once every six months, which is a powerful tool for ensuring transparency and accountability in the expenditure of funds.

• Women Empowerment: The Act stipulates that at least one-third (33%) of the beneficiaries shall be women who have registered and requested for work under the scheme.

• Funding: The Central Government bears 100% of the cost of unskilled manual labor and 75% of the material cost, while the State Governments contribute the remaining 25% of the material cost and the unemployment allowance.

• Financial Inclusion: Wages are paid directly into the Bank accounts or Post Office accounts of the workers using the Direct Benefit Transfer (DBT) mechanism to prevent leakages and corruption.

• Coverage: Since April 1, 2008, the act has been extended to cover all rural districts of the country, making it a universal program for the rural poor.

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Q74. Answer: (c) (22,21,67)

The logic followed here:

3rd number = 1st number × 4 - 2nd number.

(19,21,55)

=> 19 × 4 - 21 = 76 - 21 = 55

(8, 9, 23)

=> 8 × 4 - 9 = 32 - 9 = 23

Now checking options:

Option (1): (1, 21, 19)

=> 1 × 4 - 21 = 4 - 21 = - 17 (False)

Option (2): (20, 12, 79)

=> 20 × 4 - 12 = 80 - 12 = 78 (False)

Option (3): (22, 21, 67)

=> 22 × 4 - 21 = 88 - 21 = 67 (True)

Option (4): (7, 5, 3)

=> 7 × 4 - 5 = 28 - 5 = 23 (False)

Hence, the correct answer is option (3).

Q75. Answer: (a) 1

Given: (Left) G 6 E * @ # 3 D 2 % 7 4 Y & 5 + C R K S T (Right)

Now,

Numbers, which are immediately preceded by a symbol and also immediately followed by a letter.

So, Needed pattern is: Symbol – Number – Letter

(Left) G 6 E * @ # 3 D 2 % 7 4 Y & 5 + C R K S T (Right)

Only one number satisfies the condition.

Hence, the correct answer is 'Option 1'.

Q76. Answer: (d) Daughter's husband

Family Chart:

Decoding the Symbols:

Symbol	•	•	**X**	#
Meaning	Father	Daughter	Mother	Husband

Given: G # A - R + K

It means: G is the husband of A, A is the daughter of R, R is the father of K.

Here, G is related to R as Daughter’s husband.

Hence, the correct answer is Option 4.

Q77. Answer: (d) x = 4, y = −2, z = 3

Shortcut Trick

Substitution method: Test given options in the simplest equation, x − 3z = −5.

Check Option (4): x = 4, y = −2, z = 3.

Eq (1): 4 − 3(3) = 4 − 9 = −5 (Correct).

Eq (2): 2(4) − (−2) + 2(3) = 8 + 2 + 6 = 16 (Correct).

Eq (3): 7(4) − 3(−2) − 5(3) = 28 + 6 − 15 = 19 (Correct).

Therefore Answer = Option (4)

Alternate Method

Given:

x − 3z = −5 ...(i)

2x − y + 2z = 16 ...(ii)

7x − 3y − 5z = 19 ...(iii)

Formula used:

Method of Elimination and Substitution.

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Eq (i): x − 3z = −5 Eq (ii): 2x − y + 2z = 16 Eq (iii): 7x − 3y − 5z = 19 Solution: x = 4, y = −2, z = 3 Option (4)

Calculations:

From (i), x = 3z − 5.

Substitute x in (ii): 2(3z − 5) − y + 2z = 16

=> 6z − 10 − y + 2z = 16 => y = 8z − 26 ...(iv)

Substitute x and y in (iii): 7(3z − 5) − 3(8z − 26) − 5z = 19

=> 21z − 35 − 24z + 78 − 5z = 19

=> −8z + 43 = 19 => −8z = −24 => z = 3

=> x = 3(3) − 5 = 4

=> y = 8(3) − 26 = −2

Therefore The correct answer is Option (4).

Additional Information

Cramer's Rule

Variables are solved using determinants: x = D_x/D, y = D_y/D, and z = D_z/D, provided D ≠ 0.

Matrix Method

The system AX = B is solved as X = A^(−1)B, where A is the coefficient matrix.

Consistency of System

A system is consistent if rank(A) = rank(A|B). It has a unique solution if this rank equals the number of variables.

Q78. Answer: (c) Dispersion

The correct answer is Dispersion.

Key Points

• Dispersion is the phenomenon of splitting white light into its constituent seven colors when it passes through a transparent medium like a glass prism. Hence, the formation of a spectrum is primarily due to this process.

• The spectrum consists of seven colors, commonly remembered by the acronym VIBGYOR: Violet, Indigo, Blue, Green, Yellow, Orange, and Red.

• The splitting occurs because different colors of light travel at different speeds in a glass medium, even though they travel at the same speed in a vacuum. This variation in speed leads to different refractive indices for each color.

• Sir Isaac Newton was the first scientist to use a glass prism in 1666 to demonstrate that sunlight is made up of seven colors. He showed that if a second inverted prism is placed in the path of the spectrum, the colors recombine to form white light again.

• In the process of dispersion, Violet light undergoes the maximum deviation because it has the shortest wavelength, while Red light undergoes the minimum deviation because it has the longest wavelength.

Additional Information

• Refraction:

• This is the bending of light when it passes from one optical medium to another of different optical density. It occurs due to the change in the velocity of light.

• While refraction is the mechanism that causes the light to bend at the surfaces of the prism, the specific separation into colors is called dispersion. Hence, statement 2 is the underlying mechanism but not the specific answer for spectrum formation.

• Reflection:

• This is the phenomenon where light rays bounce back into the same medium after striking a polished or shiny surface, like a mirror.

• It follows two laws: the angle of incidence equals the angle of reflection, and the incident ray, reflected ray, and the normal all lie in the same plane. Hence, statement 1 is incorrect as it does not result in a spectrum in this context.

• Scattering:

• This occurs when light rays are deviated from their straight path upon striking obstacles like dust particles, gas molecules, or water droplets.

• The blue color of the sky and the reddish appearance of the sun at sunrise and sunset are due to Rayleigh scattering. Hence, statement 4 is incorrect regarding the prism's spectrum.

• Rainbow Formation:

• A natural spectrum appearing in the sky after rain is a rainbow. It is caused by the dispersion of sunlight by tiny water droplets, which act like small prisms.

• The process involves three steps: refraction, internal dispersion, and total internal reflection within the raindrop.

Important Points

• Angle of Deviation: The angle between the incident ray and the emergent ray is known as the angle of deviation. In a prism, this

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angle depends on the angle of the prism and the refractive index of the material.

• Wavelength and Frequency: The wavelength (λ) of light is inversely proportional to its frequency and the refractive index of the medium. Visible light ranges roughly from 400 nm (Violet) to 700 nm (Red).

• Cauchy's Formula: This mathematical relation describes how the refractive index of a material varies with the wavelength of light, explaining why different colors refract at different angles, leading to dispersion.

Q79. Answer: (a) 92nd Amendment Act, 2003

The correct answer is 92nd Amendment Act, 2003.

Key Points

• The 92nd Constitutional Amendment Act was enacted in the year 2003 to amend the Eighth Schedule of the Constitution of India.

• This specific amendment added four new languages to the list of official languages: Bodo, Dogri, Maithili, and Santhali.

• With the inclusion of these four languages, the total number of languages listed in the Eighth Schedule increased from 18 to 22.

• The bill for this amendment received the President's assent on January 7, 2004, and it became effective from that period.

• The 92nd Amendment is significant as it recognized the linguistic diversity and cultural identity of the speakers of these languages, primarily located in Assam (Bodo), Jammu and Kashmir (Dogri), Bihar (Maithili), and Jharkhand/West Bengal (Santhali).

Additional Information

• 86th Amendment Act, 2002:

• This amendment is primarily related to Education. It inserted Article 21A into the Constitution, making the Right to Education a Fundamental Right for children aged 6 to 14 years.

• It also amended Article 45 (Directive Principles) and added a new Fundamental Duty under Article 51A(k) for parents to provide opportunities for education to their children.

• 91st Amendment Act, 2003:

• This amendment dealt with the size of the Council of Ministers and the Anti-Defection Law.

• It stipulated that the total number of ministers, including the Prime Minister, in the Central Council of Ministers shall not exceed 15% of the total strength of the Lok Sabha.

• A similar provision was applied to the State Legislative Assemblies, ensuring that the number of ministers (including the Chief Minister) does not exceed 15% of the total strength of the Assembly, with a minimum of 12 ministers.

• 93rd Amendment Act, 2005:

• This amendment allowed the State to make special provisions for the advancement of any socially and educationally Backward Classes or for the Scheduled Castes or the Scheduled Tribes regarding their admission to educational institutions.

• This includes private educational institutions, whether aided or unaided by the State, except for minority educational institutions referred to in Article 30(1).

Important Points

• Evolution of the Eighth Schedule:

• The Constitution originally listed 14 languages in the Eighth Schedule in 1950.

• The 21st Amendment Act, 1967, added Sindhi as the 15th language.

• The 71st Amendment Act, 1992, added three more languages: Konkani, Manipuri, and Nepali, bringing the count to 18.

• The 92nd Amendment Act, 2003, added the final four (Bodo, Dogri, Maithili, Santhali), resulting in the current total of 22.

• Constitutional Articles:

• Article 344(1) provides for the constitution of a Commission by the President on expiration of five years from the commencement of the Constitution.

• Article 351 provides a directive for the development of the Hindi language so that it may serve as a medium of expression for all the elements of the composite culture of India.

• Current Status: At present, there are 22 scheduled languages in India. These include Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Konkani, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Sanskrit, Sindhi, Tamil, Telugu, Urdu, Bodo, Santhali, Maithili, and Dogri.

Q80. Answer: (d) Ramananda

The correct answer is Ramananda.

Key Points

• Ramananda was a 14th-century Vaishnava devotional poet-saint who lived in the Gangetic basin of northern India. He is widely recognized as the primary figure who brought the Bhakti movement from South India to North India.

• He was a devoted follower of the Sri Vaishnava tradition, which was originally pioneered by Ramanujacharya. However,

Ramananda introduced significant reforms to make the tradition more accessible to the masses.

• One of his most revolutionary contributions was preaching in Hindi, the vernacular language of the common people, instead of Sanskrit. This shift allowed the Bhakti teachings to reach a much wider audience across the northern plains.

• Ramananda is also credited with discarding the rigid caste rules within the spiritual domain. He famously declared, "Let no man ask a man's caste or sect; whoever adores God is God's own."

• He founded the Ramanandi Sampradaya, which remains one of the largest monastic orders in India today, centered primarily in Ayodhya and Varanasi.

Additional Information

• Ramanujacharya (1017–1137 AD):

• He was a great philosopher and social reformer from Tamil Nadu. He propounded the philosophy of Vishishtadvaita (qualified monism).

• He revitalized the Sri Vaishnava movement and is the original inspiration behind the lineage that Ramananda later adapted for North India.

• Madhvacharya (1238–1317 AD):

• He was a philosopher from the Karnataka region and the founder of the Dvaita (dualism) school of Vedanta.

• He was a staunch critic of Shankara's Advaita and Ramanuja's Vishishtadvaita, emphasizing the absolute distinction between Brahman (God) and individual souls.

• Namdev (1270–1350 AD):

• He was a prominent saint from Maharashtra belonging to the Varkari tradition.

• While he played a role in spreading Bhakti and his hymns are even included in the Guru Granth Sahib, he was primarily associated with the worship of Lord Vitthal (a form of Vishnu) in the Deccan region.

• Bhakti Movement:

• The movement began in South India in the 7th to 9th centuries through the Alvars (devotees of Vishnu) and Nayanars (devotees of Shiva).

• It emphasized personal devotion (Bhakti) to a personal god as the path to salvation (Moksha), regardless of gender or caste.

Important Points

• Disciples of Ramananda:

• Ramananda is famous for his twelve disciples (the Dwadash Mahants), who came from various backgrounds. These included Kabir (a Muslim weaver), Ravidas (a cobbler), Sena (a barber), and Dhanna (a Jat peasant).

• This inclusivity was a radical departure from the orthodox Brahminical practices of the medieval period.

• Geographical Impact:

• The influence of Ramananda can be seen in the spiritual landscape of modern-day Uttar Pradesh, Rajasthan, and Bihar.

• His teachings bridged the gap between the Saguna school (worship of God with form, like Rama) and the Nirguna school (worship of formless God).

• Literary Contribution:

• Though his primary medium was oral, several verses attributed to him are found in the Adi Granth of the Sikhs, highlighting his pan-Indian religious significance.

Q81. Answer: (c) Two

Given the number: 5723946

The rules for transformation are:

For each even digit: Add 3 (+ 3)

For each odd digit: Subtract 2 (- 2)

Step-by-step transformation of each digit:

Position	1st	2nd	3rd	4th	5th	6th	7th
Original Digit	5	7	2	3	9	4	6
Type	Odd	Odd	Even	Odd	Odd	Even	Even
Operation	5 → 3	7 → 5	2 → 5	3 → 1	9 → 7	4 → 7	6 → 9
New Digit	3	5	5	1	7	7	9

The new number formed is: 3551779

Now, let's count the frequency of each digit in the new number:

Digit 3: Appears 1 time

Digit 5: Appears 2 times (More than once)

Digit 1: Appears 1 time

Digit 7: Appears 2 times (More than once)

Digit 9: Appears 1 time

The digits that appear more than once are 5 and 7. There are two such digits.

Hence, the correct answer is "Option 3".

Q82. Answer: (c) 16:25

Shortcut Trick

Let the third number be 100.

Second number = 100 − 20% of 100 = 80.

First number × 125% = 80.

First number = 80 × (100 ÷ 125) = 80 × 4/5 = 64.

Ratio of First : Third = 64 : 100 = 16 : 25.

Therefore Answer = 16:25

Alternate Method

Given:

N1 increased by 25% = N2

N2 is 20% less than N3

Formula used:

Value = Base × (100 ± Percentage) ÷ 100

N1 (64) N2 (80) N3 (100) +25% -20% Ratio N1 : N3 = 64 : 100 = 16 : 25

Calculations:

Let the third number N3 = 100x

=> N2 = 100x − (20/100) × 100x = 80x

=> N1 × (1 + 25/100) = N2

=> N1 × (125/100) = 80x

=> N1 × (5/4) = 80x

=> N1 = 80x × 4/5 = 64x

=> Ratio N1 : N3 = 64x : 100x = 16 : 25

Therefore The correct answer is 16:25.

Additional Information

Fraction Equivalents

Converting percentages to fractions simplifies calculations: 25% = 1/4 (multiplied by 5/4 for increase) and 20% = 1/5 (multiplied by 4/5 for decrease).

Reverse Percentage

To find the original value after an x% increase, divide the final value by (1 + x/100). If A is 25% more than B, then B = A ÷ 1.25.

Successive Percentage Change

If a value changes by a% and then b%, the net effective change is given by [a + b + (a × b)/100]%.

Q83. Answer: (a) 13-18-36-46

The logic followed here is:

Given sets:

6 - 11 - 22 - 32

9 - 14 - 28 - 38

=> 6 → 11 => +5

9 → 14 => +5

=> 11 → 22 => ×2

14 → 28 => ×2

=> 22 → 32 => +10

28 → 38 => +10

Now, checking the options:

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Option 1) 13 - 18 - 36 - 46

=> 13 + 5 = 18

=> 18 × 2 = 36

=> 36 + 10 = 46

Option 2) 7 - 12 - 24 - 14

=> 7 + 5 = 12

=> 12 × 2 = 24

=> 24 + 10 = 34 ≠ 14

Option 3) 14 - 19 - 38 - 58

=> 14 + 5 = 19

=> 19 × 2 = 38

=> 38 + 10 = 48 ≠ 58

Option 4) 12 - 17 - 34 - 54

=> 12 + 5 = 17

=> 17 × 2 = 34

=> 34 + 10 = 44 ≠ 54

Hence, the correct answer is Option 1.

Q84. Answer: (c) Coriolis force

The correct answer is Coriolis force.

Key Points

• The Coriolis force is an apparent force caused by the Earth's rotation on its axis. It is not a real force in the sense of a physical push or pull but is an effect observed because the Earth rotates beneath the moving air or water.

• According to Ferrel's Law, this force deflects moving objects, such as wind and ocean currents, to the right of their path in the Northern Hemisphere and to the left in the Southern Hemisphere.

• The magnitude of the Coriolis force is directly proportional to the sine of the latitude. Therefore, it is zero at the Equator and reaches its maximum at the North and South Poles.

• This force acts perpendicular to the direction of the wind and the pressure gradient force. It plays a critical role in the general circulation of the atmosphere and the formation of cyclonic weather systems.

• It was first mathematically described by the French scientist Gaspard-Gustave de Coriolis in the year 1835. He explained how energy transfer in rotating systems affects the motion of bodies.

Additional Information

• Pressure Gradient Force (PGF):

• This force is generated by differences in atmospheric pressure between two regions. It acts from high-pressure areas to low-pressure areas.

• The rate of change of pressure with respect to distance is known as the pressure gradient. When isobars (lines of equal pressure) are close together, the gradient is steep and the wind speed is high.

• While PGF initiates the movement of air, the Coriolis force subsequently modifies its direction.

• Frictional Force:

• This force opposes the motion of the wind and is most significant near the Earth's surface. It generally affects wind up to an altitude of 1 to 3 kilometers, a layer known as the planetary boundary layer.

• Over oceans, the friction is minimal, allowing winds to be stronger, whereas over mountainous or forested land, friction is maximum.

• Friction slows down the wind, which in turn reduces the Coriolis effect, causing the wind to blow more across the isobars toward low pressure rather than parallel to them.

• Gravitational Force:

• Gravity acts downward toward the center of the Earth. It prevents the atmosphere from escaping into space and creates vertical pressure gradients.

• While it is a fundamental force, its direct contribution to the horizontal deflection of winds is negligible compared to the Coriolis force.

• Geostrophic Wind:

• In the upper atmosphere (above the friction layer), when the Pressure Gradient Force and the Coriolis force are in equilibrium, the resulting wind blows parallel to the isobars. This is called the Geostrophic wind.

• This phenomenon explains the characteristic flow of the Jet Streams and other high-altitude wind patterns.

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Important Points

• Impact on Cyclones: In the Northern Hemisphere, the Coriolis force causes winds to blow counter-clockwise around a low-pressure center (cyclone). In the Southern Hemisphere, the rotation is clockwise.

• Wind Speed Factor: The Coriolis force is also dependent on the speed of the wind. The faster the wind blows, the stronger the deflection caused by the Coriolis effect.

• Equatorial Absence: Because the Coriolis force is absent at 0 degrees latitude, tropical cyclones rarely form between 5 degrees North and 5 degrees South of the Equator; there is insufficient "spin" to initiate the cyclonic rotation.

Q85. Answer: (b) 7

Shortcut Trick

Mode is the observation that occurs the maximum number of times in a dataset.

Scan the list for frequencies: 4 occurs twice, 5 occurs thrice, 7 occurs four times, 13 occurs thrice.

Comparing frequencies: 4 (Max) is the frequency for value 7.

All other values occur fewer than 4 times.

Therefore Answer = 7

Alternate Method

Given:

Dataset: 2, 4, 4, 5, 5, 5, 6, 7, 7, 7, 7, 8, 8, 9, 9, 10, 10, 11, 11, 12, 13, 13, 13, 15, 16

Total number of students = 25

Formula used:

Mode = The value in the dataset with the highest frequency.

5 3 7 4 (Mode) 13 3 Others Frequency → ≤ 2

Calculations:

Step 1: Create a frequency table for the repeated values in the dataset.

=> Frequency of 4 = 2

=> Frequency of 5 = 3

=> Frequency of 7 = 4

=> Frequency of 13 = 3

=> Frequency of other values (2, 6, 8, 9, 10, 11, 12, 15, 16) is either 1 or 2.

Step 2: Compare the frequencies to find the maximum.

=> Maximum frequency = 4

=> The value corresponding to frequency 4 is 7.

Therefore The correct answer is 7 (Option 2).

Additional Information

Arithmetic Mean

It is the average of all observations, calculated as: Mean = Σx ÷ n.

Median

The middle value of a sorted dataset. For n = 25 (odd), Median = [(n + 1) ÷ 2]^(th) term = 13^(th) term.

Empirical Formula

The relationship between mean, median, and mode is given by: Mode = 3 × Median − 2 × Mean.

Range

The difference between the highest and lowest values in the dataset: Range = Max − Min = 16 − 2 = 14.

Q86. Answer: (c) decreased

The correct answer is decreased.

Key Points

• According to the Census of India 2011, the gap between male and female literacy rates decreased significantly over the decade from 2001 to 2011.

• In the 2001 Census, the male literacy rate was 75.26% and the female literacy rate was 53.67%, resulting in a gender gap of 21.59 percentage points.

• By the 2011 Census, the male literacy rate rose to 82.14%, while the female literacy rate saw a more substantial increase to 65.46%.

• This shift reduced the literacy gap to 16.68 percentage points in 2011, highlighting that female literacy grew at a faster pace than

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male literacy during this ten-year period.

• The national average literacy rate in 2011 was recorded at 74.04%, compared to 64.83% in 2001.

Additional Information

• State-wise Literacy Trends:

• Kerala maintained its position with the highest literacy rate in the country at 94.00% in 2011, with a very narrow gender gap.

• Bihar recorded the lowest literacy rate in India at 61.80%, although it showed significant improvement from its 2001 status.

• Lakshadweep followed Kerala with a high literacy rate of 91.85%.

• Gender-Specific Data (2011):

• The total number of literates in India rose from 560.7 million in 2001 to 763.5 million in 2011.

• Out of the total literates in 2011, 434.7 million were males and 328.8 million were females.

• The increase in female literates (110 million) was higher than the increase in male literates (92 million) during the 2001-2011 decade.

• Urban vs Rural Divide:

• In 2011, the literacy rate in urban areas was 84.11%, while in rural areas, it was 67.77%.

• The gender gap in rural areas (19.10%) remained higher than in urban areas (9.75%).

Important Points

• Definition of Literacy: As per the Census of India, a person aged 7 years and above who can both read and write with understanding in any language is considered literate.

• Government Initiatives: The reduction in the gender gap can be attributed to various government schemes such as Sarva Shiksha Abhiyan (SSA) launched in 2001, and the Right to Education (RTE) Act which was implemented in April 2010.

• Historical Context: Since 1951, the literacy rate in India has shown a steady upward trend; however, the decade 2001-2011 is particularly noted for the narrowing of the male-female divide.

• Social Impact: Higher female literacy is directly linked to improved maternal health, lower infant mortality rates, and better socio-economic participation of women in the Indian economy.

Q87. Answer: (c) Enhancing co-operation on medicine quality standards

The correct answer is Enhancing co-operation on medicine quality standards.

Key Points

• The primary objective of the Memorandum of Understanding (MoU) signed between India and Liberia in December 2025 is to strengthen the regulatory framework for medical products. This agreement specifically aims at enhancing co-operation on medicine quality standards to ensure the safety and efficacy of pharmaceuticals. Hence, statement 3 is correct.

• The MoU facilitates collaboration between the Central Drugs Standard Control Organization (CDSCO) of India and the Liberia Medicines and Health Products Regulatory Authority (LMHRA). This involves sharing best practices in drug regulation and quality control.

• While India is a major defense exporter, the specific agreement in December 2025 did not focus on establishing defense manufacturing units in Liberia. Hence, statement 1 is incorrect.

• There have been no official records or announcements regarding initiating joint space missions between the Indian Space Research Organisation (ISRO) and Liberian agencies as a primary objective of this particular MoU. Hence, statement 2 is incorrect.

• Although India provides Line of Credit (LoC) for infrastructure projects in Africa, the December 2025 agreement was sector-specific to healthcare and medicine, not for constructing new highways. Hence, statement 4 is incorrect.

Additional Information

• India-Liberia Bilateral Relations: Diplomatic ties between the two nations were established in 1965. India has consistently supported Liberia through humanitarian assistance and capacity building programs.

• Economic Cooperation: India is one of the largest trading partners of Liberia. The major items of export from India include pharmaceuticals, engineering goods, and rice, while imports from Liberia mainly consist of wood and scrap metals.

• Pharmaceutical Sector: India is often referred to as the "Pharmacy of the World" because it supplies over 20% of the global generic medicine demand. These MoUs are vital for African countries to access affordable and high-quality healthcare.

• ITEC Program: Under the Indian Technical and Economic Cooperation (ITEC) program, India offers several scholarships and training slots to Liberian professionals in various fields, including IT, agriculture, and management.

• Development Assistance: India has extended Lines of Credit worth over $150 million to Liberia for projects such as the rehabilitation of power grids and water systems.

Important Points

• Regulatory Bodies: The CDSCO is the national regulatory body for Indian pharmaceuticals and medical devices. Cooperation with the LMHRA ensures that Indian drugs exported to West Africa comply with international quality benchmarks.

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• Significance of the Year 2025: This MoU marks a milestone in South-South Cooperation, emphasizing India's role as a reliable partner in the Global South for achieving Sustainable Development Goals (SDGs) related to health.

• Training and Capacity Building: A key component of the agreement is the training of Liberian regulators in Indian laboratories to understand testing protocols and pharmacovigilance.

Q88. Answer: (d) 12.2 m

Shortcut Trick

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

The height (opposite to 30°) corresponds to 1 unit.

The string length (hypotenuse) corresponds to 2 units.

Given: 2 units = 24.4 m

Height = 1 unit = 24.4 ÷ 2 = 12.2 m

Therefore Answer = 12.2 m

Alternate Method

Given:

Length of the string (Hypotenuse) = 24.4 m

Angle of inclination (θ) = 30°

Formula used:

sin θ = Perpendicular (Height) ÷ Hypotenuse

30° String = 24.4 m Height (h) Kite Ground Level

Calculations:

sin 30° = h ÷ 24.4

=> 1 ÷ 2 = h ÷ 24.4

=> h = 24.4 × (1 ÷ 2)

=> h = 12.2 m

Therefore The correct answer is 12.2 m.

Additional Information

Trigonometric Ratios

sin θ = P/H, cos θ = B/H, tan θ = P/B. For any height and distance problem, select the ratio involving the known and unknown sides.

30-60-90 Triangle Rule

In a right triangle with angles 30° and 60°, the sides opposite to these angles are in the ratio 1 : √3, and the hypotenuse is 2 units.

Angle of Elevation

The angle formed by the line of sight with the horizontal when looking up at an object. Here, the string angle with the ground is the angle of elevation.

Q89. Answer: (b) 316.67

Shortcut Trick

Relative speed in opposite direction = 110 + 120 = 230 km/hr.

Total distance (Sum of lengths) = (230 × 5/18) × 12 = 2300 ÷ 3 = 766.67 m.

Length of other train = Total distance − First train = 766.67 − 450 = 316.67 m.

Therefore Answer = 316.67

Alternate Method

Given:

Speed of train 1 (S1) = 110 km/hr

Speed of train 2 (S2) = 120 km/hr

Length of train 1 (L1) = 450 m

Time to cross (T) = 12 seconds

Formula used:

Relative Speed (Opposite) = S1 + S2

Total Distance = (L1 + L2) = Relative Speed × Time

Train 1: 450 m 110 km/hr Train 2: x m 120 km/hr Relative Speed = 110 + 120 = 230 km/hr Time taken to cross = 12 seconds

Calculations:

Relative Speed = 110 + 120 = 230 km/hr

=> Speed in m/s = 230 × (5 ÷ 18) = 1150 ÷ 18 = 575 ÷ 9 m/s

=> Total Distance = (575 ÷ 9) × 12

=> 450 + L2 = (575 × 4) ÷ 3

=> 450 + L2 = 2300 ÷ 3 ≈ 766.67

=> L2 = 766.67 − 450 = 316.67 m

Therefore The correct answer is 316.67 (Option 2).

Additional Information

Relative Speed Concept

When objects move in opposite directions, add speeds: V_(rel) = V1 + V2. In the same direction, subtract them: V_(rel) = |V1 − V2|.

Unit Conversion

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

Train Crossing Distance

When a train crosses another train or a bridge/platform, the total distance covered is the sum of the lengths of both objects.

Q90. Answer: (c) Hnahthial

The correct answer is Hnahthial.

Key Points

• The Hnahthial district in Mizoram was recognised as the best-performing district in NITI Aayog's North Eastern Region (NER) District SDG Index 2023–24.

• Hnahthial secured the first rank across the entire Northeast region with a composite score of 81.43.

• The district is classified as a "Front Runner" (scores between 65 and 99).

• Mizoram overall performed exceptionally well, with all 11 of its districts achieving "Front Runner" status.

• Other top-performing districts from the state include Champhai (ranked 2nd overall) and Kolasib (ranked 9th).

Additional Information

• Structure of the SDG Index: The NER District SDG Index evaluates districts based on 15 out of the 17 global SDGs. It utilizes a framework of 84 indicators tailored to the specific geographical and socio-economic context of the North Eastern Region.

• Performance Categories: Districts are classified into four categories based on their composite scores: Aspirant (0–49), Performer (50–64), Front Runner (65–99), and Achiever (100). In the 2023-24 report, a significant number of districts moved from the Performer to the Front Runner category.

• Mizoram's General Performance: Mizoram has consistently performed well in indicators related to SDG 4 (Quality Education) and SDG 15 (Life on Land) due to its high literacy rate and extensive forest cover. Districts like Champhai and Lunglei also show positive trends but Aizawl remains the administrative and developmental leader.

• Regional Leader: While Aizawl is the top district in Mizoram, districts from Sikkim (such as East Sikkim) and Tripura often compete for the top overall positions in the entire North Eastern Region.

• Objective of the Index: The primary objective is to foster Competitive Federalism among the districts of the North East. It encourages districts to improve their data collection systems and implement evidence-based policies to meet United Nations standards by 2030.

Important Points

• Date of Release: The SDG Index NE Districts 2023-24 was released in August 2024, reflecting data collected and analyzed over the preceding fiscal cycles.

• Technological Integration: The index utilizes an online dashboard maintained by NITI Aayog to provide real-time updates and interactive data visualization for policy makers and the general public.

• Key Themes: The index places heavy emphasis on SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), and SDG 5 (Gender Equality). For Mizoram, the challenges of SDG 9 (Industry, Innovation, and Infrastructure) remain a focus area due to the hilly terrain.

• Institutional Role: The NITI Aayog (National Institution for Transforming India), established on 1 January 2015, replaced the Planning Commission and acts as the premier policy Think Tank of the Government of India, overseeing the implementation of SDGs at the national and sub-national levels.

Q91. Answer: (a) $9p^2k^2$

Shortcut Trick

For $x^2 - 3px + q = 0$ with equal roots, each root is $-(-3p)/2 = 3p/2$.

Product of equal roots: $(3p/2) \times (3p/2) = q \Rightarrow q = 9p^2/4$.

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The common root must be 3p/2. Substitute it into $x^2 - 2kx + t = 0$.

$(3p/2)^2 - 2k(3p/2) + t = 0 \Rightarrow q - 3pk + t = 0$.

This gives $(t + q) = 3pk$. Squaring both sides, we get $(t + q)^2 = 9p^2k^2$.

Therefore Answer = $9p^2k^2$

Alternate Method

Given:

Equation 1: $x^2 - 3px + q = 0$ has equal roots.

Equation 2: $x^2 - 2kx + t = 0$ share one root with Equation 1.

Formula used:

For $ax^2 + bx + c = 0$, if roots are equal, then Discriminant $D = b^2 - 4ac = 0$ and root $x = -b/2a$.

Eq 1: Roots (α, α) Eq 2: Roots (α, β) $\alpha = 3p/2$ $q = (3p/2)^2$ $t + q = 3pk$

Calculations:

For $x^2 - 3px + q = 0$, equal roots mean $(-3p)^2 - 4(1)(q) = 0$

$\Rightarrow 9p^2 = 4q \Rightarrow q = 9p^2/4$.

$\Rightarrow$ The equal roots are $\alpha = -(-3p)/2 = 3p/2$.

$\Rightarrow$ Since Eq 1 and Eq 2 have a common root, $x = 3p/2$ must satisfy $x^2 - 2kx + t = 0$.

$\Rightarrow (3p/2)^2 - 2k(3p/2) + t = 0$

$\Rightarrow 9p^2/4 - 3pk + t = 0$

$\Rightarrow q - 3pk + t = 0$ (Substituting $q = 9p^2/4$)

$\Rightarrow t + q = 3pk$

$\Rightarrow$ Squaring both sides: $(t + q)^2 = (3pk)^2 = 9p^2k^2$.

Therefore The correct answer is $9p^2k^2$ (Option 1).

Additional Information

Condition for One Common Root

For $a1x^2 + b1x + c1 = 0$ and $a2x^2 + b2x + c2 = 0$, the condition for one root common is $(a1c2 - a2c1)^2 = (b1c2 - b2c1)(a1b2 - a2b1)$.

Condition for Both Roots Common

Two quadratic equations have both roots common if their coefficients are proportional: $a1/a2 = b1/b2 = c1/c2$.

Nature of Roots

If $D = b^2 - 4ac > 0$, roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.

Q92. Answer: (a) 63

Shortcut Trick

The average of the first n even natural numbers is always (n + 1).

Given n = 62.

Average = 62 + 1 = 63.

Therefore Answer = 63

Alternate Method

Given:

Total numbers (n) = 62

The numbers are: 2, 4, 6, ..., (2 × 62)

Formula used:

Average of an Arithmetic Progression (AP) = (First term + Last term) ÷ 2

First Term (2) Last Term (124) Average: (2 + 124) ÷ 2 Sequence of 62 Even Numbers

Calculations:

First term (a) = 2

$\Rightarrow$ Last term (l) = 2 × 62 = 124

$\Rightarrow$ Average = (2 + 124) ÷ 2

$\Rightarrow$ Average = 126 ÷ 2 = 63

Therefore The correct answer is 63 (Option 1).

Additional Information

Average of first n natural numbers

The average is calculated as (n + 1) ÷ 2.

Average of first n odd natural numbers

The average of the first n odd numbers is always equal to n.

Sum of first n even natural numbers

The sum is given by the formula n(n + 1).

Average of squares of first n natural numbers

The formula is (n + 1)(2n + 1) ÷ 6.

Q93. Answer: (b) FI-JM

The logic followed here is based on the alphabetical position pattern:

Option 1: ZD → CG

Option 2: FI → JM

Option 3: KO → NR

Option 4: QU → TX

Thus, FI–JM does not follow the same pattern.

Hence, the odd one out is Option 2.

Q94. Answer: (c) Mother's sister

Family Chart:

Decoding the Symbols:

Symbol	•	•	x	÷
Meaning	Daughter	Mother	Wife	Father

Given: G + R x W ÷ D - M

It means: G is the daughter of R, R is the wife of W, W is the father of D, D is the mother of M.

Thus, G is the mother’s sister of M.

Hence, the correct answer is Option 3.

Q95. Answer: (a) Debendranath Tagore

The correct answer is Debendranath Tagore.

Key Points

• Prarthana Samaj was a movement for religious and social reform in Bombay, India, founded in 1867. It was inspired by the Brahmo Samaj and sought to reform Hinduism from within.

• Atmaram Pandurang was the founder of the Prarthana Samaj. He established the organization on 31 March 1867 with the help of Keshab Chandra Sen, a prominent leader of the Brahmo Samaj.

• Mahadev Govind Ranade (popularly known as M.G. Ranade) joined the Samaj in 1870. He was the primary figure who popularized the movement and expanded its social reform activities across Maharashtra.

• R.C. Bhandarkar (also known as Ramakrishna Gopal Bhandarkar) was a renowned orientalist and scholar who was a founding member and a pillar of the Prarthana Samaj. He provided the theological and intellectual foundation for the movement.

• Debendranath Tagore was a leader of the Brahmo Samaj in Bengal and founded the Tattvabodhini Sabha in 1839. While his work influenced movements across India, he was not directly associated with the Prarthana Samaj in Bombay. Hence, Debendranath Tagore is the correct option.

Additional Information

• Social Reforms: The Prarthana Samaj focused on social justice, including the abolition of the caste system, the promotion of women's education, and widow remarriage. It also campaigned against child marriage and untouchability.

• Religious Philosophy: Unlike the Brahmo Samaj, the Prarthana Samaj did not seek to form a new religion but remained within the Hindu fold. It emphasized monotheism and the worship of one God through prayer and bhakti (devotion), drawing inspiration from Marathi saint-poets like Namdev and Tukaram.

• Institutions: Under the leadership of M.G. Ranade, the Samaj established various institutions, such as orphanages, night schools for the working class, and asylums. In 1861, Ranade helped found the Widow Marriage Association.

• Influence of Keshab Chandra Sen: The organization was heavily influenced by Keshab Chandra Sen’s visit to Bombay in 1864. His progressive ideas and eloquent speeches motivated local intellectuals to start a reformist society.

Important Points

• Location and Reach: The Prarthana Samaj was primarily based in the Bombay Presidency. While it shared common goals with the Brahmo Samaj of Bengal and the Arya Samaj of Punjab, its approach was more gradualist and moderate.

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• Key Leaders: Other notable members included N.M. Joshi, who later founded the Social Service League in 1911, and G.G. Agarkar. These individuals contributed significantly to the modernization of Indian society in the 19th century.

• Literature: The Samaj published journals and pamphlets to spread its message. The Subodh Patrika was a weekly journal published by the Samaj to educate the public on social and religious issues.

• Comparison with Brahmo Samaj: While the Brahmo Samaj broke away from orthodox Hindu traditions more radically, the Prarthana Samaj leaders preferred to remain as social protesters within the existing religious structure.

Q96. Answer: (c) Both statements I and II together are NOT sufficient to answer the question

Given Statements:

I. Ishan is older than Gaurav but younger than Lokesh.

II. Mukul is older than Ishan but younger than Lokesh.

Analysis:

I. From Statement I → Lokesh > Ishan > Gaurav, but no information about Himanshu and Mukul → Not sufficient.

II. From Statement II → Lokesh > Mukul > Ishan, but no information about Gaurav and Himanshu → Not sufficient.

Using both I and II together →

From I: Lokesh > Ishan > Gaurav

From II: Lokesh > Mukul > Ishan

=> Combining: Lokesh > Mukul > Ishan > Gaurav

But, Himanshu's position is unknown, so the third oldest cannot be uniquely determined.

Hence, the correct answer is Option 3.

Q97. Answer: (b) Neither conclusion (I) nor (II) follows.

Given Statements:

All tigers are wolves.

All jackals are wolves.

All animals are wolves.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some animals are tigers – False (No direct or necessary overlap between animals and tigers is given, so this does not necessarily follow).

II. Some jackals are animals – False (Jackals and animals are both only subsets of wolves, but no relation is given between them, so overlap is not certain).

So, neither conclusion I nor II follows.

Hence, the correct answer is "Option 2".

Q98. Answer: (a) 20%

Shortcut Trick

Profit percentage is independent of the number of items sold (59 dozens).

CP of 1 article = 520 ÷ 12

SP of 1 article = 52

Ratio CP : SP = (520 ÷ 12) : 52 → 10 : 12 = 5 : 6

Profit % = (Difference ÷ CP unit) × 100 = (1 ÷ 5) × 100 = 20%

Therefore Answer = 20%

Alternate Method

Given:

CP of articles = Rs. 520 per dozen

SP of each article = Rs. 52

Total quantity purchased = 59 dozens

Formula used:

Profit = SP − CP

Profit % = (Profit ÷ CP) × 100

CP (1 Doz) Rs. 520 SP (1 Doz) Rs. 624 Profit: +Rs. 104 Profit % = (104 ÷ 520) × 100 = 20%

Calculations:

CP of 1 dozen articles = Rs. 520

=> SP of 1 article = Rs. 52

=> SP of 12 articles (1 dozen) = 52 × 12 = Rs. 624

=> Profit per dozen = 624 − 520 = Rs. 104

=> Profit % = (104 ÷ 520) × 100

=> Profit % = (1 ÷ 5) × 100 = 20%

Therefore The correct answer is 20% (1).

Additional Information

Profit and Loss Percent

Profit or Loss percentage is always calculated on the Cost Price (CP) unless stated otherwise. Profit % = (Profit ÷ CP) × 100.

Marked Price (MP)

The price at which an article is labeled is called the Marked Price. Discount is always offered on the Marked Price: SP = MP − Discount.

Relationship between CP and MP

The ratio of CP to MP can be expressed as CP ÷ MP = (100 − Discount%) ÷ (100 + Profit%).

Successive Discounts

If two successive discounts of a% and b% are given, the single equivalent discount is (a + b − ab ÷ 100)%.

Q99. Answer: (c) Resistive touch

The correct answer is Resistive touch.

Key Points

• A Resistive touch screen is a sensor consisting of two flexible layers coated with a resistive material (usually Indium Tin Oxide or ITO) and separated by an air gap or micro-dots. When pressure is applied to the surface, the two layers touch, completing an electrical circuit and allowing the device to register the location of the touch. Hence, the description provided in the question matches the functionality of Resistive touch.

• This technology is pressure-sensitive, meaning it does not require a conductive object (like a human finger) to operate; it can detect input from a plastic stylus, fingernails, or even gloved hands. Hence, the statement regarding non-conductive objects is correct.

• The Resistive touch system is widely used in industrial applications, medical devices, and point-of-sale (POS) terminals because of its high durability against dust and water.

• It was one of the earliest touchscreen technologies, commercialized in the 1970s after being invented by Dr. G. Samuel Hurst in 1971 (originally called the "Elograph").

• While cost-effective, Resistive touch screens generally do not support multi-touch gestures like pinching or zooming and have lower image clarity (around 75% to 80%) compared to other technologies because of the multiple layers involved.

Additional Information

• Capacitive touch:

• This technology uses a layer of conductive material (like ITO) that stores an electrical charge.

• When a conductive object, such as a human finger, touches the screen, it draws a small amount of current to the point of contact, creating a voltage drop that the controller processes as an input.

• It is highly responsive, supports multi-touch, and provides high clarity, making it the standard for modern smartphones (e.g., iPhone, Samsung Galaxy) and tablets.

• However, it generally does not work with gloves or standard plastic styluses because they lack conductivity.

• Infrared grid touch:

• This system uses an X-Y grid of infrared LED emitters and photo-detectors around the edges of the screen.

• When an object touches the screen, it interrupts the invisible light beams, allowing the sensors to pinpoint the coordinates.

• It is used in large-scale displays, outdoor kiosks, and military applications because it provides 100% light transmission and high durability.

• Surface acoustic wave (SAW):

• SAW technology uses ultrasonic waves that pass over the touchscreen panel.

• When the panel is touched, a portion of the wave is absorbed, and the transducers detect the change to register the event.

• It offers superior image clarity and resolution compared to resistive screens but can be affected by surface contaminants like grease or dirt.

Important Points

• Comparison of Features: Resistive screens are preferred in logistics and factories (year-round use with tools/gloves), while Capacitive screens dominate the consumer electronics market (year 2007 onwards) due to the user experience.

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• Technical Limitations: Resistive touch screens are susceptible to scratches because the top layer must be flexible (usually polyester) rather than hard glass.

• Calibration: Resistive panels often require periodic re-calibration to ensure the software correctly aligns with the physical touch point as the flexible layers age over time.

Q100. Answer: (b) H2SO4

The correct answer is H2SO4.

Key Points

• The atmosphere of Venus is famously thick and toxic, consisting primarily of Carbon Dioxide (96.5%) and Nitrogen (3.5%).

• The most defining feature of the Venusian atmosphere is its permanent layer of thick clouds composed of droplets of sulfuric acid (H2SO4). These clouds are highly reflective, which is why Venus appears as the brightest object in the sky after the Moon.

• These sulfuric acid clouds are located at an altitude of 45 to 70 kilometers above the planet's surface. The concentration of the acid in these droplets is estimated to be between 75% and 96%.

• The formation of sulfuric acid on Venus occurs through photochemical reactions. In the upper atmosphere, ultraviolet radiation from the Sun breaks down carbon dioxide and water vapor, which then react with sulfur dioxide (SO2) to create H2SO4.

• Unlike Earth, where clouds are made of water vapor, the environment of Venus is extremely caustic due to the high concentration of this mineral acid.

Additional Information

• Planet Characteristics: Venus is often described as Earth's twin because of its similar mass, size, and composition. However, its atmospheric conditions are vastly different and hostile to life.

• Runaway Greenhouse Effect: Because of the high carbon dioxide concentration, Venus experiences a runaway greenhouse effect. This makes it the hottest planet in our solar system, with surface temperatures reaching approximately 467°C (872°F), which is hot enough to melt lead.

• Atmospheric Pressure: The surface pressure on Venus is immense, measuring about 92 times that of Earth. This is comparable to the pressure found at a depth of 1 kilometer under Earth's oceans.

• Retrograde Rotation: Venus is unique because it rotates on its axis in the opposite direction (retrograde) compared to most other planets. A day on Venus (243 Earth days) is actually longer than its year (225 Earth days).

• Volcanic Activity: Venus has a surface covered with thousands of volcanoes. It is believed that volcanic outgassing is the primary source of the sulfur dioxide that maintains the sulfuric acid clouds.

Important Points

• Virga Phenomenon: While it "rains" sulfuric acid in the upper layers of the Venusian atmosphere, the heat near the surface is so intense that the droplets evaporate before they can touch the ground. This phenomenon is known as virga.

• Chemical Formula: The correct answer H2SO4 represents Sulfuric Acid. The other options provided in the question represent:

• HNO3: Nitric Acid.

• HCl: Hydrochloric Acid.

• HCOOH: Formic Acid.

• Exploration History: Several missions have studied this atmosphere, most notably the Venera series by the Soviet Union and the Magellan orbiter by NASA. The Venera 13 probe was the first to send back color images of the surface in 1982, surviving for only about two hours in the extreme conditions.

• Phosphine Discovery: In 2020, researchers reported the potential detection of phosphine gas in the clouds of Venus, which sparked debates about the possibility of microbial life existing within the sulfuric acid layers, although this remains unconfirmed.

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