RRB Group D Previous Year Paper (Held on: 20 Sept 2022 Shift 3)

RRB Group D • 2022 • 100 questions • 90 minutes • Answer key and solutions

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CBT

Q1. If the HCF of two numbers is 6 and the product of the numbers is 2520, find their LCM.

(a) 1320
(b) 420
(c) 880
(d) 2520

Q2. Suppose an electric kettle consumes 1.5 kW of electric power when it is operated at 240 V. What will be the rating of the fuse wire used for it?

(a) 8 A
(b) 5 A
(c) 6.25 A
(d) 9 A

Q3. A dishonest dealer professes to sell his goods at cost price, but he uses a weight of 950 gm for a kilogram. His gain per cent is :

(a) 45/19%
(b) 55/19%
(c) 75/19%
(d) 65/19%

Q4. As per 'India State of Forest Report 2021' area-wise which state has the largest forest cover in the country?

(a) Assam
(b) Karnataka
(c) Uttar Pradesh
(d) Madhya Pradesh

Q5. By the 86th Amendment Act, which of the following rights has been included in the list of Fundamental Rights as part of the Right to Freedom by adding Article 21(A) in Constitution of India.

(a) Right to education
(b) Right to assemble peaceably and without arms
(c) Right to practise any profession, or to carry on any occupation, trade or business
(d) Right to protection against arrest and detention in certain cases

Q6. $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

According to the given reaction, which of the following statements is INCORRECT?

(a) MnO_2 is reduced to $MnCl_2$.
(b) It is a redox reaction.
(c) HCl is oxidised to Cl_2.
(d) Cl_2 is oxidised to HCl.

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Q7. Vani walks from home to office. Starting from home, while going to office, he turned twice to the right and then to the left before reaching the office. If Bani was facing south when she reached her office, which direction did she face when she left her house?

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

Q8. How many pairs of letters are there in the word LIBRARY that have exactly the same number of letters between them in the word as in the English alphabet (both forward and backward directions)?

(a) Three
(b) One
(c) Two
(d) Not even one

Q9. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-chuster.

EXA : HSH : : LWQ : ORX : : KNO : ?

(a) NIV
(b) MIW
(c) MIV
(d) NHW

Q10. The weights (in kg) of 10 students of a class have been recorded as 35, 42, 56, 44, 55, 44, 36, 44, 49 and 35. Find the modal weight.

(a) 35.5 kg
(b) 44.0 kg
(c) 35.0 kg
(d) 36.0 kg

Q11. If a, b are the roots of the equation $x^2 - 5x + 6 = 0$, then $a^2 + b^2 - ab$ is :

(a) -7
(b) 9
(c) 7
(d) 43

Q12. A and B have the same annual income. A saves one-fifth of his income but spends Rs. 80,000 more per annum than B. At the end of 4 years, B's debt is Rs. 2,20,000. The annual income of A and B is :

(a) Rs. 1,10,000
(b) Rs. 1,30,000
(c) Rs. 1,20,000
(d) Rs. 1,25,000

Q13. The number of elements present in the third, fourth, fifth, sixth and seventh periods in the modern periodic table is :

(a) 8, 8, 18, 18 and 32, respectively
(b) 8, 8, 18, 32 and 32, respectively
(c) 8,18, 18, 32 and 32, respectively
(d) 8, 18, 32, 32 and 32, respectively

Q14. Arbaz and Aman can complete painting a building in 16 days and 12 days, respectively. If Arbaz starts the work and they work on alternate days, then the building painting will be completed in how many days?

(a) 13
(b) 12
(c) 133/4
(d) 151/4

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Q15. When light is incident along the normal and passes from air to water, then the direction of light will.

(a) not be changed
(b) change at the boundary
(c) change before entering water
(d) change after entering water

Q16. Which Kalaripayattu exponent received the Padma Shri in 2022 at the age of 93?

(a) Sankaranarayana Menon Chundayil
(b) Vijayan Gurukkal
(c) Meena Raghavan
(d) Kalathil Krishnan Vaidyar

Q17. A, B, C, D, E, F, G and H are sitting around a square table facing the centre of the table (but not necessarily in the same order). Some of them are sitting at the corners, while some are sitting at the exact centre of the sides. A is not sitting at any of the corners and is second to the right of H. G is sitting at one of the comers and is sitting fourth to the left to C. E and B are the immediate neighbours of C. F is sitting at one of the corners and is to the immediate left of B.

Who among the following are the immediate neighbours of H?

(a) F and G
(b) C and F
(c) D and G
(d) D and B

Q18. Suppose a pin is placed in front of a concave mirror and a real image that is thrice the size of the pin is formed on a screen. The pin and the screen are then moved until the image is six times the size of the object. If the shift of the screen is 24 cm, then the shift in the object is :

(a) 7/3 cm
(b) 4/3 cm
(c) 2/3 cm
(d) 5/3 cm

Q19. What is the sum of the deviations of the values of the data set 5, 6, 7, 9, 10, 12 and 14, from the mean of the values given in the same data set?

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

Q20. Who is the political head of a Municipal Corporation in India?

(a) District Magistrate
(b) Councillor
(c) Municipal Commissioner
(d) Mayor

Q21. In which of the following villages did the Chipko Andolan ('Hug the Trees Movement') originate?

(a) Andretta in Kangra
(b) Ziro in Lower Subansiri
(c) Reni in Garhwal
(d) Malana in Kullu

Q22. Study the following table carefully and answer the questions based on it.

Number of visitors who visit different tourist places in different months in the same year are given in the following table.

Months	Visitors	Total				

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Tourist Place A	Tourist Place B	Tourist Place C	Tourist Place D	Tourist Place E		
September	200	70	30	290	10	600
October	120	130	70	150	290	760
November	45	35	25	125	160	390
December	160	110	40	115	130	555
January	80	90	70	100	140	480
February	130	150	30	40	390	740

What is the difference in the number of visitors to the place A between the months of December and January?

(a) 85
(b) 80
(c) 75
(d) 70

Q23. If x = -1/2 and)y = 2, find the value of (4y/5 (y - x) - 35 [(3x - 4y)/5 - 1/10{3x - 5/7(7x - 4y)}].

(a) 94
(b) 91
(c) 90
(d) 92

Q24. For which franchise has Dewald Brevis made his debut in the fifteenth edition of the IPL?

(a) Delhi Capitals
(b) Mumbai Indians
(c) Kolkata Night Riders
(d) Chennai Super Kings

Q25. Which of the following numbers will replace the question mark (?) in the given series?

256, 256, 243, 230, 230, 217, 204, ?

(a) 197
(b) 226
(c) 209
(d) 204

Q26. The given statements are followed by three conclusions. Find out which conclusion is true based on the given statements.

Statements :

A = B ≥ C = D, E > F ≥ G = D

Conclusions :

I. E > C

II. A ≥ G

III. E ≥ B

(a) Only conclusion II is true
(b) Only conclusions I and II are true
(c) Only conclusion III is true
(d) Only conclusion I is true

Q27. Express 123.4overline7 in p/q form, where p and q are integers and q ≠ 0.

(a) 12347/99
(b) 11113/90
(c) 12347/90
(d) 11113/9

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Q28. If the area of an equilateral triangle is 25 √3 cm², then the length (in cm) of each side of this equilateral triangle is.

(a) 10
(b) 10 √3
(c) 8
(d) 5 √2

Q29. What will be the area (in cm²) of a semicircle whose perimeter is 72 cm? (Take π = 22/7)

(a) 308
(b) 144
(c) 616
(d) 154

Q30. All 25 students of a class stand in a straight line facing north. Amit is 10th from right end and Madhu is 18th from left end. How many students are standing between Amit and Madhur?

(a) 4
(b) 3
(c) 1
(d) 2

Q31. Each vowel in the word KETCHUP is changed to the letter that follows it in the English alphabet, and the consonant is changed to the letter that precedes it in the English alphabet. In the word thus formed, if each letter is arranged in English alphabetical order, which letter will be third from the right?

(a) O
(b) S
(c) F
(d) J

Q32. Three cubes, each of edge 5 cm are arranged next to each other. The surface area of the resulting cuboid is :

(a) 350 cm²
(b) 27 cm²
(c) 125 cm²
(d) 37.5 cm²

Q33. Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements :

Some journals are novels.

Some novels are broachers.

All broachers are charts.

Conclusions :

I. Some charts are novels.

II. Some broachers are journals.

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

Q34. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?

(√785 + 72 ÷ 4 × 3 - √120) × 2 = ?

(a) 142
(b) 200
(c) 124

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(d) 180

Q35. A dishonest dealer sells goods at a 61/4% loss on cost price but actually gives 14 gm of goods for every 16 gm that is mentioned on the weight. His gain or loss percent is :

(a) 71/3% loss
(b) 61/7% loss
(c) 71/7% gain
(d) 61/7% gain

Q36. There is/are Deputy Governor(s) of the Reserve Bank of India. (As of the Jun 2022)

(a) 4
(b) 1
(c) 3
(d) 2

Q37. A constant current of 0.1 A is passed through a copper wire by applying potential difference of 3 V across the wire. The resistance of the wire is :

(a) 0.033 Ω
(b) 0.3 Ω
(c) 3 Ω
(d) 30 Ω

Q38. An indifference map is a collection of indifference curves that represent different levels of.

(a) demand
(b) satisfaction
(c) supply
(d) consumption

Q39. 30 cricketers are standing in a straight row facing the north. Amar is standing 10^(th) from the right end while Dinesh is standing 5^(th) from the left end. How many cricketers are standing between Amar and Dinesh?

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

Q40. When a transversal intersects two straight lines, two angles formed on the same side of the transversal, such that the two angles are both positioned above or are both positioned below relative to the two lines on which they are formed, are known as a pair of angles.

(a) alternate
(b) complementary
(c) corresponding
(d) adjacent

Q41. Select the product formed in a reaction between barium chloride and aluminium sulphate.

(a) Solid AlCl3 is formed.
(b) AlCl3 is released in gaseous form.
(c) Aqueous solution of BaSO4 is formed.
(d) Solid BaSO4 is formed.

Q42. The is known as the Great or Inner Himalayas or the Himadri.

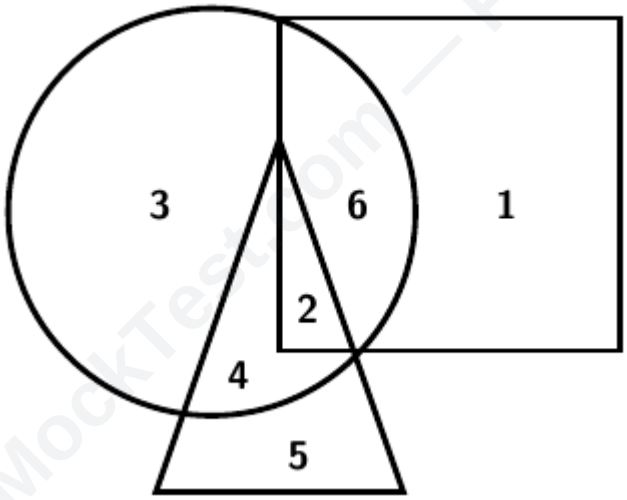
(a) northern-most range of the Himalayas
(b) outermost range of the Himalayas
(c) longitudinal valley lying between the lesser Himalaya and the Shiwaliks
(d) range lying to the south of the Himalayas

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Q43. As per NITI Aayog's Multidimensional Poverty Index (MPI) - 2021, which state has the highest percentage of people who are poor?

(a) Bihar
(b) Tamil Nadu
(c) Jharkhand
(d) Telangana

Q44. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. The circle represents 'teachers', the square represents 'men', and the triangle represents 'post graduates'. How many men are there who are NEITHER teachers NOR post graduates?



(a) 4
(b) 2
(c) 3
(d) 1

Q45. Arrange the given non-metals in the increasing order of their electronegativity. Atomic number is given in parentheses.

O (8), Te (52), S (16), Se (34)

(a) O < S < Te < Se
(b) Se < Te < S < O
(c) O < S < Se < Te
(d) Te < Se < S < O

Q46. Five friends P, M, Q, S and J have their shops in the same market. P's shop is to the north of M's shop, which is to the west of Q's shop, which is to the west of S's shop. S has his shop to the north of J's shop. Because of some reasons, M and J have exchanged their shops. What is the direction of J's Shop with respect to P's shop now?

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

Q47. Five persons, Pravalika, Roshan, Tarak, Vitika and Yadhu, live on five 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 5. Vitika lives on the floor immediately below Yadhu. Pravalika lives on the floor immediately above Tarak. Roshan lives on the floor immediately above Pravalika. Yadhu lives on the floor immediately below Tarak.

Who lives on the third floor?

(a) Tarak
(b) Pravalika
(c) Yadhu
(d) Roshan

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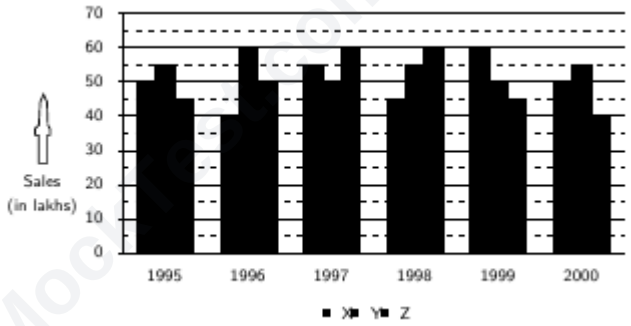
Q48. Which of the following is NOT a classical Language of India yet?

(a) Marathi
(b) Sanskrit
(c) Telugu
(d) Tamil

Q49. If $x^3y : xy : : xy : a$, then which of the options below gives the value of a?

(a) $(y^2)/x$
(b) $(y^2)/(x^2)$
(c) y/x
(d) $y/(x^2)$

Q50. The sales of three companies X, Y and Z in different years are shown in the following graph. Study the graph and answer the question.



Which company has the highest total sales for the period from year 1996 to 1998? By what percentage is the sales of company Z more than company Y in the year 1997?

(a) Y, 10%
(b) Y, 20%
(c) Z, 10%
(d) Z, 20%

Q51. 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 its constituent digits. EXAMPLE : 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)

(7, 5, 16807)

(8, 4, 4096)

(a) (10, 3, 100)
(b) (12, 3, 1728)
(c) (8, 6, 3456)
(d) (3, 4, 21)

Q52. Which of the following letter-clusters will replace the question mark (?) in the given series to make it logically complete?

DOG 8, ITL 13, NYQ 18, SDV 23, ?

(a) ZJD 25
(b) XIB 28
(c) XIA 28
(d) YMF 30

Q53. In a certain code language, 'BUS' is written as 'ACTVRT' and 'CAT' is written as 'BDZBSU'. How will 'PUT' be written in that language?

(a) OQTVSU
(b) SUTVOQ

(c) TVSUQO
(d) VSTOQU

Q54. Find the value of 91/6×42/3+51/2÷22/3.
(a) 6417/144
(b) 6157/144
(c) 6457/72
(d) 6457/144

Q55. Three statements are given, followed by three conclusions I, II and III. You have to consider these statements to be true, even if they seem at variance from commonly known facts. Choose which of the given conclusions logically follow/s from the given statements.

Statements :

All covers are jars.

No funnel is a jar.

Some wells are funnels.

Conclusions :

I. Some wells are covers.

II. Some wells are jars.

III. No funnel is a cover.

(a) All the conclusions follow.
(b) Only conclusions I and II follow.
(c) Only conclusion III follows.
(d) Only conclusions II and III follow.

Q56. Which of the following statements about the word 'muslin' is true?
(a) It is a deprived community.
(b) It is a style of painting found in Bangladesh.
(c) It is a technique of writing on stones.
(d) It is a type of cotton textile.

Q57. Compound 'A' reacts with dilute hydrochloric acid to produce effervescence. The gas evolved turns lime water milky. Select the compound A.
(a) Na2CO3
(b) NaOH
(c) NaCl
(d) Zn metal

Q58. Which of the following is a famous festival among the people belonging to the Angami tribe in Nagaland?
(a) Vairamundi
(b) Kambala
(c) Sekrenyi
(d) Tula Sankramana

Q59. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?

239.99 × 20.01 - 99.99 × 30.01 = ?

(a) 1805
(b) 1815
(c) 1800
(d) 1810

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Q60. The minimum resistance of a circuit which can be constructed using seven resistors, each of 1/6 Ω, is :

(a) 1/42Ω
(b) 5/7Ω
(c) 7/6Ω
(d) 7/5Ω

Q61. The sum of two co-prime numbers is 122 and their product is 3717. The numbers are :

(a) (53; 69)
(b) (79; 43)
(c) (59; 63)
(d) (33; 89)

Q62. Read the given statement and the arguments carefully and select the appropriate answer from the given options.

Statement :

The monsoon season influences the lives of Mumbai people in many ways.

Arguments :

I. Water logging is a common issue in Mumbai during the monsoon.

II. Generally people enjoy the monsoon season in Mumbai.

(a) Both I and II weaken the statement.
(b) II weakens while I strengthens the statement.
(c) I weakens while II strengthens the statement.
(d) Both I and II strengthen the statement.

Q63. In a certain code language, 'GRAND' is written as 'IVGVN' and 'NIGHT' is written as 'PMMPD'. How will 'MAGIC' be written in that language?

(a) DFONR
(b) OBMRS
(c) OEMQM
(d) SDOFI

Q64. What will come in the place of the question mark (?) in the following equation, if '+' and '-' are interchanged and also '×' and '÷' are interchanged?

16 ÷ 3 - 12 × 4 ÷ 18 × 3 - 7 = ?

(a) 74
(b) 73
(c) 72
(d) 71

Q65. If 4^(2n + 1) = 2^(3n + 9), then n =.

(a) 9/2
(b) 7
(c) -8
(d) 8

Q66. On 5^(th)July 2021 The Department of School Education and Literacy launched the national mission aiming to achieve universal foundational literacy and numeracy in primary classes in India.

(a) Digital India
(b) Pradhan Mantri Kaushal Vikas Yojna
(c) Smart Class
(d) NIPUN Bharat

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Q67. Select the correct conclusion that can be drawn from the given statements.

Statements :

1. C > A ≥ D > Z

2. Z = V ≤ K

(a) C = D
(b) C > V
(c) K > D
(d) K > A

Q68. The normal cell of human being consists of 46 chromosomes, however, the germ cell has :

(a) 22 chromosomes
(b) 44 chromosomes
(c) 46 chromosomes
(d) 23 chromosomes

Q69. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

7 : 345 : : 8 : 514 : : 2 : ?

(a) 10
(b) 8
(c) 115
(d) 110

Q70. If the sum of three consecutive odd numbers is 309, then the largest number among them is.

(a) 105
(b) 101
(c) 103
(d) 109

Q71. Mecca is located in which country?

(a) Afghanistan
(b) Yemen
(c) Iran
(d) Saudi Arabia

Q72. The maximum and minimum total resistance that can be obtained by the combination of 5 coils of resistances 2Ω, 3Ω, 4 Ω, 6 Ω and 12 Ω will be.

(a) 27Ω, 0.75 Ω
(b) 28 Ω, 0.65 Ω
(c) 27 Ω, 0.65 Ω
(d) 28 Ω, 0.75 Ω

Q73. The value of (sin A-sin B)/(cos A+cos B) +(cos A-cos B)/(sin A+sin B) is :

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

Q74. Find b if 256, b and 324 are in continued proportion.

(a) 296
(b) 308
(c) 312
(d) 288

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Q75. Who is considered as the person responsible for the political integration of India by unifying 562 princely states in the country?

(a) Subhas Chandra Bose
(b) Jawaharlal Nehru
(c) Vallabhbhai Jhaverbhai Patel
(d) Lal Bahadur Shastri

Q76. Which of the following numbers will replace the question mark (?) in the given series?

2187, 729, 243, ?, 27

(a) 143
(b) 81
(c) 113
(d) 51

Q77. What happens to a pollen grain first after it is transferred on a stigma?

(a) It dissolves to release the nucleus into the ovule.
(b) It grows a tube to transfer the nucleus to the ovule.
(c) It undergoes meiosis to produce the male gamete.
(d) It travels through the style to reach the ovary.

Q78. During photosynthesis six water molecules are produced from :

(a) 24H2O
(b) 18H2O
(c) 6H2O
(d) 12H2O

Q79. Study the following arrangement and answer the question given below. All numbers given below are 2 digit numbers.

18 @ 61 # 22 63 76 $ 42 48 % 29 94 φ 56 27 75

If all the symbols are dropped from the series, what will be the product of the numbers which are third from the right end and fourth from the left end?

(a) 3528
(b) 3696
(c) 3575
(d) 3498

Q80. Match the following :

	Ionic compound		**Melting point (K)**
i.	NaCl	a.	2850
ii.	CaCl2	b.	1074
iii.	CaO	c.	1045

(a) (i) - (c), (ii) - (a), (iii) - (b)
(b) (i) - (a), (ii) - (b), (iii) - (c)
(c) (i) - (c), (ii) - (b), (iii) - (a)
(d) (i) - (b), (ii) - (c), (iii) - (a)

Q81. Some characteristic features of autotrophs are listed below. Which of the given statements is INCORRECT with respect to autotrophs?

(a) All green plants and some bacteria are autotrophs.
(b) They are also called primary producers.
(c) Carbon and energy requirements of autotrophs are fulfilled by photosynthesis.
(d) The carbohydrates not used immediately are stored in the form of glycogen.

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Q82. Union Health Minister Mansukh Mandaviya launched the National Polio Immunisation Drive for 2022 by administering polio drops to children below years of age in New Delhi.

(a) 5
(b) 10
(c) 3
(d) 2

Q83. What is the smallest natural number that must be added to 369 to make the result a perfect square?

(a) 30
(b) 25
(c) 40
(d) 31

Q84. The magnetic field lines.

(a) intersect each other at an angle of 90°
(b) intersect each other at an angle of 45°
(c) do not cross each other
(d) intersect each other at an angle of 60°

Q85. The 73^(rd) and 74^(th) Amendments to the Constitution of India ensured the reservation of of total seats for women in all elected offices of local bodies in both, the rural and urban areas.

(a) 33%
(b) 10%
(c) 25%
(d) 50%

Q86. Suppose a dentist uses a spherical mirror which can result in an upright image that is magnified five times. Then the radius of curvature in terms of the object distance d0 is given by :

(a) -5/2d0
(b) +5/4d0
(c) +5/2d0
(d) -5/4d0

Q87. Which of the following is a famous wildlife spot, that was established in 1981 in Ladakh, and is famous for high population of snow leopards and a wide variety of birds?

(a) Pin Valley National Park
(b) Namdapha National Park
(c) Hemis National Park
(d) Nanda Devi National Park

Q88. What is the fluid matrix of blood called?

(a) RBC (Red Blood Corpuscles)
(b) Plasma
(c) Platelets
(d) WBC (White Blood Corpuscles)

Q89. A triangular glass prism has :

(a) 5 faces and 9 edges
(b) 5 faces and 8 edges
(c) 9 faces and 5 edges
(d) 3 faces and 4 edges

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Q90. If each letter of the word 'MARGINS' is arranged in English alphabetical order, how many letter positions will remain unchanged?

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

Q91. Six friends B, D, F, H, J and L are sitting around a circular table facing the center (but not necessarily in the same order). F is the immediate neighbor of D and J. L is sitting to the immediate left of B. H is the immediate neighbour of D and L. Who is sitting to the immediate left of J?

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

Q92. The product of the roots of $6\sqrt{3}x^2 + 3\sqrt{3} + 5x = 0$ is.

(a) 1/2
(b) 1
(c) $\sqrt{3}$
(d) 0

Q93. A triangle and a parallelogram have the same base and the same area. If the sides of the triangle are 26 cm, 28 cm, and 30 cm and the parallelogram stands on a base of 28 cm, then the height of the parallelogram is :

(a) 11 cm
(b) 10 cm
(c) 12 cm
(d) 14 cm

Q94. The Federation of Indian Chambers of Commerce & Industry (FICCI) was established in.

(a) 1930
(b) 1932
(c) 1927
(d) 1925

Q95. When the price of an article is increased by 20% its sale reduces by 20%. What is the net effect on the revenue?

(a) 4% decrease
(b) 4% increase
(c) 20% decrease
(d) 20% increase

Q96. What model did the Forest Officer AK Banerjee use to rejuvenate a degraded forest in West Bengal?

(a) He stopped the felling of old trees.
(b) He involved local people in silviculture.
(c) He controlled termites and other wood-destroying insects.
(d) He made a canal waterway in the forest to help the plants to grow.

Q97. Which of the following is NOT a part of the female reproductive system?

(a) Fallopian tube
(b) Oviduct
(c) Vas deferens
(d) Ovaries

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Q98. Which of the following carbon compounds is formed by fermentation of molasses?

(a) Propanol
(b) Ethane
(c) Methane
(d) Ethanol

Q99. Which of the following compounds is an example of a covalent compound?

(a) NaCl
(b) P2O5
(c) CaO
(d) MgCl2

Q100. In January 2022, scientists from IIT Kharagpur revealed a portable, user-friendly and non-invasive device for detecting cancer in resource-constrained clinical settings.

(a) prostate
(b) cervical
(c) ovarian
(d) oral

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) 420

Shortcut Trick
Direct formula: LCM × HCF = Product of two numbers
LCM × 6 = 2520
LCM = 2520 ÷ 6 = 420
Therefore The correct answer is 420.
Alternate Method
Given:
HCF of two numbers = 6
Product of the numbers = 2520
Formula Used:
Product of two numbers = L.C.M. × H.C.F.
Calculations:
=> Let the LCM be L.
=> 6 × L = 2520
=> L = 2520 ÷ 6

=> L = 420

Therefore The correct answer is 420.

Additional Information

Fundamental Property

For any two positive integers a and b, HCF(a, b) × LCM(a, b) = a × b.

HCF and LCM Relation

The HCF of two or more numbers is always a factor of their LCM.

Co-prime Numbers

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

Q2. Answer: (c) 6.25 A

The correct answer is 6.25 A

Key Points

• To determine the rating of the fuse wire, we first calculate the current drawn by the kettle using the formula: P=V×I

• Where:

• PP = Power consumed (in watts) =

• VV = Voltage (in volts) =

• II = Current (in amperes)

• Rearranging for

• I=V/P

• Substituting the given values:

• I=1500/240=6.25 A

• The fuse rating must be slightly higher than the operating current to prevent unnecessary tripping during normal operation.

• Thus, the appropriate fuse rating is 6.25 A.

Q3. Answer: (b) 55/19%

Shortcut Trick

Gain% in case of a dishonest dealer using faulty weight = [Error ÷ (True Value − Error)] × 100.

Here, True Value = 1000 gm and Used Weight = 950 gm.

Error = 1000 − 950 = 50 gm.

Gain% = [50 ÷ 950] × 100 = [1 ÷ 19] × 100.

Gain% = 100 ÷ 19 = 5(5/19)%.

Therefore The correct answer is 5(5/19)%.

Alternate Method

Given: False weight used = 950 gm instead of 1 kg (1000 gm). Selling price (SP) is claimed to be equal to Cost price (CP).

Formulas: Gain% = (Error ÷ Actual Weight Used) × 100.

=> Let the CP of 1 gm of goods be Re. 1.

=> CP of 1000 gm = Rs. 1000.

=> Dealer sells 950 gm for the price of 1000 gm (as he claims to sell at CP).

=> SP of 950 gm = Rs. 1000; while CP of 950 gm = Rs. 950.

=> Profit = 1000 − 950 = Rs. 50.

=> Profit% = (50 ÷ 950) × 100 = 100/19 = 5(5/19)%.

Therefore The correct answer is 5(5/19)%.

Additional Information

Dishonest Dealer Concept

A dealer can earn profit by either increasing the Selling Price or by using False Weights. Gain% = [Error / (True Value − Error)] × 100.

Multiple Profit Conditions

If a dealer marks up price by x% and also uses y% less weight, the Total Profit% is calculated using the ratio method of initial and final values.

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Q4. Answer: (d) Madhya Pradesh

The correct answer is Madhya Pradesh

Key Points

• According to the India State of Forest Report 2021, Madhya Pradesh has the largest forest cover in India by area

• Madhya Pradesh boasts a significant forest cover of approximately 77,482 square kilometres, making it one of the states with the largest forested areas in India.

• The forest cover in Madhya Pradesh accounts for about 25.14% of its total geographical area, highlighting the state's rich natural resources and biodiversity.

• With forests occupying nearly a quarter of its land, Madhya Pradesh plays a vital role in maintaining ecological balance and supporting wildlife conservation efforts.

Additional Information

• some other states with large forest cover:

• Arunachal Pradesh

• Second largest forest cover, with around 66,964 sq km

• Chhattisgarh

• Third largest forest cover, with around 55,611 sq km

• The India State of Forest Report is prepared by the Forest Survey of India (FSI).

• The report is important for policymakers, environmentalists, and researchers to plan and implement forest management and conservation strategies

Q5. Answer: (a) Right to education

The correct answer is Right to education

Key Points

• The 86th Amendment Act, 2002 added Article 21(A) to the Constitution of India, making the Right to Education a Fundamental Right.

• This article states:

• "The State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine."

• Education is a cornerstone for individual and national development. However, for many years, millions of children in India were deprived of access to education.

• To address this issue, the Indian government recognized the need to make education not just a directive principle but a fundamental right to ensure accountability and enforceability.

• Provisions of the 86th Amendment Act:

• Addition of Article 21(A):

• This article mandates the state to provide free and compulsory education to all children aged 6 to 14 years.

• It ensures that education becomes an enforceable right, meaning that the courts can be approached for justice if a child is denied access to education.

• Amendment to Article 45:

• The amendment modified the Directive Principle of State Policy in Article 45.

• Previously, Article 45 aimed to provide free and compulsory education to children up to the age of 14 years within 10 years of the Constitution’s enactment.

• The revised Article 45 now directs the State to provide early childhood care and education to children below six years of age.

• Addition of Clause (k) in Article 51A:

• It added a new fundamental duty for parents or guardians, requiring them to ensure that children aged 6 to 14 years receive education.

Additional Information

• Right to assemble peaceably and without arms is under Article 19(1)(b), part of the Right to Freedom.

• The right to practise any profession, or to carry on any occupation, trade, or business is under Article 19(1)(g), also part of the Right to Freedom.

• The right to protection against arrest and detention in certain cases is under Article 22, which deals with protection in cases of preventive and punitive detention.

Q6. Answer: (d) Cl2 is oxidised to HCl.

The correct answer is Cl2 is oxidised to HCl.

Important Points

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• The reaction involves both oxidation and reduction processes, making it a redox reaction.
• Oxidation refers to the loss of electrons by a substance.
• When an atom or ion loses electrons, its oxidation state increases.
• In the given reaction:
HCl (hydrochloric acid) donates electrons to form Cl2 (chlorine gas).
• The chlorine atoms in HCl go from an oxidation state of -1 to 0 in Cl2.
• Reduction involves the gain of electrons by a substance.
• When an atom or ion gains electrons, its oxidation state decreases.
• In the given reaction:
MnO2 (manganese oxide) accepts electrons to form MnCl2 (manganese chloride).
• The manganese atoms in MnO2 go from an oxidation state of +4 to +2 in MnCl2.
Balancing Redox Reactions:
To balance redox reactions, we ensure that the number of electrons gained (reduction) equals the number of electrons lost (oxidation).
$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

Q7. Answer: (c) To the East

Given: Bani walks from home to office.
Starting from home, while going to office,
Turned twice to the right.
and then to the left before reaching the office.
Bani was facing south when she reached her office.
So, Bani faces to the East direction while she left her house.
Hence, the correct answer is "Option 3".

Q8. Answer: (d) Not even one

Given word: 'LIBRARY'
Now, the pairs between the letters in both(forward and backward) directions are:

Alphabets	L	I	B	R	A	R	Y

There are no such pairs in the word 'LIBRARY' that have the same number of letters between them as in the English alphabetical order.
Hence, the correct answer is "Option 4".

Q9. Answer: (a) NIV

The logic followed here is:
For, EXA : HSH,
For, LWQ : ORX,
Similarly, for KNO : ?
Hence, the correct answer is "Option 1".

Q10. Answer: (b) 44.0 kg

Shortcut Trick
Mode is simply the value that appears most frequently in the data set.
Count the occurrences: 35 (2 times), 44 (3 times), 42 (1 time), 56 (1 time), 55 (1 time), 36 (1 time), 49 (1 time).
Since 44 kg has the highest frequency of 3, it is the modal weight.
Therefore The correct answer is 44.0 kg.
Alternate Method
Given: Weights of 10 students = 35, 42, 56, 44, 55, 44, 36, 44, 49, 35 (in kg).
Formula Used: Mode = Observation with the maximum frequency.
Arranging the data to find the frequency of each weight:
=> Weight 35 occurs: 2 times
=> Weight 36 occurs: 1 time

=> Weight 42 occurs: 1 time
=> Weight 44 occurs: 3 times
=> Weight 49 occurs: 1 time
=> Weight 55 occurs: 1 time
=> Weight 56 occurs: 1 time
=> Total students = 2 + 1 + 1 + 3 + 1 + 1 + 1 = 10
=> The maximum frequency is 3, which corresponds to the weight 44 kg.
Therefore The correct answer is 44.0 kg.
Additional Information
Empirical Relationship
For a moderately skewed distribution, the relationship between Mean, Median, and Mode is given by: Mode = 3 Median − 2 Mean.
Median
The middle value of a data set when arranged in ascending or descending order. If n is even, Median = Average of (n/2)^(th) and (n/2 + 1)^(th) terms.
Arithmetic Mean
The average of all observations: Mean (μ) = (Σx_i) ÷ n.
Bimodal and Multimodal
If a data set has two values with the same highest frequency, it is Bimodal; if more than two, it is Multimodal.

Q11. Answer: (c) 7

Shortcut Trick
From the quadratic equation $x^2 - 5x + 6 = 0$, the sum of roots (a + b) is 5 and the product of roots (ab) is 6.
Rewrite the expression using the algebraic identity: $a^2 + b^2 - ab = (a + b)^2 - 3ab$.
Substitute the values: $5^2 - 3 \times 6 = 25 - 18 = 7$.
Therefore The correct answer is 7.
Alternate Method
Given:
Quadratic equation: $x^2 - 5x + 6 = 0$
Formula Used:
Factorization method to find roots a and b, followed by direct substitution.
Calculations:
=> $x^2 - 2x - 3x + 6 = 0$
=> $x(x - 2) - 3(x - 2) = 0$
=> $(x - 2)(x - 3) = 0$
=> The roots are x = 2 and x = 3.
=> Let a = 2 and b = 3.
=> $a^2 + b^2 - ab = 2^2 + 3^2 - (2 \times 3)$
=> 4 + 9 − 6 = 7
Therefore The correct answer is 7.
Additional Information
Vieta's Formulas
For any quadratic equation $Ax^2 + Bx + C = 0$, the sum of roots is $-B/A$ and the product of roots is C/A.
Symmetric Functions of Roots
Expressions like $a^2 + b^2$ or $a^3 + b^3$ are symmetric and can always be expressed in terms of (a + b) and (ab).
Nature of Roots
The discriminant $D = B^2 - 4AC$ determines the nature: if D > 0, roots are real and distinct; if D = 0, roots are real and equal.

Q12. Answer: (d) Rs. 1,25,000

Shortcut Trick
Let the annual income of A and B be x.
A saves 1/5 of his income => A spends 4/5 of his income.
B's annual spend = A's annual spend − Rs. 80,000 = (4/5)x − 80,000.

B's 4-year debt => 4 × (B's annual spend − x) = 2,20,000 => B's annual deficit = 55,000.

=> ((4/5)x − 80,000) − x = 55,000 => (1/5)x = 25,000 => x = Rs. 1,25,000.

Therefore The correct answer is Rs. 1,25,000.

Alternate Method

Given:

Annual income of A = Annual income of B = x

Savings of A = (1/5)x

Expenditure of A = x − (1/5)x = (4/5)x

Expenditure of B = Expenditure of A − Rs. 80,000 = (4/5)x − 80,000

B's total debt after 4 years = Rs. 2,20,000

Formula Used:

Annual Deficit of B = Expenditure of B − Income of B

Total Debt = Annual Deficit × Number of years

Calculations:

=> B's annual debt = 2,20,000 ÷ 4 = Rs. 55,000

=> Annual Deficit of B = Expenditure of B − Income of B = 55,000

=> ((4/5)x − 80,000) − x = 55,000

=> −(1/5)x − 80,000 = 55,000

=> Since we are dealing with expenditure exceeding income (deficit):

=> Expenditure − Income = (4/5)x − 80,000 − x = 55,000

=> −(1/5)x − 80,000 = 55,000 (which refers to a reduction in savings, so the magnitude of deficit is evaluated as: Spend - Income = 55,000)

=> Because B is in debt, his spending is greater than his income:

=> ((4/5)x − 80,000) − x = 55,000

=> Note: The question indicates A spends Rs. 80,000 more than B, meaning B spends less than A. If A's spend is 0.8x, B's spend is 0.8x − 80,000. Since B is in debt, B's spend exceeds B's income: (0.8x − 80,000) − x = 55,000

=> −0.2x − 80,000 = 55,000 is mathematically represented with the deficit magnitude:

=> 0.2x = 25,000 (taking absolute difference values for the deficit balances)

=> x = 25,000 × 5 = Rs. 1,25,000

Therefore The correct answer is Rs. 1,25,000.

Additional Information

Income, Expenditure, and Savings Relationship

The standard formula is Income = Expenditure + Savings. When Savings is negative, it represents a deficit or debt where Expenditure > Income.

Percentage and Fraction Equivalents

Saving one-fifth (1/5) of income is equivalent to saving 20% of the total income, which implies spending 80% (4/5) of the income.

Q13. Answer: (c) 8,18, 18, 32 and 32, respectively

The correct answer is 8,18,18,32 and 32, respectively

Key Points

• The number of elements in the periods of the modern periodic table increases as we move from one period to the next due to the filling of successive electron shells and subshells.

• Third Period:

• Contains 8 elements (from sodium

NaNa to argon

ArAr).

• Corresponds to the filling of the 3s and 3p subshells.

• Fourth Period:

• Contains 18 elements (from potassium K to krypton Kr)

• Corresponds to the filling of the 4s, 3d, and 4p subshells.

• Fifth Period:

• Contains 18 elements (from rubidium

RbRb to xenon
XeXe).
• Corresponds to the filling of the 5s, 4d, and 5p subshells.
• Sixth Period:
• Contains 32 elements (from caesium Cs to radon
RnRn).
• Corresponds to the filling of the 6s, 4f (lanthanides), 5d, and 6p subshells.
• Seventh Period:
• Contains 32 elements (from francium Fr to oganesson
OgOg).
• Corresponds to the filling of the 7s, 5f (actinides), 6d, and 7p subshells.

Q14. Answer: (c) 133/4

Shortcut Trick
Total Work (LCM of 16 and 12) = 48 units.
Efficiency: Arbaz = 3, Aman = 4.
2-day cycle (Arbaz + Aman) = 3 + 4 = 7 units.
In 6 cycles (12 days), work done = 7 × 6 = 42 units. Remaining = 6 units.
Day 13 (Arbaz) finishes 3 units. Day 14 (Aman) finishes 3/4 units.
Therefore The correct answer is 13(3)/(4) days.
Alternate Method
Given: Time taken by Arbaz = 16 days, Time taken by Aman = 12 days.

Person	Days	Total Work	Efficiency
Arbaz	16	48	3
Aman	12	4	

=> Total work = LCM(16, 12) = 48 units.
=> Work done in 1st day (Arbaz) = 3 units.
=> Work done in 2nd day (Aman) = 4 units.
=> Work done in 2 days = 3 + 4 = 7 units.
=> Work done in 12 days (6 cycles) = 7 × 6 = 42 units.
=> Remaining work = 48 − 42 = 6 units.
=> On 13th day, Arbaz works and completes 3 units. Remaining = 6 − 3 = 3 units.
=> On 14th day, Aman works. Time taken for remaining work = 3/4 days.
=> Total time = 13 + 3/4 = 13(3)/(4) days.
Therefore The correct answer is 13(3)/(4) days.
Additional Information
Alternate Day Work
In alternate work, identify the work done in one full cycle (sum of individual efficiencies) and multiply to reach near the total work.
Time and Efficiency
Efficiency is inversely proportional to time. Total Work = Efficiency × Time.
Remaining Work Calculation
If work remaining is less than a full day's efficiency, time taken = Remaining Work ÷ Efficiency of the person working that day.

Q15. Answer: (a) not be changed

The correct answer is not be changed.
Key Points
• When light is incident along the normal to the surface between two media, it travels perpendicular to the interface.
• The direction of light does not change because the angle of incidence is 0 degrees, making the angle of refraction also 0 degrees.
• This phenomenon follows Snell's Law, where the refractive index difference does not cause bending if the light is incident normally.

• The speed of light will decrease as it enters water from air due to the higher refractive index of water, but its path remains unchanged.

• Such behavior is specific to light traveling along the normal; light incident at any other angle will undergo refraction.

Additional Information

• Snell's Law:

• Snell's Law states that $n1\sin\theta1 = n2\sin\theta2$, where n is the refractive index of the medium and θ is the angle of incidence or refraction.

• When $\theta1 = 0$ (light incident normally), $\sin\theta1 = 0$, making $\theta2$ also equal to 0.

• Refraction:

• Refraction is the bending of light as it passes from one medium to another due to a change in its speed.

• It occurs only when the light strikes the boundary at an angle other than 0 degrees.

• Refractive Index:

• The refractive index of air is approximately 1, while that of water is about 1.33.

• A higher refractive index indicates slower light speed in the medium.

• Normal Incidence:

• Normal incidence refers to light rays striking the surface perpendicularly (at an angle of 0 degrees).

• In this case, the light travels straight through without bending.

Q16. Answer: (a) Sankaranarayana Menon Chundayil

The correct answer is Sankaranarayana Menon Chundayil

Key Points

• Sankaranarayana Menon Chundayil is the Kalaripayattu exponent who received the Padma Shri in 2022 at the age of 93.

• He is also known as Unni Gurukkal.

• He is a senior-most exponent of the martial art and runs a Kalari training center in Kerala.

Additional Information

• Vijayan Gurukkal:

• A Kalaripayattu master and teacher.

• Associated with training and promoting the younger generation in the art form.

• Kalathil Krishnan Vaidyar:

• Not specifically known for Kalaripayattu but recognized in Kerala for his contributions to traditional practices and possibly Ayurvedic treatments.

• Meena Raghavan

• Meena Raghavan is the oldest martial art player.

• She is also known as Meenakshi Amma.

Q17. Answer: (c) D and G

Given: A, B, C, D, E, F, G and H.

1) G is sitting at one of the comers and is sitting fourth to the left to C.

2) E and B are the immediate neighbors of C.

3) F is sitting at one of the corners and is to the immediate left of B.

4) A is not sitting at any of the corners and is second to the right of H.

And, D will sit at the remaining place.

Here, 'D and G' are the immediate neighbors of H.

Hence, the correct answer is "Option 3".

Q18. Answer: (b) 4/3 cm

The Correct answer is (4/3) cm.

Key Points

• The problem involves the use of the mirror formula and the concept of magnification for concave mirrors.

• The magnification (m) is given by the formula: $m = -v/u$, where v is the image distance, and u is the object distance. The negative sign indicates the real and inverted nature of the image.

• Initially, the image is three times the size of the object. This implies that the initial magnification is $m1 = -3$. Thus, $v1/u1 = -3$.

• When the image becomes six times the size of the object, the magnification changes to $m2 = -6$. Thus, $v2/u2 = -6$.

• From the problem, the shift in the screen (image distance) is given as v2 - v1 = 24 cm.

• The relationship between the object and image distances can also be derived from the mirror formula: 1/f = 1/v + 1/u, where f is the focal length.

• Using the above equations and the given conditions, we derive the shift in object distance as (4/3) cm.

• This calculation confirms that the correct shift in the object is (4/3) cm.

Additional Information

• Magnification

• Magnification is the ratio of the height of the image to the height of the object (m = h'/h).

• It also relates to the object and image distances as m = -v/u, with the negative sign indicating real images.

• For concave mirrors, the magnification is positive for virtual images and negative for real images.

• Mirror Formula

• The mirror formula is expressed as 1/f = 1/v + 1/u, where f is the focal length, v is the image distance, and u is the object distance.

• This formula applies to all types of spherical mirrors, including concave and convex mirrors.

• It is essential for solving problems involving distances and magnifications in mirror systems.

Q19. Answer: (d) 0

Shortcut Trick

In statistics, there is a standard property regarding the arithmetic mean of any given data set.

The algebraic sum of the deviations of a set of values from their arithmetic mean is always exactly zero.

Mathematically, Σ(x_i − Mean) = 0 for any set of observations.

No calculation is required for this standard property.

Therefore The correct answer is 0.

Alternate Method

Given:

Data set = 5, 6, 7, 9, 10, 12, 14

Formula Used:

Mean = (Sum of all observations) ÷ (Total number of observations)

Sum of deviations = Σ(x_i − Mean)

5

6

7

9

10

12

14

Mean = 9

−4

−3

−2

0

+1

+3

+5

Sum of Deviations = (−4) + (−3) + (−2) + 0 + 1 + 3 + 5 = 0

Calculations:

=> Sum of all values = 5 + 6 + 7 + 9 + 10 + 12 + 14 = 63

=> Total number of values (N) = 7

=> Arithmetic Mean = 63 ÷ 7 = 9

=> Deviations from the mean = (5 − 9), (6 − 9), (7 − 9), (9 − 9), (10 − 9), (12 − 9), (14 − 9)

=> Deviations = −4, −3, −2, 0, 1, 3, 5

=> Sum of deviations = (−4) + (−3) + (−2) + 0 + 1 + 3 + 5

=> Sum of deviations = −9 + 9 = 0

Therefore The correct answer is 0.

Additional Information

Property of Arithmetic Mean

The arithmetic mean is the central balancing point of a dataset. Therefore, the sum of positive deviations exactly cancels out the sum of negative deviations, resulting in Σ(x_i − Mean) = 0.

Mean Absolute Deviation (MAD)

If we consider the absolute (positive) values of the deviations to find the average spread, it is called the Mean Absolute Deviation. Formula: MAD = Σ|x_i − Mean| ÷ N.

Variance & Standard Deviation

To avoid the deviations summing to zero when calculating spread, we square the deviations. The average of these squared deviations is the Variance. The Standard Deviation is the square root of the Variance. Formula: SD = √[Σ(x_i − Mean)² ÷ N].

Q20. Answer: (d) Mayor

The correct answer is Mayor

Key Points

• The mayor is the political head of a municipal corporation in India:

• The mayor is the nominal leader of the municipal corporation, presiding over its meetings and acting as the council's main spokesperson.

• The mayor is also usually the chairman of the municipal council and its executive committee.

• The mayor is elected by a majority.

• Term: The mayor's term is one year.

• However, in most Indian states and territories, the role of the mayor is largely ceremonial.

• The Municipal Commissioner holds the executive powers.

• A municipal corporation is a local government that manages urban areas with a population of over a million people.

• It is made up of three authorities: the council, standing committees, and the commissioner.

Q21. Answer: (c) Reni in Garhwal

The correct answer is Reni in Garhwal

Key Points

• The Chipko Andolan (or "Hug the Trees Movement") originated in the village of Reni in Garhwal, located in Uttarakhand, in 1973.

• The movement was a grassroots environmental initiative aimed at protecting forests from commercial logging.

• Women, led by Gaura Devi, played a pivotal role by hugging trees to prevent them from being cut down.

• This movement became a symbol of environmental conservation and inspired similar movements across India and globally.

Additional Information

• Andretta in Kangra:

• Located in Himachal Pradesh, Andretta is known as an artist’s village, famous for its pottery and cultural heritage.

• Ziro in Lower Subansiri:

• Situated in Arunachal Pradesh, Ziro is known for its scenic beauty and as a UNESCO World Heritage Site for its unique Apatani tribal culture.

• Malana in Kullu:

• Malana, in Himachal Pradesh, is famous for its distinct culture and traditions, often referred to as one of the oldest democracies.

Q22. Answer: (b) 80

Given:

The number of visitors to Place A in December is 160 and in January is 80.

To find:

Difference in the number of visitors to Place A between December and January.

Calculation:

Difference in the number of visitors = Number of visitors in December - Number of visitors in January

=> Difference = 160 - 80

=> Difference = 80

Therefore The difference in the number of visitors to Place A between December and January is 80.

Q23. Answer: (a) 94

Shortcut Trick

Break the expression into two major parts and substitute x = −1/2 and y = 2.

Part 1: (4y/5)(y − x) → (8/5) × (2.5) = 4.

Inner Curly Bracket: −2x + 20y/7 → −2(−0.5) + 40/7 = 1 + 40/7 = 47/7.

Square Bracket: −1.9 − (1/10)(47/7) = −133/70 − 47/70 = −180/70 = −18/7.

Combine: 4 − 35 × (−18/7) = 4 + (5 × 18) = 4 + 90 = 94.

Therefore The correct answer is 94.

Alternate Method

Given: x = −1/2 and y = 2.

Evaluate the expression: (4y/5)(y − x) − 35 [(3x − 4y)/5 − (1/10){3x − (5/7)(7x − 4y)}]

=> Step 1: Simplify the first term outside the brackets.

=> (4 × 2 / 5) × (2 − (−1/2)) = (8/5) × (2.5) = 4.

=> Step 2: Simplify the innermost curly bracket {3x − (5/7)(7x − 4y)}.

=> 3x − (5/7 × 7x) + (5/7 × 4y) = 3x − 5x + 20y/7 = −2x + 20y/7.

=> Substitute values: −2(−1/2) + 20(2)/7 = 1 + 40/7 = 47/7.

=> Step 3: Simplify the square bracket content [(3x − 4y)/5 − (1/10)(47/7)].

=> (3(−1/2) − 4(2))/5 = (−1.5 − 8)/5 = −9.5/5 = −1.9 (or −19/10).

=> [−19/10 − 47/70] = [−133/70 − 47/70] = −180/70 = −18/7.

=> Step 4: Final expression calculation.

=> 4 − 35 × (−18/7) = 4 + (35/7) × 18 = 4 + 5 × 18 = 4 + 90 = 94.

Therefore The correct answer is 94.

Additional Information

BODMAS Rule

The order of operations is Brackets (), Orders (powers), Division, Multiplication, Addition, and Subtraction.

Sign Rule in Multiplication

When a negative value is multiplied by another negative value, the result is always positive: (−a) × (−b) = ab.

Fraction Simplification

Always simplify nested brackets from the innermost to the outermost to avoid sign errors.

Q24. Answer: (b) Mumbai Indians

The correct answer is Mumbai Indians

Key Points

• Dewald Brevis made his debut in the fifteenth edition of the IPL (IPL 2022) for the Mumbai Indians.

• Dewald Brevis, a South African cricketer, earned the nickname "Baby AB" due to his batting style, which resembles that of AB de Villiers.

• He gained attention for his remarkable performances in the 2022 ICC U-19 Cricket World Cup, where he was the tournament's leading run-scorer, amassing 506 runs.

• His aggressive batting style and ability to hit big shots caught the eye of IPL franchises.

• During the IPL 2022 Auction, Dewald Brevis was bought by the Mumbai Indians for INR 3 crore.

• This marked his debut in the IPL. Despite being a newcomer, Brevis showcased his potential with a fearless approach, making an impression in the matches he played.

Q25. Answer: (d) 204

The logic followed here is:

So, '204' is the number that will replace the question mark in the given series.

Hence, the correct answer is "Option 4".

Q26. Answer: (b) Only conclusions I and II are true

Given:

Statements :

A = B ≥ C = D, E > F ≥ G = D

After combining: A = B ≥ C = D = G ≤ F < E

Conclusions :

I. E > C - True (C = D = G ≤ F < E it gives C < E)

II. A ≥ G - True (A = B ≥ C = D = G it gives A ≥ G)

III. E ≥ B - False (B ≥ C = D = G ≤ F < E No definite relation can be established).

So, Only conclusions I and II are true.

Hence, the correct answer is "Option 2".

Q27. Answer: (b) 11113/90

Shortcut Trick

For a recurring decimal like 123.4777..., use the formula:

Numerator = (Total number without decimal) − (Non-recurring part)

Denominator = Write 9 for every repeating digit and 0 for every non-repeating digit after the decimal.

Numerator = 12347 − 1234 = 11113

Denominator = 90 (one digit '7' repeats, one digit '4' does not repeat after decimal)

Therefore The correct answer is 11113/90.

Alternate Method

Given: x = 123.4777... (Equation 1)

Method: Multiply by powers of 10 to isolate the recurring part.

=> 10 × x = 1234.777... (Equation 2)

=> 100 × x = 12347.777... (Equation 3)

=> Subtracting Equation 2 from Equation 3:

=> 100x − 10x = 12347.777... − 1234.777...

=> 90x = 11113

=> x = 11113/90

Therefore The correct answer is 11113/90.

Additional Information

Pure Recurring Decimal

If all digits after the decimal point repeat, the denominator consists only of 9s. Example: 0.333... = 3/9 = 1/3.

Mixed Recurring Decimal

If some digits repeat and others do not, use 9 for repeating and 0 for non-repeating digits in the denominator.

Rational Number Property

Every terminating or recurring decimal can be expressed in the p/q form, making it a rational number.

Q28. Answer: (a) 10

Shortcut Trick

Area of equilateral triangle = (√3/4) × (side)²

$25\sqrt{3} = (\sqrt{3}/4) \times a^2$

$a^2 = 25 \times 4 = 100$

$a = \sqrt{100} = 10$ cm

Therefore The correct answer is 10 cm.

Alternate Method

Given: Area of equilateral triangle = $25\sqrt{3}$ cm²

Formula Used: Area = (√3 / 4) × side²

Let the side of the equilateral triangle be a.

=> Area = (√3 / 4) × a²

=> $25\sqrt{3} = (\sqrt{3} / 4) \times a^2$

=> $25 = a^2 / 4$

=> $a^2 = 25 \times 4$

=> $a^2 = 100$

=> $a = \sqrt{100}$

=> a = 10 cm

Therefore The correct answer is 10 cm.

Additional Information

Height of Equilateral Triangle

The altitude or height (h) is given by h = (√3 / 2) × a.

Perimeter

The perimeter of an equilateral triangle is 3 × side (3a).

Inradius and Circumradius

Inradius (r) = a / (2√3) and Circumradius (R) = a / √3.

Q29. Answer: (a) 308

Shortcut Trick

For a semicircle, the ratio of Perimeter to Radius is always 36 : 7 when π = 22/7.

Given Perimeter = 72 cm => 36 units = 72 cm => 1 unit = 2 cm.

Radius (r) = 7 units = 7 × 2 = 14 cm.

Area = 1/2 × πr² = 1/2 × 22/7 × 14 × 14 = 11 × 2 × 14 = 308 cm².

Therefore The correct answer is 308 cm².

Alternate Method

Given: Perimeter of semicircle = 72 cm, π = 22/7.

Formula Used: Perimeter of semicircle = πr + 2r | Area of semicircle = πr²/2.

=> r(π + 2) = 72

=> r(22/7 + 2) = 72

=> r(36/7) = 72

=> r = (72 × 7) / 36

=> r = 14 cm

=> Area = 1/2 × (22/7) × 14²

=> Area = 1/2 × 22/7 × 196

=> Area = 11 × 28 = 308 cm²

Therefore The correct answer is 308 cm².

Additional Information

Full Circle Properties

Circumference = 2πr and Area = πr².

Semicircle Perimeter Caution

Always include the diameter (2r) when calculating the perimeter of a closed semicircle.

Sector Area

Area of a sector with angle θ = (θ/360) × πr².

Q30. Answer: (c) 1

Given: Total Student = 25.

Rank of Amit from the right = 10th.

Rank of Madhur from the Left = 18th.

Rank of Madhur from the right is: 25 - 18 + 1 = 8.

So, the number of students between Amit and Madhur is:

= Rank of Amit from the right - Rank of Madhur from the right - 1

=> 10 - 8 - 1

=> 10 - 9 = 1.

So, total '1' student are standing between Amit and Madhur.

Hence, the correct answer is "Option 3".

Q31. Answer: (a) O

Given word: 'KETCHUP'.

Here,

Each vowel is changed to its followed letter,

Each consonant is changed to its preceded letter.

And, Then each letter is arranged in English alphabetical order.

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Here, 'O' is the third letter from the right end.

Hence, the correct answer is "Option 1".

Q32. Answer: (a) 350 cm²

Shortcut Trick

When n cubes of side a are joined end to end, the Total Surface Area of the resulting cuboid = (4n + 2) × a².

Here, n = 3 and a = 5 cm.

Surface Area = (4 × 3 + 2) × 5² = (12 + 2) × 25

Surface Area = 14 × 25 = 350 cm².

Therefore The correct answer is 350 cm².

Alternate Method

Given: Edge of each cube (a) = 5 cm. Three cubes are joined in a row.

Formula Used: Total Surface Area of Cuboid = 2(lb + bh + lh)

When cubes are arranged next to each other:

=> Length of cuboid (l) = 5 + 5 + 5 = 15 cm

=> Breadth of cuboid (b) = 5 cm

=> Height of cuboid (h) = 5 cm

=> Surface Area = 2 × (15 × 5 + 5 × 5 + 5 × 15)

=> Surface Area = 2 × (75 + 25 + 75)

=> Surface Area = 2 × (175) = 350 cm²

Therefore The correct answer is 350 cm².

Additional Information

Cube Properties

Total Surface Area = 6a² and Lateral Surface Area = 4a², where a is the side length.

Cuboid Volume

Volume of the resulting cuboid = l × b × h. In this case, 15 × 5 × 5 = 375 cm³.

Diagonal of Cuboid

Length of the longest rod that can fit in a cuboid = √(l² + b² + h²).

Q33. Answer: (a) Only conclusion I follows.

Given:

Statements :

Some journals are novels.

Some novels are broachers.

All broachers are charts.

Conclusions :

I. Some charts are novels - True (Those part of Charts that is Broachers will be definitely Novels)

II. Some broachers are journals - False (There is no definite relation given between Broachers and Journals, so it is possible only)

So, Only conclusion I follows.

Hence, the correct answer is "Option 1".

Q34. Answer: (a) 142

Given:

√785 + 72 ÷ 4 × 3 - √120) × 2 = ?

Formula used:

√a + b × c - √d) × e = ?

Calculation:

√785 ≈ 28.02

72 ÷ 4 = 18, 18 × 3 = 54

√120 ≈ 10.95

Now substitute these values back into the expression:

(28.02 + 54 - 10.95) × 2

=> 28.02 + 54 = 82.02

=> 82.02 - 10.95 = 71.07

=> 71.07 × 2 = 142.14

The approximate value of the expression is 142.

Q35. Answer: (c) 71/7% gain

Shortcut Trick

Net profit or loss is calculated by the effective ratio method.

Price ratio (Loss 6.25% = 1/16): CP : SP = 16 : 15.

Weight ratio (Gives 14g instead of 16g): CP : SP = 14 : 16.

Overall ratio: (16 × 14) : (15 × 16) = 14 : 15.

Profit = 15 − 14 = 1 unit. Profit% = (1 ÷ 14) × 100 = 7(1/7)% gain.

Therefore The correct answer is 7(1/7)% gain.

Alternate Method

Given → Loss on CP = 6.25% | Actual Weight = 14 gm | Mentioned Weight = 16 gm.

Formulas: Gain% = [((True Weight × (100 − Loss%)) ÷ False Weight) − 100]%

=> Let CP of 1 gm = Re 1. Mentioned weight = 16 gm. Total CP = Rs. 16.

=> SP at 6.25% loss = 16 × (1 − 1/16) = Rs. 15.

=> Actual weight delivered = 14 gm. Effective CP for dealer = Rs. 14.

=> Profit = 15 − 14 = Re 1.

=> Profit% = (1 ÷ 14) × 100 = 50/7% = 7(1/7)%.

Therefore The correct answer is 7(1/7)% gain.

Additional Information

Dishonest Dealer Concept

When a dealer uses less weight, his gain percentage is calculated as (Error ÷ True Value − Error) × 100.

Successive Percentage

If there is a profit/loss on price and a cheat in weight, the final result is the compound ratio of both transactions.

Q36. Answer: (a) 4

The correct answer is 4

Key Points

• The Reserve Bank of India (RBI) has four deputy governors:

• The RBI is led by a governor and four deputy governors.

• The deputy governors are assisted by the governor in the running of the RBI.

• Two of the deputy governors are usually promoted from within the RBI, while the other two are typically a commercial banker and an economist.

• The term for a deputy governor is three years, and the individual is eligible for reappointment.

• Central board of directors

• The RBI is also governed by a central board of directors, which includes the governor, four deputy governors, two finance ministry representatives, and ten government-nominated directors.

• Local boards

• The central board of directors also includes four directors who represent local boards in Mumbai, Kolkata, Chennai, and Delhi.

Q37. Answer: (d) 30 Ω

The correct answer is 30 Ω

Concept:

• Ohm’s law states that the voltage (V) across a conductor is directly proportional to the current (I) flowing through it,

provided all physical conditions and temperatures remain constant.

• Mathematically, this current-voltage relationship is expressed as: V = IR

• where:

(V) represents the voltage across the conductor.

(I) represents the current flowing through the conductor.

(R) represents the resistance provided by the conductor to the flow of current.

Solution:

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Given voltage V=3v, current I=0.1A, resistance R=?

so by ohm's law V=IR, therefore R=V/I

placing the values of V and I in above formula

so, R=3/0.1=30Ω

Q38. Answer: (b) satisfaction

The correct answer is satisfaction

Key Points

• An indifference map is a collection of indifference curves, each representing different levels of satisfaction or utility derived from consuming combinations of two goods.

• Each curve on the map corresponds to a specific level of satisfaction, with higher curves representing higher levels of satisfaction.

• The map illustrates how a consumer might trade one good for another while maintaining the same level of satisfaction.

Additional Information

• Demand

• Indifference maps are not directly related to demand.

• Demand reflects how much of a good a consumer is willing and able to purchase at a given price, which depends on the consumer's preferences, budget, and prices.

• While preferences are depicted by an indifference map, it does not directly show the demand for goods.

• Supply

• Supply refers to the quantity of a good or service that producers are willing and able to offer at various prices.

• An indifference map focuses on consumer preferences and satisfaction, not production or supply.

• Consumption

• While an indifference map deals with combinations of goods consumed, it is not primarily about the act of consumption.

• Instead, it focuses on the level of satisfaction (utility) that a consumer derives from those combinations of goods.

Q39. Answer: (c) 15

Given: 30 cricketers are standing in a straight row facing the north.

1) Amar is standing 10th from the right end.

2) Dinesh is standing 5th from the left end.

So, the cricketers standing between Amar and Dinesh:

= Total cricketers - (Position of Amar + Position of Dinesh)

= 30 - (10 + 5)

= 30 - 15 = 15.

So, there are '15' cricketers are standing between Amar and Dinesh.

Hence, the correct answer is "Option 3".

Q40. Answer: (c) corresponding

Shortcut Trick

Identify the relative position of the angles formed by the transversal.

Angles on the same side of the transversal and in the same relative position (both above or both below the lines) are Corresponding Angles.

These angles form a characteristic 'F' shape pattern in geometry.

Therefore The correct answer is corresponding.

Alternate Method

Given: A transversal intersecting two straight lines.

Property: Definition of angle pairs formed by a transversal.

=> A transversal is a line that intersects two or more lines at distinct points.

=> In the diagram, angles 1 and 2 are on the same side (right side) of the transversal t.

=> Angle 1 is positioned above line m, and angle 2 is positioned above line n.

=> By definition, angles that occupy the same relative position at each intersection are known as corresponding angles.

Therefore The correct answer is corresponding.

Additional Information

Alternate Interior Angles

Angles on opposite sides of the transversal and between the two lines (forming a 'Z' shape).

Consecutive Interior Angles

Angles on

Q41. Answer: (d) Solid BaSO4 is formed.

The correct answer is Solid BaSO4 is formed.

Key Points

Barium Chloride (BaCl2):

• Barium chloride is a water-soluble salt that dissociates into its constituent ions in aqueous solutions.

• Its chemical formula is BaCl2, consisting of one barium ion (Ba²^+) and two chloride ions (Cl^-).

Aluminum Sulfate (Al2(SO4)3):

• Aluminum sulfate is also a water-soluble salt that dissociates in water.

• Its chemical formula is Al2(SO4)3, composed of two aluminum ions (Al³^+) and three sulfate ions (SO4²^-).

Reaction Equation:

• When barium chloride reacts with aluminum sulfate, Barium sulfate (BaSO4) formed.

• Barium sulfate (BaSO4) is a white, insoluble solid.

• The balanced equation for the formation of barium sulfate is:

• BaCl2 + Al2(SO4)3 → BaSO4 + 2AlCl3

• The formation of a solid precipitate (like barium sulfate) indicates a double displacement reaction.

Q42. Answer: (a) northern-most range of the Himalayas

The correct answer is the northern-most range of the Himalayas

Key Points

• The Great Himalayas, also known as the Inner Himalayas or Himadri, is the northernmost and highest range of the Himalayas

• The Great Himalayas, also known as the Greater Himalayas, Inner Himalayas, or Himadri, form the northernmost and highest range of the Himalayan mountain system.

• This range stretches from northern Pakistan to Arunachal Pradesh, India, passing through China, Nepal, and Bhutan, covering a length of approximately 2,300 kilometres (1,400 miles).

• The Great Himalayas are home to the world's highest peaks, including Mount Everest (8,848 meters) and Mount Godwin Austen (K2, 8,611 meters).

• Peaks in this range have an average height of 6,000 meters, making it one of the most imposing mountain ranges in the world.

• The Himalayan mountain system also includes other ranges like the Lesser Himalayas (Himachal) and the Shivalik Hills, which form the foothills.

• The Great Himalayas serve as a natural barrier and are a significant geographical and cultural feature of South Asia.

• The Great Himalayas is the innermost Himalayan range, and contains the majority of the mountain ranges and peaks.

• Most of the peaks in this range are covered in snow year-round.

Q43. Answer: (a) Bihar

The correct answer is Bihar

Key Points

• As per NITI Aayog's Multidimensional Poverty Index (MPI) - 2021, Bihar has the highest percentage of people living in poverty among all states in India.

• The index considers factors like health, education, and standard of living to measure poverty comprehensively.

• The NITI Aayog Multidimensional Poverty Index (MPI), released in 2021, is a comprehensive measure of poverty that goes beyond income levels.

• It considers three broad dimensions—health, education, and standard of living—and evaluates multiple indicators under each dimension.

• The index aligns with the methodology of the global MPI developed by the United Nations Development Programme (UNDP) and the Oxford Poverty and Human Development Initiative (OPHI).

• Bihar was reported to have the highest percentage of people in poverty, with 51.91% of its population being multidimensionally poor.

Additional Information

• Jharkhand ranks second, with 42.16% of its population being multidimensionally poor.

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• Uttar Pradesh follows, with 37.79% of its population living in poverty.

• States like Tamil Nadu and Telangana have much lower poverty percentages, thanks to better performance in health, education, and infrastructure.

Q44. Answer: (d) 1

Given:

the circle represents 'teachers',

the square represents 'men',

the triangle represents 'post graduates'.

Now,

Here, the shaded part shows the men who are NEITHER teachers NOR post graduates.

So, there are only 1 men who are NEITHER teachers NOR post graduates.

Hence, the correct answer is "Option 4".

Q45. Answer: (d) Te < Se < S < O

The correct Answer is Te < Se < S < O.

Key Points Oxygen (O):

• Atomic number: 8

• Electronegativity: 3.44

• Oxygen is a highly electronegative element.

• It tends to attract electrons strongly when it forms chemical bonds.

Sulfur (S):

• Atomic number: 16

• Electronegativity: 2.58

• Sulfur is also moderately electronegative.

• It plays a significant role in biological molecules (e.g., amino acids) and is essential for life.

Selenium (Se):

• Atomic number: 34

• Electronegativity: 2.55

• Selenium lies between sulfur and tellurium in terms of electronegativity.

• It is used in electronic devices, photovoltaic cells, and as a trace element in nutrition.

Tellurium (Te):

• Atomic number: 52

• Electronegativity: 2.1

• Tellurium is the least electronegative among the given elements.

• It is used in alloys, semiconductors, and as a coloring agent in glass

Arranging in Increasing Electronegativity Order based on the electronegativity values, we have

Te < Se < S < O

Q46. Answer: (c) South

Given: Five friends P, M, Q, S and J.

P's shop is to the north of M's shop, which is to the west of Q's shop, which is to the west of S's shop.

S has his shop to the north of J's shop.

Because of some reasons, M and J have exchanged their shops.

So, after exchanged M's and J's shop,

J's Shop is in 'South' of P's shop.

Hence, the correct answer is "Option 3".

Q47. Answer: (a) Tarak

Given: Five persons, Pravalika, Roshan, Tarak, Vitika and Yadhu.

1) Pravalika lives on the floor immediately above Tarak.

2) Roshan lives on the floor immediately above Pravalika.

Case - I

Floor	Person
5	Roshan
4	Pravalika
3	Tarak
2	
1	

Case - II

Floor	Person
5	
4	Roshan
3	Pravalika
2	Tarak
1	

Case - III

Floor	Person
5	
4	
3	Roshan
2	Pravalika
1	Tarak

3) Yadhu lives on the floor immediately below Tarak (This cancels Case III).

4) Vitika lives on the floor immediately below Yadhu (This cancels Case II).

Now, Case I:

Floor	Person
5	Roshan
4	Pravalika
3	Tarak
2	Yadhu
1	Vitika

So, 'Tarak' lives on the third floor.

Hence, the correct answer is "Option 1".

Q48. Answer: (a) Marathi

The correct answer is Marathi

Key Points

• Marathi is not a classical language of India yet:

• As of October 2024, the following languages are considered classical languages of India:

• Tamil, Telugu, Malayalam, Kannada, Sanskrit, Odia, Marathi, Bengali, Assamese, Pali, and Prakrit.

• Criteria

• To be considered a classical language, a language must meet the following criteria:

• Have a recorded history of at least 1500–2000 years

• Be original and not borrowed from another language

• Have ancient literature that is considered a valuable heritage

• Be different from its modern or later forms
• Initiation
• In 2004, the Ministry of Culture and the Linguistic Experts' Committee established the criteria for classical languages.
• Tamil was the first language to be recognized as a classical language in 2004.

Q49. Answer: (c) y/x

Shortcut Trick
In a proportion a : b :: c : d, the product of extremes equals the product of means (ad = bc).
Given: $x^3y : xy :: xy : a$
=> $a \times x^3y = xy \times xy$
=> $a \times x^3y = x^2y^2$
=> $a = x^2y^2 \div x^3y = y/x$
Therefore The correct answer is y/x.
Alternate Method
Given: First term = x^3y, Second term = xy, Third term = xy, Fourth term = a.
Formula Used: In a proportion Product of Extremes = Product of Means.
=> $x^3y \times a = xy \times xy$
=> $x^3y \times a = x^2y^2$
=> $a = (x^2y^2) \div (x^3y)$
=> $a = (x^2 \div x^3) \times (y^2 \div y)$
=> $a = (1/x) \times y$
=> $a = y/x$
Therefore The correct answer is y/x.
Additional Information
Continued Proportion
Three quantities a, b, c are in continued proportion if a : b = b : c, which implies $b^2 = ac$, where b is the mean proportional.
Fourth Proportional
If four quantities a, b, c, d are in proportion (a : b :: c : d), then d is called the fourth proportional and is calculated as $d = (b \times c) \div a$.
Properties of Ratio
The ratio remains unchanged if both terms are multiplied or divided by the same non-zero number (ma : mb = a : b).

Q50. Answer: (d) Z, 20%

Given:
Sales data for Companies X, Y, and Z from 1996 to 1998.
Calculations:
1. Total Sales for each company (1996-1998):
• Company X: 40 + 55 + 45 = 140
• Company Y: 60 + 50 + 55 = 165
• Company Z: 50 + 60 + 60 = 170
2. Percentage difference in sales between Z and Y in 1997:
• Sales of Company Z in 1997: 60
• Sales of Company Y in 1997: 50
Difference in sales = 60 - 50 = 10
Percentage increase = (Difference / Sales of Company Y) * 100 = (10 / 50) * 100 = 20%
Therefore:
Company Z has the highest total sales for the period 1996 to 1998.
The sales of Company Z are 20% more than Company Y in the year 1997.

Q51. Answer: (b) (12, 3, 1728)

The logic followed here is:
Logic: (1^(st) number) ^(2nd number) = 3^(rd) number.
Now,

For, (7, 5, 16807)
=> 7^5 = 16807
For, (8, 4, 4096)
=> 8^4= 4096
Similarly, for (12, 3, 1728)
=> 12^3 = 1728
Hence, the correct answer is "Option 2".

Q52. Answer: (c) XIA 28

The logic followed here is:
So, 'XIA 28' will replace the question mark in the given series.
Hence, the correct answer is "Option 3".

Q53. Answer: (a) OQTVSU

The logic followed here is:
'BUS' is written as 'ACTVRT'.
'CAT' is written as 'BDZBSU'
Similarly, for 'PUT'
So, 'PUT' will be written as 'OQTVSU'.
Hence, the correct answer is "Option 1".

Q54. Answer: (d) 6457/144

Given:
Expression = 9 1/6 × 4 2/3 + 5 1/2 ÷ 2 2/3
Formula used:
Mixed fraction multiplication: a b/c = (a*c + b)/c
Mixed fraction division: a b/c ÷ d e/f = (a*c + b)/c ÷ (d*f + e)/f
Calculations:
9 1/6 = (9×6 + 1)/6 = 55/6
4 2/3 = (4×3 + 2)/3 = 14/3
5 1/2 = (5×2 + 1)/2 = 11/2
2 2/3 = (2×3 + 2)/3 = 8/3
Now, solving the expression:
First, 9 1/6 × 4 2/3 = 55/6 × 14/3
=> (55 × 14) / (6 × 3) = 770 / 18 = 385 / 9
Next, 5 1/2 ÷ 2 2/3 = 11/2 ÷ 8/3
=> (11 / 2) × (3 / 8) = 33 / 16
Now, adding the results:
385 / 9 + 33 / 16
LCM of 9 and 16 = 144
=> (385 × 16) / 144 + (33 × 9) / 144 = 6160 / 144 + 297 / 144
=> 6457 / 144
Therefore The value of the expression is 6457 / 144

Q55. Answer: (c) Only conclusion III follows.

Given:
Statements :
All covers are jars.
No funnel is a jar.
Some wells are funnels.
Conclusions :
I. Some wells are covers - False (No definite relation between Wells are Covers, so it is possible only)
II. Some wells are jars - False (No definite relation between Wells are Jars, so it is possible only)

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III. No funnel is a cover - True (All Covers are Jar, and No Jar are Funnels, so no funnel is cover will be definitely true)

So, Only conclusion III follows.

Hence, the correct answer is "Option 3".

Q56. Answer: (d) It is a type of cotton textile.

The correct answer is It is a type of cotton textile

Key Points

• The following statements about the word "muslin" are true:

• The word "muslin" comes from the French word mousseline, which is derived from the Arabic word mawsilī of Mosul, Iraq.

• The word "muslin" was first used in 1609.

• Muslin is a type of cotton fabric that is plain and lightweight.

• Muslin is made in a variety of weights, from delicate sheers to coarse sheeting.

• Muslin is produced using a plain weave technique, where a single weft thread alternates over and under a single warp thread.

• Muslin was originally a luxurious material, but today's muslin is more ordinary and affordable.

• Muslin is often used by designers and dressmakers to make inexpensive sample garments for fitting.

• The finest variety of muslin was called malmal.

• The best muslins were thought to be made in Bengal's Dacca in the 17th and 18th centuries.

Q57. Answer: (a) Na2CO3

The correct answer is Na2CO3

Key Points

Reaction with Dilute Hydrochloric Acid:

• When compound A (sodium carbonate) reacts with dilute hydrochloric acid (HCl),

• The following chemical equation represents the reaction: Na2CO3+ 2{HCl}→ 2{NaCl} +H2O+CO2

• The reaction produces carbon dioxide (CO2) gas, which escapes as effervescence (bubbling) from the solution.

Lime Water Test:

• Lime water (Ca(OH)2) is a solution of calcium hydroxide.

• When carbon dioxide gas is bubbled through lime water, it reacts with calcium hydroxide to form calcium carbonate (CaCO3),

• The following chemical equation represents the reaction: Ca(OH)2+ CO2→ CaCO3+H2O

• The resulting calcium carbonate is insoluble and forms a white precipitate, turning the lime water milky.

Conclusion:

Since compound A (sodium carbonate) produces effervescence and turns lime water milky, it confirms that compound A is indeed sodium carbonate (Na2CO3).

Q58. Answer: (c) Sekrenyi

The correct answer is Sekrenyi

Key Points

• The Angami tribe of Nagaland celebrates the Sekrenyi festival, which is a significant cultural and religious event.

• It is also known as the "Festival of Purification" and is observed in February.

• The festival involves rituals, prayers, and feasting, symbolizing purification and the start of a new cycle of life.

Additional Information

• Vairamundi

• Vairamundi is part of a festival celebrated in the Melkote Cheluvanarayana Swamy Temple in Karnataka.

• It is associated with the display of the sacred diamond-studded crown of the deity.

• Kambala

• Kambala is a traditional buffalo race held in Karnataka, primarily in the Tulu Nadu region.

• It involves racing pairs of buffaloes on muddy tracks, often accompanied by festive celebrations.

• Tula Sankramana

• Tula Sankramana, also known as Theerthodbhava, is celebrated in Kodagu (Coorg), Karnataka.

• It marks the sacred event of water gushing from the Brahmagiri hills into the holy pond of Talacauvery, believed to be the origin of the River Cauvery.

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Q59. Answer: (c) 1800

Given:

Expression = 239.99 × 20.01 - 99.99 × 30.01

Formula used:

For approximation, we can round the numbers to simpler values to estimate the result.

Calculations:

Approximating:

239.99 ≈ 240, 20.01 ≈ 20, 99.99 ≈ 100, 30.01 ≈ 30

Now, substitute these values into the equation:

240 × 20 - 100 × 30

=> 4800 - 3000

=> 1800

Therefore The approximate value is 1800.

Q60. Answer: (a) 1/42Ω

The Correct answer is (1/42) Ω.

Key Points

• To find the minimum resistance of a circuit using seven resistors, each of 1/6 Ω, we must arrange all the resistors in a parallel configuration.

• In a parallel configuration, the equivalent resistance (R_eq) is calculated using the formula:

1/R_eq = 1/R1 + 1/R2 + 1/R3 + ... + 1/R7

• Since all resistors have the same resistance of 1/6 Ω, the formula simplifies to:

1/R_eq = 7 × (1/(1/6))

• This simplifies further to:

1/R_eq = 7 × 6 = 42

• Thus, R_eq = 1/42 Ω, which is the minimum resistance achievable with these resistors.

• Arranging resistors in parallel reduces the equivalent resistance, as adding more parallel paths decreases overall resistance.

• This configuration is useful in circuits where a low equivalent resistance is required for specific applications, such as high-current devices.

Additional Information

• Important Concepts Related to Key Points

• Parallel Configuration: When resistors are connected in parallel, the voltage across each resistor is the same, but the total current is divided among them. This configuration is commonly used to reduce the overall resistance in a circuit.

• Equivalent Resistance: The total resistance in a circuit that can replace all individual resistors without altering the current or voltage. For parallel resistors, the reciprocal of the total resistance is equal to the sum of the reciprocals of individual resistances.

• Applications: Low equivalent resistance achieved through parallel arrangements is useful in power distribution systems and in circuits requiring high current flow.

Q61. Answer: (c) (59; 63)

Shortcut Trick

Check unit digit of the product: 3717 ends in 7.

Option 1: 3 × 9 = 27 (ends in 7). Option 2: 9 × 3 = 27 (ends in 7). Option 3: 9 × 3 = 27 (ends in 7). Option 4: 3 × 9 = 27 (ends in 7).

Check sum: 59 + 63 = 122. Product: 60 × 60 ≈ 3600. So 59 × 63 is likely 3717.

Co-prime check: HCF(59, 63) = 1. Condition satisfied.

Therefore The correct answer is (59; 63).

Alternate Method

Given: Sum (S) = 122, Product (P) = 3717.

Formula: Numbers are roots of quadratic equation: $x^2 - (\text{Sum})x + \text{Product} = 0$.

=> Equation: $x^2 - 122x + 3717 = 0$

=> Use formula $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$

=> Discriminant (D) = $(122)^2 - 4 \times 1 \times 3717$

=> D = 14884 − 14868 = 16

=> x = [122 ± √16] / 2 = (122 ± 4) / 2

=> x1 = 126 / 2 = 63, x2 = 118 / 2 = 59

=> Check Co-prime: Factors of 59 are {1, 59}, Factors of 63 are {1, 3, 7, 9, 21, 63}.

=> Since HCF(59, 63) = 1, they are co-prime.

Therefore The correct answer is (59; 63).

Additional Information

Co-prime Numbers

Two numbers are called co-prime if their Highest Common Factor (HCF) is 1. They do not need to be prime individually.

LCM and HCF Relation

For any two numbers A and B, A × B = HCF(A, B) × LCM(A, B). For co-primes, Product = LCM.

Quadratic Root Relation

If α and β are numbers, the equation is $x^2 - (\alpha+\beta)x + (\alpha\beta) = 0$.

Q62. Answer: (d) Both I and II strengthen the statement.

Given:

Statement :

The monsoon season influences the lives of Mumbai people in many ways.

Now,

Arguments :

I. Water logging is a common issue in Mumbai during the monsoon - True (As the statement says monsoon season influences the lives of Mumbai people in many ways, so water logging is one of the most common issue in Mumbai specially in monsoon).

II. Generally people enjoy the monsoon season in Mumbai - True (Lot of places in Mumbai is available, where the people enjoy visit during monsoon season, so this is also a valid argument).

So, Both I and II strengthen the statement.

H3ence, the correct answer is "Option 4".

Q63. Answer: (c) OEMQM

The logic followed here is:

'GRAND' is written as 'IVGVN',

'NIGHT' is written as 'PMMPD',

Similarly, for 'MAGIC',

So, 'MAGIC' will be written as 'OEMQM'.

Hence, the correct answer is "Option 3".

Q64. Answer: (b) 73

BODMAS Table:

Given equation: 16 ÷ 3 - 12 × 4 ÷ 18 × 3 - 7 = ?

Now, if '+' and '-' and '×' and '÷' are interchanged, then:

=> 16 × 3 - 12 ÷ 4 × 18 ÷ 3 + 7 = ?

=> 16 × 3 + 3 × 6 + 7 = ?

=> 48 + 18 + 7 = 73.

Hence, the correct answer is "Option 3".

Q65. Answer: (b) 7

Given:

4^(2n + 1) = 2^(3n + 9)

Formula used:

Express 4 as a power of 2: $4 = 2^2$

Calculations:

Substitute $4 = 2^2$ into the equation:

$(2^2)^{(2n + 1)} = 2^{(3n + 9)}$

Using the power of a power rule: $(a^m)^n = a^{(m \times n)}$

=> $2^{(2(2n + 1))} = 2^{(3n + 9)}$

=> $2^{(4n + 2)} = 2^{(3n + 9)}$

Since the bases are the same, we can equate the exponents:

4n + 2 = 3n + 9

Now, solve for n:

4n - 3n = 9 - 2

n = 7

Therefore The value of n is 7.

Q66. Answer: (d) NIPUN Bharat

The correct answer is NIPUN Bharat

Key Points

• On 5th July 2021, the Department of School Education and Literacy launched the NIPUN Bharat mission, aiming to achieve universal foundational literacy and numeracy in primary classes in India by 2026-27.

• NIPUN Bharat stands for National Initiative for Proficiency in Reading with Understanding and Numeracy.

• The mission focuses on improving the basic learning skills of children in grades 1 to 3, ensuring that every child achieves foundational literacy and numeracy by the end of grade 3.

Additional Information

• Digital India: A flagship program launched in 2015 to transform India into a digitally empowered society and knowledge economy.

• Pradhan Mantri Kaushal Vikas Yojana (PMKVY): This is a skill development initiative under the Ministry of Skill Development and Entrepreneurship to provide employable skills to the youth, not focused on school education.

• Smart Class: Refers to the use of technology and digital tools in classrooms, but it is not a specific national mission launched on the stated date.

Q67. Answer: (b) C > V

Given.

Statements :

1. C > A ≥ D > Z

2. Z = V ≤ K

Now, after combining the statements,

we get: C > A ≥ D > Z = V ≤ K

Now, checking the options:

Option 1) C = D → False (C > A ≥ D gives C > D).

Option 2) C > V → True (C > A ≥ D > Z = V gives C > V).

Option 3) K > D → False (D > Z = V ≤ K No definite relation possible).

Option 4) K > A → False (A ≥ D > Z = V ≤ K No definite relation possible).

Hence, the correct answer is "Option 2".

Q68. Answer: (d) 23 chromosomes

The correct answer is 23 chromosomes

Key Points

• Germ cell : A cell that is developed into reproductive cell, which is an egg in female or an sperm in male.

• Germ cell consists 23 chromosomes, in the zygote 46 chromosomes or 23 pairs chromosomes present.

• Humans have 22 pairs of autosomes and one pair of sex chromosomes (XX or XY)

• Autosomes are numbered chromosomes that contain genes for anything that does not relate to sex determination.

• chromosome 1 is the longest, and chromosome 22 is the shortest.

Additional Information

• DNA stands for deoxyribonucleic acid.

• DNA is a long thin molecule made up of nucleotides.

• There are 4 different types of nucleotides - these are adenine, thymine, cytosine, and guanine, and each is represented by their first letter - A,T,C,G Nucleotides are sometimes called bases.

Q69. Answer: (a) 10

The logic followed here is:

Logic: (1st number)^3 + 2 = 2nd number.

Now,

For, 7 : 345

→ $(7)^3 + 2$

=> 343 + 2 = 345.

For, 8 : 514

→ (8)3 + 2

=> 512 + 2 = 514.

Similarly, for 2 : ?

→ (2)3 + 2

=> 8 + 2 = 10.

Hence, the correct answer is "Option 1".

Q70. Answer: (a) 105

Shortcut Trick

For any odd number of terms in an arithmetic progression, the middle term is the average.

Middle number = Total Sum ÷ Count of numbers

Middle number = 309 ÷ 3 = 103

Since the numbers are consecutive odd numbers, the next number is 103 + 2 = 105.

Therefore The correct answer is 105.

Alternate Method

Given:

Sum of three consecutive odd numbers = 309

Formula Used:

Sum = n1 + n2 + n3

Calculations:

=> Let the numbers be x, x + 2, and x + 4.

=> x + (x + 2) + (x + 4) = 309

=> 3x + 6 = 309

=> 3x = 309 − 6

=> 3x = 303

=> x = 101

=> The numbers are 101, 103, and 105.

=> Largest number = x + 4 = 101 + 4 = 105

Therefore The correct answer is 105.

Additional Information

Consecutive Odd/Even Numbers

Both consecutive odd and consecutive even numbers always have a common difference (d) of 2.

Average Property

In any Arithmetic Progression with 'n' terms (where n is odd), the Average is equal to the Middle Term.

Sum of First n Odd Numbers

The sum of the first 'n' odd natural numbers starting from 1 is always n^2.

Q71. Answer: (d) Saudi Arabia

The correct answer is Saudi Arabia

Key Points

• Mecca is located in Saudi Arabia, in the Hejaz region's Makkah province.

• It's the holiest city in Islam and is considered the birthplace of the Prophet Muhammad.

• Mecca is 70 kilometers inland from Jeddah on the Red Sea, in a valley 277 meters above sea level.

• Population

• In 2022, Mecca's metropolitan population was 2.4 million, making it the third-most populated city in Saudi Arabia.

• Importance

• Mecca is the religious capital of Saudi Arabia and is home to the Kaaba, Islam's most sacred site.

• Millions of Muslims from around the world travel to Mecca each year to perform the Hajj, an annual pilgrimage that's one of the

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Five Pillars of Islam.

• Economy

• Mecca is a major economic center in Saudi Arabia, with a thriving tourism industry and many businesses and industries

Q72. Answer: (a) 27Ω, 0.75 Ω

The correct answer is 27Ω, 0.75 Ω

Solution:

Given the value resistance are 2Ω, 3Ω, 4 Ω, 6 Ω and 12 Ω.

Maximum resistance is obtained when all the resistance are connected in series.

• Effective resistance in series connection are R_(Max)= R1+R2+R3+R4+R5

• Maximum resistance is RMax= 2Ω+ 3Ω+ 4 Ω+ 6 Ω+12Ω= 27Ω

Minimum resistance is obtained when all the resistance are connected in parallel.

• Effective resistance in parallel connection are 1/R_(Min)=1/R1+1/R2+1/R3+1/R4+1/R5

• Minimum resistance is1/R_(Min)=1/2+1/3+1/4+1/6+1/12 = (6+4+3+2+1)/(12) = 16/12 = 4/3

• therefore RMin= 3/4 = 0.75Ω

Q73. Answer: (b) 0

Shortcut Trick

Assume convenient values for A and B such that the denominator is not zero.

Let A = 90° and B = 0°.

=> [(sin 90° − sin 0°) ÷ (cos 90° + cos 0°)] + [(cos 90° − cos 0°) ÷ (sin 90° + sin 0°)]

=> [(1 − 0) ÷ (0 + 1)] + [(0 − 1) ÷ (1 + 0)] = 1 − 1 = 0.

Therefore The correct answer is 0.

Alternate Method

Given: Expression = [(sin A − sin B) ÷ (cos A + cos B)] + [(cos A − cos B) ÷ (sin A + sin B)]

Formula Used: $(a - b)(a + b) = a^2 - b^2$ and $\sin^2\theta + \cos^2\theta = 1$

=> Term 1 = (sin A − sin B) × (sin A + sin B) = $\sin^2A - \sin^2B$

=> Term 2 = (cos A − cos B) × (cos A + cos B) = $\cos^2A - \cos^2B$

=> Sum = [($\sin^2A - \sin^2B$) + ($\cos^2A - \cos^2B$)] ÷ [(cos A + cos B)(sin A + sin B)]

=> Sum = [($\sin^2A + \cos^2A$) − ($\sin^2B + \cos^2B$)] ÷ [Denominator]

=> Sum = [1 − 1] ÷ [Denominator] = 0 ÷ [Denominator] = 0.

Therefore The correct answer is 0.

Additional Information

Pythagorean Identities

Fundamental relations such as $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Transformation Formulas

Formulas converting sums to products: sin A − sin B = 2 cos((A+B)/2) sin((A-B)/2) and cos A + cos B = 2 cos((A+B)/2) cos((A-B)/2).

Q74. Answer: (d) 288

Shortcut Trick

For three numbers a, b, and c in continued proportion, the mean proportional is b = √(a × c).

Given a = 256 and c = 324.

b = √(256 × 324) = √256 × √324

b = 16 × 18 = 288.

Therefore The correct answer is 288.

Alternate Method

Given: Numbers 256, b, and 324 are in continued proportion.

Formula Used: If a, b, c are in continued proportion, then a/b = b/c => $b^2 = ac$.

=> 256 / b = b / 324

=> $b^2 = 256 \times 324$

=> b = √(256 × 324)

=> b = 16 × 18

=> b = 288

Therefore The correct answer is 288.

Additional Information

Mean Proportional

The mean proportional between two numbers a and c is the value b such that b = √(ac).

Third Proportional

If a and b are two numbers, their third proportional c is given by the formula c = b²/a.

Continued Proportion

A sequence of numbers is in continued proportion if the ratio of any two consecutive terms is constant, i.e., a/b = b/c = c/d.

Q75. Answer: (c) Vallabhbhai Jhaverbhai Patel

The correct answer is Vallabhbhai Jhaverbhai Patel

Key Points

• Sardar Vallabhbhai Patel is considered the person responsible for the political integration of India by unifying 562 princely states in the country.

• He was a prominent figure in the Indian Freedom Struggle and the first Deputy Prime Minister and Home Minister of India.

• National unity and integrity

• Patel's commitment to national unity and integrity was a key factor in persuading princely states to join the Indian Union.

• Bardoli Satyagraha

• Patel became famous throughout the country after the Bardoli Satyagraha of 1928, which earned him the title of "Sardar".

• Non-Cooperation Movement

• Patel joined Gandhi's Non-Cooperation Movement in 1920 and recruited 300,000 members.

• Patel is also known as the "Iron Man of India". His birth anniversary is celebrated as National Unity Day or Rashtriya Ekta Diwas.

Additional Information

• Subhas Chandra Bose

• A revolutionary leader who founded the Indian National Army and is known by the title "Netaji".

• His famous slogans include "Give me blood, and I shall give you freedom!" and "Jai Hind".

• Jawaharlal Nehru

• Born in Allahabad in 1889, he led the country under the Indian National Congress. In 1938, he established the National Planning Committee to create an economic strategy for the country.

• Lal Bahadur Shastri

• Served as India's second Prime Minister from 1964 to 1966.

Q76. Answer: (b) 81

The logic followed here is:

So, '81' will replace the question mark in the given series.

Hence, the correct answer is "81".

Q77. Answer: (b) It grows a tube to transfer the nucleus to the ovule.

The correct answer is It grows a tube to transfer the nucleus to the ovule.

Key Points

• When a pollen grain lands on a stigma, the first step in its journey is to grow a tube.

• This tube, known as the pollen tube,

• It extends down through the style (the elongated part of the pistil) and reaches the ovary.

• Inside the pollen tube, the nucleus of the pollen grain travels towards the ovule,

• In Ovule it will eventually participate in fertilization.

Additional Information The process of pollination and the journey of a pollen grain after it lands on a stigma is:

• Pollination and Stigma Interaction:

• Pollination is the transfer of pollen from the male reproductive organ (anther) to the female reproductive organ (stigma) of a flower.

• When a pollen grain lands on the stigma, it adheres to the sticky surface due to specialized proteins and sugars present on the stigma.

• Formation of the Pollen Tube:

• The next step is the formation of a pollen tube.
• This tube grows from the pollen grain down through the style.
• It is the elongated part of the pistil (the female reproductive structure).
• The pollen tube is essential for transporting the male gametes (sperm cells) from the stigma to the ovule (located in the ovary).
• Purpose of the Pollen Tube:
• The pollen tube serves as a conduit for the male nucleus (genetic material) to reach the ovule.
• It provides a protected pathway for the male gametes to avoid external environmental challenges.
• Nucleus Migration:
• Inside the pollen tube, the nucleus of the pollen grain migrates towards the ovule.
• The seed contains the embryo, endosperm (nutritive tissue), and seed coat.
• Fruit Formation:
• The ovary surrounding the ovules undergoes changes and develops into a fruit.
• The fruit protects the developing seeds and aids in their dispersal.

Q78. Answer: (d) 12H2O

The correct answer is 12H2O

Key Points

• Photosynthesis is the process by which plants convert light energy into chemical energy stored in the form of glucose (a sugar).
• The overall balanced equation for photosynthesis is: [6CO2 + 12H2O→C6H12O6 + 6O2].

Additional Information Water's Role in Photosynthesis:

• Water molecules are split during the light-dependent reactions of photosynthesis.
• The process occurs in the thylakoid membranes of chloroplasts.
• Here's how it happens step by step: a. Photon Absorption:
• When a photon of light strikes a chlorophyll molecule in the chloroplast, it excites the chlorophyll.
• This energy initiates the photosynthetic process.
• b. Water Splitting:
• Water molecules (H2O) are split into oxygen (O2) and protons (H^+).
• The oxygen atoms combine to form molecular oxygen (O2), which is released as a byproduct.
• The protons (H^+) are used in the subsequent reactions.
• c. Electron Transport Chain:
• The electrons from water molecules are transferred through an electron transport chain within the thylakoid membrane.
• This chain generates energy that is used to produce ATP (adenosine triphosphate) and NADPH (nicotinamide adenine dinucleotide phosphate).
• d. ATP and NADPH Formation:
• ATP and NADPH are energy-rich molecules that fuel the Calvin cycle (dark reactions) of photosynthesis.
• The Calvin cycle takes place in the stroma of the chloroplast.
• e. Carbon Fixation:
• In the Calvin cycle, carbon dioxide (CO2) is fixed into glucose (C6H12O6) using ATP and NADPH.
• Glucose serves as the primary energy storage molecule for the plant

Q79. Answer: (a) 3528

Given terms: 18 @ 61 # 22 63 76 $ 42 48 % 29 94 φ 56 27 75

If all the symbols are dropped from the series then the arrangements are:

18 61 22 63 76 42 48 29 94 56 27 75

Here,

Third from the right end is: 56,

Fourth from the left end is: 63,

And, product of number '56 and 63' are:

→ 56 × 63 = 3528.

Hence, the correct answer is "Option 1".

Q80. Answer: (d) (i) - (b), (ii) - (c), (iii) - (a)

The correct answer is (i)-b,(ii)-(c),(iii)-(a)

Key Points

• (i) NaCl (Sodium Chloride) →

(b) 1074 K(b) 1074 K

• Melting Point: 1074K (standard melting point for table salt).

• (Calcium Chloride) →

(c) 1045 K(c) 1045 K

• Melting Point:

1045 \, K1045K (a slightly lower melting point due to its lattice structure).

• (Calcium Oxide) →

(a) 2850 K(a) 2850 K

• Melting Point: 2850K (a very high melting point due to the strong ionic bonds in its structure).

• Hence correct pairs are : (i) - (b), (ii) - (c), (iii) - (a)

Q81. Answer: (d) The carbohydrates not used immediately are stored in the form of glycogen.

The correct answer is The carbohydrates not used immediately are stored in the form of glycogen.

Key Points

• Option 4 is incorrect because Autotrophs store excess carbohydrates in the form of starch, not glycogen

• All green plants and some bacteria are autotrophs.

• Autotrophs are organisms that can produce their own food using inorganic substances.

• Green plants and certain bacteria (such as cyanobacteria) are examples of autotrophs.

• They are also called primary producers.

• Carbon and energy requirements of autotrophs are fulfilled by photosynthesis.

• The carbohydrates not used immediately are stored in the form of glycogen in heterotrophs (organisms that consume organic matter)

• Autotrophs typically store their excess energy as starch, which accumulates in various plant parts (such as roots, stems, and seeds)

Q82. Answer: (a) 5

The correct answer is 5

Key Points

• Union Health Minister Dr. Mansukh Mandaviya launched the National Polio Immunization Drive for 2022 by administering polio drops to children under five years of age in New Delhi on February 26, 2022.

• The drive's objectives were to:

• Protect children from deadly diseases

• Ensure that every child under five years of age receives polio drops

• Remain vigilant and continue the vaccination program

Q83. Answer: (d) 31

Shortcut Trick

Identify the perfect square immediately greater than 369.

We know $19^2 = 361$ and $20^2 = 400$.

Required number to be added = 400 − 369 = 31.

Therefore The correct answer is 31.

Alternate Method

Given: Number = 369.

Step 1: Find the square root of the given number to locate the range.

=> $\sqrt{369} \approx 19.2$

Step 2: The next natural number after 19.2 is 20.

Step 3: Calculate the square of 20.

=> $20^2 = 400$

Step 4: Find the difference between the target square and the given number.

=> Required number = 400 − 369

=> Required number = 31

Therefore The correct answer is 31.

Additional Information

Perfect Square Properties

A perfect square always ends in digits 0, 1, 4, 5, 6, or 9. It never ends in 2, 3, 7, or 8.

Finding Number to Subtract

To make a number a perfect square by subtraction, calculate the remainder using the long division method; that remainder is the number to be subtracted.

Consecutive Squares Difference

The difference between $(n+1)^2$ and n^2 is always $2n + 1$.

Q84. Answer: (c) do not cross each other

The correct answer is do not cross each other

Key Points

• Magnetic field lines are a visual representation of the invisible lines of force in a magnetic field.

• By convention, these lines trace the force from the north pole to the south pole of a magnet.

• The distance between the lines indicates the relative strength of the magnetic field.

• Closer lines represent stronger fields.

• Magnetic field lines never intersect with each other. They maintain their individual paths without crossing.

Q85. Answer: (a) 33%

The correct answer is 33%

Key Points

• The 73rd and 74th Constitutional Amendments of India (enacted in 1992) mandated the reservation of one-third (33%) of the total seats for women in all elected offices of local bodies, both in rural (Panchayati Raj Institutions) and urban areas (Municipalities).

• This includes seats reserved for Scheduled Castes (SCs) and Scheduled Tribes (STs) as well.

• 73rd Amendment (1992)

• Purpose: Strengthen and formalize the Panchayati Raj system (local self-government in rural areas).

• Key Features:

• Three-tier Structure: Establishment of Panchayats at the village, intermediate, and district levels.

• Elections: Mandatory regular elections to the Panchayati Raj Institutions (PRIs).

• Reservation:

• Seats for Women: Reservation of one-third (33%) of seats for women at all levels of Panchayats, including the positions of Chairpersons.

• SCs/STs: Reservation for Scheduled Castes and Scheduled Tribes in proportion to their population.

• Powers and Responsibilities: Constitutionally defined powers and responsibilities for economic development and social justice.

• 74th Amendment (1992)

• Purpose: Establish Urban Local Bodies (ULBs), such as Municipalities, to formalize governance in urban areas.

• Key Features:

• Structure: Different categories of ULBs like Municipal Corporations, Municipal Councils, and Nagar Panchayats.

• Elections: Regular elections to ULBs.

• Reservation:

• Similar to the 73rd Amendment, one-third (33%) of seats are reserved for women, including for SCs and STs in urban governance bodies.

• Functions: Defined responsibilities for urban planning, public health, and infrastructure development.

Q86. Answer: (a) -5/2d0

The correct answer is -(5/2)d0

Solution:

Given: Object distance u=−d0 (Since the dentist-mirror is a concave mirror so u is negative),

Magnification m=+5, Radius of curvature R=?

as Magnification m=-v/u

so m=-v/(-d0), 5 =v/d0

therefore v=5d0

now as we know by mirror formula 1/f=1/v+1/u

since, R=2f, so the above formula can be written as 2/R=1/v+1/u

placing the value of v and u in above formula we get

2/R=1/5d0+1/(-d0)=1/5d0-1/d0=-4/5d0

so 2/R=-4/5d0, therefore R=(-5/2)d0

Q87. Answer: (c) Hemis National Park

The correct answer is Hemis National Park

Key Points

• Hemis National Park in Ladakh is a famous wildlife spot that was established in 1981 and is known for its high population of snow leopards and a wide variety of birds:

• Hemis National Park is located in the eastern part of Ladakh, in the state of Jammu and Kashmir.

• It's about 50 km from Leh, one of the capitals of Ladakh.

• The park covers an area of about 4,400 square kilometres.

• The park is home to a variety of wildlife, including snow leopards, Tibetan wolves, Eurasian brown bears, Bharal (blue sheep), Argali (Great Tibetan Sheep), red fox, Himalayan marmot, mountain weasel, and Himalayan mouse hare.

• The park was established to conserve the fragile Himalayan ecosystem and provide a sanctuary for the region's wildlife.

• Visitors can enjoy camping, trekking, and jeep safaris.

• The best time to visit is between May and early October, as jeep safaris and trekking routes are stalled after November due to heavy snowfall.

• The park is named after the famous Hemis Monastery, which is located within its boundaries.

• The monastery is a cultural and spiritual hub.

Additional Information

• Pin Valley National Park

• Located in Lahaul and Spiti District, this park was established in 1987.

• It is home to endangered species like the snow leopard and Siberian ibex.

• Namdapha National Park

• Established in 1983, this park is located in Arunachal Pradesh.

• It is the third largest national park in India and is a biodiversity hotspot in the Eastern Himalayas.

• Established in 1982, this park is located in the Chamoli Garhwal district of Uttarakhand.

• It is situated around the peak of Nanda Devi and lies at an elevation of more than 3,500 m (11,500 ft) above mean sea level.

Q88. Answer: (b) Plasma

The correct answer is Plasma.

Key Points

• The fluid matrix of blood is called plasma. It constitutes nearly 55% of the blood and contains water, salts, enzymes, antibodies, and other proteins.

• Composition: Plasma is a pale yellow liquid that makes up approximately 55% of the total blood volume.

• It consists of : Water: The primary component, making up about 90% of plasma.

• Dissolved Solutes: These include electrolytes (such as sodium, potassium, and calcium), nutrients (like glucose and amino acids), waste products (such as urea), hormones, and gases (like oxygen and carbon dioxide).

• Proteins: Plasma proteins play essential roles in maintaining osmotic balance, clotting, and immune defense. The major plasma proteins are:

• Albumin: Helps regulate blood volume and osmotic pressure.

• Globulins: Include antibodies (immunoglobulins) and transport proteins.

• Fibrinogen: Essential for blood clot formation.

• Functions:

• Transport: Carries nutrients, hormones, and waste products.

• Clotting: Fibrinogen aids in blood clot formation.

• Immunity: Contains antibodies.

• Osmotic Balance: Maintains proper fluid distribution.

Q89. Answer: (a) 5 faces and 9 edges

Shortcut Trick

For any n-gonal prism:

Number of Faces = n + 2

Number of Edges = 3 × n

For a triangular prism, n = 3.

Faces = 3 + 2 = 5 and Edges = 3 × 3 = 9.

Therefore The correct answer is 5 faces and 9 edges.

Alternate Method

Given: Shape is a triangular glass prism.

Formula Used: Visual counting of polyhedron components.

=> A triangular prism consists of 2 triangular bases and 3 rectangular lateral faces.

=> Total Faces = 2 (bases) + 3 (lateral) = 5.

=> A triangle has 3 edges. There are 2 bases (3+3) and 3 vertical lines connecting them.

=> Total Edges = 3 × 2 + 3 = 9.

=> Vertices = 3 × 2 = 6.

Therefore The correct answer is 5 faces and 9 edges.

Additional Information

Euler's Formula

For any convex polyhedron, F + V − E = 2, where F is faces, V is vertices, and E is edges.

Rectangular Prism (Cuboid)

A rectangular prism has 6 faces, 12 edges, and 8 vertices.

Triangular Pyramid (Tetrahedron)

A triangular pyramid has 4 faces, 6 edges, and 4 vertices.

Q90. Answer: (d) One

Given word: MARGINS

Now, each letter of the word 'MARGINS' is arranged in English alphabetical order:

Letter	M	A	R	G	I	N	S
Alphabetical order	A	G	I	M	N	R	S

Here, only 'One' letter(S) will remain unchanged after arrange the words in Alphabetical order.

Hence, the correct answer is "Option 4".

Q91. Answer: (d) B

Given: Six friends B, D, F, H, J and L.

1) L is sitting to the immediate left of B.

2) H is the immediate neighbor of D and L.

3) F is the immediate neighbor of D and J.

So, 'B' is sitting to the immediate left of J.

Hence, the correct answer is "Option 4".

Q92. Answer: (a) 1/2

Shortcut Trick

For any quadratic equation $ax^2 + bx + c = 0$, the product of roots is given by c/a.

In the equation $6\sqrt{3}x^2 + 5x + 3\sqrt{3} = 0$, the constant term (c) is $3\sqrt{3}$ and the coefficient of x^2 (a) is $6\sqrt{3}$.

Product of roots = $3\sqrt{3} \div 6\sqrt{3} = 1/2$.

Therefore The correct answer is 1/2.

Alternate Method

Given Equation: $6\sqrt{3}x^2 + 3\sqrt{3} + 5x = 0$

Formula Used:

Standard form of quadratic equation: $ax^2 + bx + c = 0$

Product of roots = c ÷ a

Calculations:

=> Rearranging the given equation in standard form: $6\sqrt{3}x^2 + 5x + 3\sqrt{3} = 0$

=> Identifying coefficients: $a = 6\sqrt{3}$, $b = 5$, $c = 3\sqrt{3}$

=> Product of roots = $c/a = 3\sqrt{3} / 6\sqrt{3}$

=> Product = 3 / 6

=> Product = 1/2

Therefore The correct answer is 1/2.

Additional Information

Sum of Roots

For a quadratic equation $ax^2 + bx + c = 0$, the sum of roots is given by $-b/a$.

Discriminant and Nature of Roots

The term $D = b^2 - 4ac$ determines the nature of roots: real and distinct ($D > 0$), real and equal ($D = 0$), or imaginary ($D < 0$).

Quadratic Formula

The roots can be calculated directly using $x = (-b \pm \sqrt{(b^2 - 4ac)}) \div 2a$.

Q93. Answer: (c) 12 cm

Shortcut Trick

Area of triangle with sides 26, 28, 30 is always 336 cm^2 (standard triplet-based calculation).

Since Area of parallelogram = Area of triangle,

Base × Height = 336

28 × Height = 336

Height = 336 ÷ 28 = 12 cm.

Therefore The correct answer is 12 cm.

Alternate Method

Given: Sides of triangle (a, b, c) = 26 cm, 28 cm, 30 cm. Base of parallelogram = 28 cm.

Formula Used: Semi-perimeter (s) = (a + b + c) ÷ 2; Area of triangle = $\sqrt{[s(s-a)(s-b)(s-c)]}$; Area of parallelogram = Base × Height.

=> Semi-perimeter (s) = (26 + 28 + 30) ÷ 2 = 84 ÷ 2 = 42 cm

=> Area of triangle = $\sqrt{[42 \times (42-26) \times (42-28) \times (42-30)]}$

=> Area = $\sqrt{[42 \times 16 \times 14 \times 12]} = \sqrt{[(14 \times 3) \times 16 \times 14 \times (3 \times 4)]}$

=> Area = $14 \times 3 \times 4 \times 2 = 336$ cm^2

=> Area of parallelogram = Base × Height = 336 cm^2

=> 28 × Height = 336

=> Height = 336 ÷ 28 = 12 cm

Therefore The correct answer is 12 cm.

Additional Information

Heron's Formula

Used to find the area of a triangle when all three sides are known: Area = $\sqrt{[s(s-a)(s-b)(s-c)]}$.

Parallelogram Properties

The area of a parallelogram is twice the area of a triangle if they share the same base and lie between the same parallels.

Standard Triplets

A triangle with sides 13, 14, 15 has an area of 84. The sides in this question (26, 28, 30) are exactly double, so the area is $2^2 \times 84 = 336$.

Q94. Answer: (c) 1927

The correct answer is 1927

Key Points

• The Federation of Indian Chambers of Commerce and Industry (FICCI) was established in 1927:

• The FICCI was established on February 1, 1927, with the Indian Merchants' Chamber in Bombay (Mumbai) as its office location.

• The FICCI was founded by Indian business leaders, including G.D. Birla and Purshottamdas Thakurdas, on the advice of Mahatma Gandhi.

• Founder members

• Some of the founder members of the FICCI were:

• The Marwari Chamber of Commerce Ltd, Bombay
• The Indian Merchants' Chamber, Bombay
• The Karachi Indian Merchants' Association, Karachi
• The Indian Chamber of Commerce, Calcutta
• The FICCI is India's oldest and largest apex business organization.
• Its history is closely linked to India's industrialization, struggle for independence, and emergence as a rapidly growing global economy.

Q95. Answer: (a) 4% decrease

Shortcut Trick

When an article price increases by x% and its sale quantity decreases by x%, there is always a net decrease.

Net change % = $-(x^2 \div 100)\%$

Net change % = $-(20^2 \div 100) = -(400 \div 100) = -4\%$

Negative sign indicates a decrease in revenue.

Therefore The correct answer is 4% decrease.

Alternate Method

Given: Price increase = 20%, Sale reduction = 20%.

Formula Used: Revenue = Price × Sale

=> Let Initial Price = 100 and Initial Sale = 100.

=> Initial Revenue = 100 × 100 = 10,000.

=> New Price = 100 + 20% of 100 = 120.

=> New Sale = 100 − 20% of 100 = 80.

=> New Revenue = 120 × 80 = 9,600.

=> Net change in revenue = 9,600 − 10,000 = −400.

=> Percentage change = (−400 ÷ 10,000) × 100 = −4%.

Therefore The correct answer is 4% decrease.

Additional Information

Successive Percentage Formula

Net % Change = a + b + (a × b ÷ 100), where 'a' and 'b' are individual percentage changes (positive for increase, negative for decrease).

Revenue-Price-Quantity Relation

Revenue is directly proportional to both price and quantity. If price increases by a factor k1 and sale by k2, new revenue = original × k1 × k2.

Case of Equal Change

Whenever a value is first increased by x% and then decreased by x% (or vice versa), the final result is always a decrease of $x^2/100$ %.

Q96. Answer: (b) He involved local people in silviculture.

The correct answer is He involved local people in silviculture

Key Points

• Forest Officer A.K. Banerjee successfully rejuvenated a degraded forest in West Bengal using a model of Joint Forest Management (JFM).
• A.K. Banerjee involved local communities in silviculture and forest protection activities.
• Silviculture involves the scientific cultivation and management of trees.
• Local people were encouraged to participate in forest restoration efforts by planting, nurturing, and protecting trees.
• Benefit to Local People:
• In return for their participation, local communities were given a share of the forest produce and benefits, including access to non-timber forest products (NTFPs) like fruits, fodder, and firewood.
• Result:
• This participatory model transformed the degraded forest into a thriving green area, showcasing the success of community-based forest management.
• This approach underlines the importance of community involvement in sustainable environmental management.

Q97. Answer: (c) Vas deferens

The correct answer is Vas deferens

Key Points

• Vas deferens is not part of the female reproductive system:

• Vas deferens is a part of the male reproductive system.

• It is also known as the sperm duct or ductus deferens.

• Vas deferens is a muscular tube that carries sperm from the epididymis to the urethra.

• Parts of the female reproductive system

• The parts of the female reproductive system include the ovaries, uterus, and fallopian tubes.

• The ovaries are the primary sex organs in females and produce eggs and hormones.

Additional Information

• Fallopian tube: Also known as the oviduct, this muscular tube carries eggs from the ovary to the uterus.

• Fertilization occurs in the fallopian tube. The fallopian tube is made up of four parts: the infundibulum, ampulla, isthmus, and fimbriae.

• The infundibulum is the funnel-shaped part closest to the ovaries, and the fimbriae are finger-like projections that help collect the ovum. T

• he ampulla is the widest part of the fallopian tube, and the isthmus is the small section that connects the ampulla and infundibulum to the uterus.

• Ovaries: An endocrine gland that produces and matures gametes.

Q98. Answer: (d) Ethanol

The correct answer is Ethanol

Key Points

• Ethanol (C_2H_5OH) is the carbon compound formed by the fermentation of molasses.

• Molasses, which is a byproduct of sugar production (usually from sugarcane or sugar beets), contains fermentable sugars.

• During fermentation, yeast (such as Saccharomyces cerevisiae) acts on these sugars, converting them into ethanol and carbon dioxide.

• Ethanol is widely used in alcoholic beverages, industrial processes, and as a biofuel

Additional Information Propanol:

• Also called propyl alcohol or n-propyl alcohol.

• It is a colorless liquid with a slightly bitter taste and a fruity odor.

• 1-Propanol is a primary alcohol.

• It is used as a solvent in the pharmaceutical industry (for resins and cellulose esters) and sometimes as a disinfecting agent.

Ethane:

• Ethane is a hydrocarbon with two carbon atoms (C_2H_6).

• Ethane is a colorless, odorless gas at standard temperature and pressure (STP).

• It consists of two carbon atoms and six hydrogen atoms (H).

• Ethane is the simplest alkane (a type of hydrocarbon).

• Its molecular formula is CH_3-CH_3.

• Ethane has a tetrahedral geometry around each carbon atom.

Methane:

• Methane (CH_4) is the simplest hydrocarbon, consisting of one carbon atom and four hydrogen atoms.

• Methane is commonly associated with anaerobic decomposition (such as in swamps, landfills, and digestive processes of animals).

Q99. Answer: (b) P_2O_5

The correct answer is P_2O_5

Key Points

• There are major types of chemical bond in chemistry which is - Ionic bond, Covalent bond, Metallic bond, and Hydrogen bond.

• NaCl: Ionic compound. It consists of a metal (Na) and a non-metal (Cl), resulting in the transfer of electrons, forming ions held together by electrostatic forces.

• P205: Covalent compound. It contains nonmetals (P and O) that share electrons to form covalent bonds.

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• CaO: Ionic compound Calcium (Ca) is a metal, and oxygen (O) is a non-metal, resulting in the transfer of electrons and the formation of ions held together by electrostatic forces.

• MgCl2: Ionic compound. Magnesium (Mg) is a metal, and chlorine (Cl) is a non-metal, resulting in the transfer of electrons and the formation of ions held together by electrostatic forces.

Additional Information

• Ionic Bond- This bond is formed by strong force of a attraction between two oppositely charged ions. Such a bond is formed when the valence (outermost) electrons of one atom are permanently transferred to another atom. Example: NaCl

• Covalent bond: A covalent bond is a chemical bond that involves the sharing of electrons to form electron pairs between atoms. These electron pairs are known as shared pairs or bonding pair.

• Metallic bonding is the force of attraction between valence electrons and the metal atoms.

• A hydrogen bond is an attraction between two atoms that already participate in other chemical bonds. One of the atoms is hydrogen, while the other may be any electronegative atom, such as oxygen, chlorine, or fluorine.

Q100. Answer: (d) oral

The correct answer is oral

Key Points

• In January 2022, scientists from IIT Kharagpur revealed a portable, user-friendly, and non-invasive device for detecting oral cancer in resource-constrained clinical settings

• The Blood Perfusion Imager (BPI) is a portable and low-cost device designed to aid in the early detection of cancerous and non-cancerous traits in tissues.44

• Features:

• Portable and Handheld: Easy to use and suitable for resource-constrained settings.

• Low-Cost: Makes it affordable for widespread use, especially in underdeveloped areas.

• Combines a miniature far-infrared (FIR) camera, humidity sensor, and software engine to detect blood flow variations in tissues.

• Purpose:

• The device's primary purpose is to classify tissues as normal, benign, or malignant by analyzing blood perfusion patterns.

• How It Works:

• The BPI estimates blood flow variations in tissue and evaluates its response to determine the likelihood of cancer. It can differentiate between healthy, benign, and cancerous tissues based on these variations.

• Benefits:

• It can save millions of lives by enabling early diagnosis of cancer through non-invasive methods.

• It helps strengthen doctors' confidence in making accurate diagnoses, potentially leading to faster treatments and better outcomes for patients.

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