RRB Group D Previous Year Paper (Held on: 20 Sept 2022 Shift 1)

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

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CBT

Q1. A statement is given followed by two arguments I and II. Read the statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

Reclaimed land should be avoided as it only has disadvantages.

Arguments:

I. Many countries have no option but to reclaim land to provide for the increasing population.

II. Land that is reclaimed has long lasting effect on nature as it deteriorates ecosystems and biodiversity.

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

Q2. Which of the following is a hydrate of sodium carbonate containing ten molecules of water of crystallisation?

(a) Baking soda
(b) Bleaching powder
(c) Baking powder
(d) Washing soda

Q3. Each of the six students, Pavan, Vinay, Reshma, Sunayana, Tarun and Unmukth, has an engineering entrance exam on a different day of a week, starting from Monday and ending on Saturday of the same week, but not necessarily in the same order. Reshma has the exam on Tuesday. Only one student has the exam between Pavan and Reshma. Vinay has the exam on the day immediately after Pavan. None of them have the exam before Unmukth. Sunayana has the exam on the day immediately after Reshma.

On which day does Tarun have the exam?

(a) Thursday
(b) Friday
(c) Wednesday
(d) Saturday

Q4. Three statements are given, followed by four conclusions numbered I, II, III and IV. 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:

All carpets are scholars.

All scholars are trip advisors.

No hat is a trip advisor.

Conclusions:

I. No trip advisor is a scholar.

II. All carpets are trip advisors.

III. Some trip advisors are scholars.

IV. No carpet is a hat.

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

Q5. Each vowel in the word MAJESTY is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. If each letter, thus formed, is arranged in alphabetical order, which letter will be third from the left?

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

Q6. The positive root of 4x2 - 1 = 0 is:

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

Q7. If $(x + y + z) = 0$ and $x^2 + y^2 + z^2 = 36$, then the value of $xy + yz + zx$ is:

(a) -6
(b) 18
(c) -28
(d) -18

Q8. Rs. 3,903 is divided between A and B, so that A's share at the end of 7 years will be equal to B's share at the end of 9 years, with interest being compounded annually at the rate of 4% per annum. The share of A is:

(a) Rs. 1,828
(b) Rs. 1,875
(c) Rs. 2,075
(d) Rs. 2,028

Q9. In which year did the Federal Court of India start functioning?

(a) 1935
(b) 1937
(c) 1947
(d) 1950

Q10. Who was the Chief Election Commissioner of India as on 1 April 2022?

(a) Om Prakash Rawat
(b) Achal Kumar Jyoti
(c) Sushil Chandra
(d) Sunil Arora

Q11. Which of the following states is home to the Great Indian Bustard?

(a) Bihar
(b) Sikkim
(c) Uttar Pradesh
(d) Rajasthan

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Q12. Rohini walked for 2 kilometres on a straight road, facing North. Then she took a right turn and walked for 1 kilometre. Then she again took a right turn and walked 2 kilometres. In which direction is she facing now? (All turns are 90 degree turns only)

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

Q13. From which budget year in India was the Railway budget merged with the Union budget and was not presented separately?

(a) 2014 - 15
(b) 2017 - 18
(c) 2016 - 17
(d) 2015 - 16

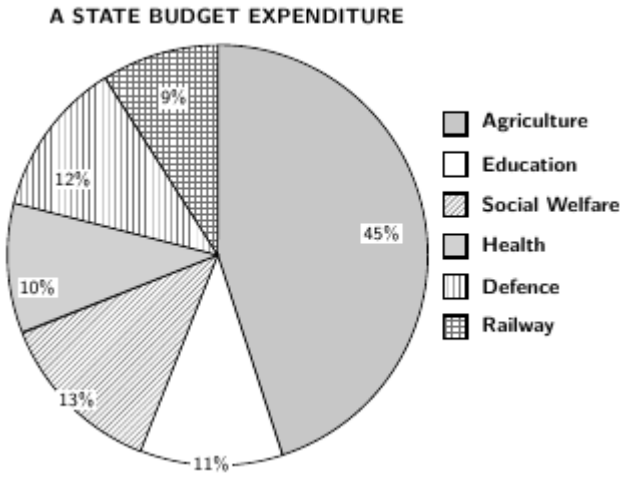
Q14. A certain number of class I students are sitting in a row on their graduation day, facing north. Ruchi is ninth to the right of Pranavi. No student is to the left of Pranavi. Tanya is fifth to the right of Ruchi. Vipanchi is seventh to the right of Tanya. If no other student is sitting in the row, what is the total number of students seated?

(a) 20
(b) 21
(c) 22
(d) 19

Q15. The ratio of the present ages of Shinjan and Aamya is 3 : 4. After 10 years this ratio will become 5 : 6. The present age (in years) of Aamya is:

(a) 65
(b) 60
(c) 18
(d) 20

Q16. The following pie chart represents the percentage distribution of expenditure of a state's budget. Study the pie chart and answer the question that follows.



Approximately how many degrees should be there in the central angle of the sector for agriculture expenditure?

(a) 162°
(b) 152°
(c) 142°
(d) 172°

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Q17. In July 2021, which Union Territory of India launched ‘Tejaswini’ _____ an initiative centred around women empowerment and safety?

(a) Delhi
(b) Chandigarh
(c) Lakshadweep
(d) Puducherry

Q18. Refer to the following number series and answer the question.

7 2 9 6 3 7 3 9 7 7 3 9 7 3 2 2 1 3 3 9 3 7 3 9 3 9

How many 3s are there that are immediately preceded by 7 and immediately followed by 9?

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

Q19. If each vowel in the word 'SCIENCE' is changed to the letter preceding it in the English alphabetical order and each consonant is changed to the letter following it in the English alphabetical order, which letter will occur maximum times in the newly formed word?

(a) D
(b) O
(c) H
(d) T

Q20. Each of the six professors of same department, Jayanth, Kiran, Lasya, Mythili, Nischal and Omprakash, have their classes on six different days of a week, starting from Monday and ending on Saturday of the same week, but not necessarily in the same order. Only two professors have classes before Mythili’s class. Jayanth has the class on Tuesday and Omprakash has the class on Saturday. Only one professor has the class after the class of Kiran. The class of Nischal is not on any of the days between the classes of Kiran and Mythili.

Who among the following has the class on Monday?

(a) Lasya
(b) Nischal
(c) Mythili
(d) Kiran

Q21. On which of the following dates was Hindi adopted as the official language of the Indian Union?

(a) 30 November 1954
(b) 26 January 1950
(c) 14 September 1949
(d) 15 August 1947

Q22. A house is supplied electricity through a 15 A fuse. The number of 100 W lamps that can be used simultaneously along with a 2KW AC is: (The AC and lamps both are rated for 220 V Supply)

(a) 23
(b) 15
(c) 13
(d) 18

Q23. The measures of three angles of a quadrilateral are given as 90°, 96° and 88°. The measure of its fourth angle is _____.

(a) 86°
(b) 96°
(c) 88°
(d) 82°

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Q24. Let r be the greatest number which when divides 41, 71 and 91 leaves the same remainder. Find the LCM of r and 45.

(a) 10
(b) 45
(c) 75
(d) 90

Q25. Which of the following reactions produces water insoluble salts?

(a) Precipitation reaction
(b) Catalytic reaction
(c) Addition reaction
(d) Displacement reaction

Q26. Three statements are given, followed by three conclusions numbered I, II and III. 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:

All eggs are millets.

All millets are balloons.

All balloons are prisoners.

Conclusions:

I. All balloons are eggs.

II. Some prisoners are millets.

III. All prisoners are balloons.

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

Q27. Which of the following statements is NOT correct?

1. There are only four single-digit prime numbers.
2. There are infinitely many prime numbers.
3. A prime number has only two factors.
4. All prime numbers are odd.

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

Q28. In a certain code language, 'TALCUM' is written as 'LSZHVN' and ‘GRAINS’ is written as ‘RLFWMA’. How will ‘LOWER’ be written in that language?

(a) QDTKH
(b) QCTKG
(c) PCTKG
(d) QCTKH

Q29. Study the given table and answer the question that follows.

The table show the percentage of marks obtained by a candidate in five subjects and the weightage given to the subjects, in an examination.

Subject	English	Hindi	Maths	Social Studies	Science
Marks Percentage	90	92	93	78	86

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Weightage to subjects	2	2	3	1	2

Find the difference between the weighted average and the average if all subjects had equal weightage.

(a) 2%
(b) 0.5%
(c) 1%
(d) 1.5%

Q30. First find the median of 46, 64, 87, 41, 58, 77, 35, 90, 55, 92, and 33. If 92 is replaced with 99 and 41 is replaced with 43 in the data, then find the new median. What is the difference between the old median and the new median?

(a) 6
(b) 0
(c) 3
(d) 2

Q31. The Cultural performances 'MILAN 2022' was organised by the Ministry of Culture as a part of Azadi ka Amrit Mahostav in which City?

(a) Visakhapatnam
(b) Madurai
(c) Coimbatore
(d) Mysuru

Q32. Select the option that represents the letters that, when placed from left to right in the same sequence in the blanks below, will complete the letter series.

D _ B _ A _ C _ _ G F _ E _ _ H

(a) BACDEFGH
(b) CABDHEFG
(c) BACDHEFG
(d) CABDEFGH

Q33. The value of (x^(2/3) - x^(1/3)y^(1/3) + y^(2/3))(x^(1/3) + y^(1/3)) is _____.

(a) x + y
(b) 1/x - 1/y
(c) x - y
(d) 1/x + 1/y

Q34. Suppose in a circuit, a silver wire of length L and cross-sectional area A is replaced by an aluminium wire of length 5 L and cross-sectional area 9 A. The resistance of the circuit will _____.

(Given that ρsilver = 1.6 × 10-8 Ω m and ρAluminium = 2.6 × 10-8 Ωm)

(a) decrease to 0.9 times of itself
(b) increase to 1.1 times of itself
(c) decrease to 0.8 times of itself
(d) increase to 1.2 times of itself.

Q35. What type of nutrition is observed in mushrooms?

(a) Symbiotic
(b) Chemotrophic
(c) Autotrophic
(d) Saprotrophic

Q36. The strength of magnetic field inside a long current-carrying straight solenoid is:

(a) the maximum at the middle
(b) the minimum at the centre
(c) more at the end than the centre

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(d) uniform at all points inside the solenoid

Q37. Which of the following statements is correct?

(a) Plastics and paper are biodegradable.
(b) Paper is biodegradable.
(c) Plastic cannot be recycled.
(d) Paper cannot be recycled.

Q38. Which of the following statements about the gradation of boiling point in a homologous series is correct?

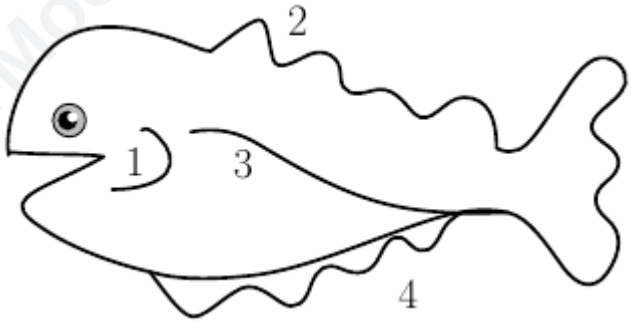
(a) The boiling points increase with decreasing molecular mass.
(b) The boiling points decrease with increasing molecular mass.
(c) The boiling points increase with increasing molecular mass.
(d) The boiling point does not depend on molecular mass.

Q39. Which of the following numbers will replace the question mark (?) in the given series?

1, 5, 13, 29, 61, ?

(a) 131
(b) 253
(c) 128
(d) 125

Q40. In the following figure of a fish, where are the gills located?



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

Q41. Which of the following explanations regarding the given reaction is correct?

$Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

(a) Iron displaces copper because iron is more reactive than copper.
(b) Iron displaces copper because iron is less reactive than copper.
(c) Iron displaces copper because the atomic mass of iron is less than copper.
(d) Iron displaces copper because the atomic number of iron is less than copper.

Q42. The ratio of the present ages of Monu and Sonu is 3 : 4. The ratio of the age of Monu 5 years ago and that of Sonu 5 years hence is 2 : 5. Find Monu's present age.

(a) 15 years
(b) 66 years
(c) 18 years
(d) 20 years

Q43. Which of the following numbers will replace the question mark (?) in the given series?

14, 27, 40, 53, 66, 79, 92, ?

(a) 105
(b) 104

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(c) 103
(d) 102

Q44. Mona, Rahul, Vikas, Kavita, Poonam and Khushi, each has a different height. They are standing in a line according to their heights in an increasing order. Vikas is taller than only one person. Only Rahul is standing between Khushi and Vikas. Mona is shorter than only one person. Exactly two people are standing between Poonam and Rahul. Who is the shortest person in this group?

(a) Poonam
(b) Kavita
(c) Rahul
(d) Vikas

Q45. The 'Tripitaka' is a holy book of which religion from following _____.

(a) Buddhism
(b) Zoroastrianism
(c) Jainism
(d) Sikhism

Q46. What is the smallest natural number by which 217800 must be multiplied so that the product is a perfect square?

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

Q47. Arindam purchased a coat for Rs. 2,100 after getting a discount of 20% and but then paying GST at a rate of 5% on the discounted price. Find the marked price of the coat.

(a) Rs. 2,500
(b) Rs. 2,480
(c) Rs. 2,490
(d) Rs. 2,520

Q48. What is the trend for the atomic number while moving across a period in the modern periodic table?

(a) The mass number increases by one unit.
(b) The atomic number decreases by one unit.
(c) The atomic number increases by two units.
(d) The atomic number increases by one unit.

Q49. What will come in the place of the question mark (?) in the following equation, if '+' and '-' are interchanged and also '×' and '÷' are interchanged?

120 × 4 ÷ 2 - 8 + 10 = ?

(a) 48
(b) 78
(c) 68
(d) 58

Q50. The reproductive parts of a flower are:

(a) stamens and pistil
(b) stamens and petals
(c) sepals and petals
(d) pistil and sepals

Q51. The marked price of an article is Rs. 7,200. Two successive discounts of 9% and 15% are offered. Find the selling price of the article.

(a) Rs. 6,400.00
(b) Rs. 5,600.00
(c) Rs. 5,472.00

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(d) Rs. 5,569.20

Q52. 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)

(16, 64, 5)

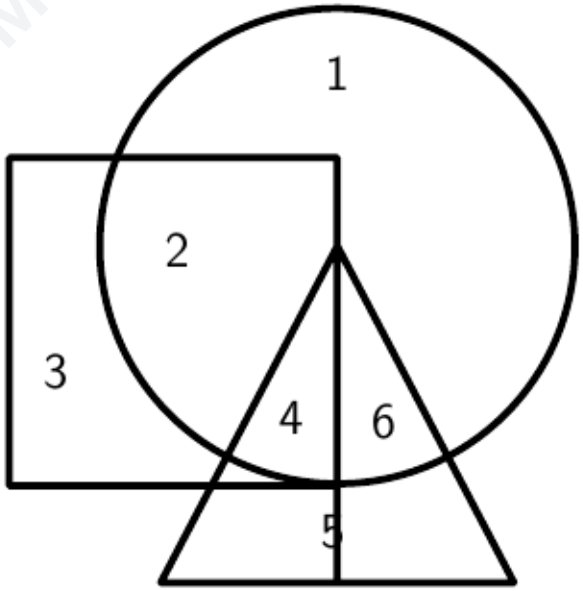
(9, 27, 4)

(a) (11, 56, 7)
(b) (21, 126, 7)
(c) (10, 50, 5)
(d) (13, 91, 10)

Q53. What is the smallest positive fraction that must be added to the fraction 3/5 × 16/21 × 7/10 × 3/4 to make it a whole number?

(a) 19/25
(b) 23/2
(c) 19/16
(d) 20/5

Q54. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. The circle represents ‘actors’, the square represents ‘directors’, and the triangle represents ‘producers’. How many actors are there who are directors and also producers?



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

Q55. If the focal length of a spherical mirror increases to double, then the radius of curvature of the mirror will:

(a) remain the same
(b) increase to four times
(c) increase to double
(d) decrease to half

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Q56. Which two mathematical operators should be interchanged to make the given equation correct?

18 × 6 + 12 - 7 ÷ 2 = 1

(a) ÷ and -
(b) • and ×
(c) • and +
(d) × and ÷

Q57. In a rectangle PQRS, if mangle QPR = 26°, then mangle SQR = _____.

(a) 52°
(b) 26°
(c) 74°
(d) 64°

Q58. In which year did the cyclone 'Tauktae' hit India?

(a) 2022
(b) 2019
(c) 2020
(d) 2021

Q59. If $a + 1/a = 9$, then the value of $a^3 + 1/(a^3)$ is:

(a) 702
(b) 726
(c) 729
(d) 732

Q60. 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.

81 : 49 :: 36 : 16 :: 64 :: ?

(a) 49
(b) 32
(c) 25
(d) 36

Q61. A field is in the form of a right-triangle. Its area is 25000 m2 and the length of the base is 500 m. Its height (in m), corresponding to the given base, is _____.

(a) 175
(b) 100
(c) 50
(d) 200

Q62. On 4 June 2021, India's first CAR-T cell therapy, which was done at Mumbai's Tata Memorial Centre, was for which of the following ailments?

(a) Bone Transplant
(b) Blood cancer
(c) Lung Transplant
(d) AIDS

Q63. Which of the following organisations in India advises people how to save petrol/diesel while driving?

(a) ACRP
(b) PRCA
(c) PARC
(d) PCRA

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Q64. The birth centenary of which famous Indian hockey captain was celebrated on 2 February 2022?

(a) Balbir Singh Dosanjh
(b) Kunwar Digvijay Singh 'Babu'
(c) Leslie Claudius
(d) Major Dhyan Chand

Q65. Refer to the following letter series and answer the question.

(Left) J B I S O E Z I L U B O P A R D I H O M A K O (Right)

How many such consonants are there, each of which is immediately preceded by a vowel and also immediately followed by a vowel?

(a) Six
(b) Three
(c) Four
(d) Eight

Q66. When a car is moving through a dusty road during night, a path of beam from the headlight is clearly visible due to _____ effect.

(a) immersion
(b) refraction
(c) scattering
(d) dispersion

Q67. If 2 is added to each odd digit and 1 is subtracted from each even digit in the number 5317846, what will be the sum of the digits which are second from the left and second from the right, in the number thus formed?

(a) 12
(b) 11
(c) 10
(d) 8

Q68. Plaster of Paris should be stored in sealéd containers.

Which of the following is the correct explanation for the given assertion?

(a) It turns into a hard solid after reacting with moisture present in air.
(b) It decomposes in the presence of sunlight.
(c) It decomposes in the presence of oxygen.
(d) It turns into hard solid after reacting with oxygen present in the air.

Q69. A statement is followed by two conclusions. Find out which conclusion is true based on the given statement.

Statement:

$H > L \geq M \geq N > O \leq P \leq Q$

Conclusions:

I. $L > P$

II. $M \leq Q$

(a) Both conclusions I and II are true
(b) Neither conclusion I nor II is true
(c) Only conclusion I is true
(d) Only conclusion II is true

Q70. In order to obtain an inverted and magnified image of an object by a spherical mirror of radius of curvature 40 cm, the object should be placed:

(a) between 20 cm and 40 cm from a concave mirror
(b) at infinity from a Convex mirror
(c) 20 cm from a convex mirror
(d) between 20 cm and 40 cm from a convex mirror

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Q71. Study the following table and answer the question.

Name of the Student	Marks		
Paper I	Paper II	Paper III	
Anushri	83	79	83
Jay	71	90	60
Vinay	64	93	72
Pooja	81	88	87

An exam consists of three papers. If each paper was of 100 marks, then who scored the highest percentage in the exam?

(a) Pooja
(b) Jay
(c) Vinay
(d) Anushri

Q72. 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-cluster.

ADJUST : BEKWUV :: BACKED : CBDMGF :: PACKUP : ?

(a) QBDMWS
(b) QBDMVR
(c) QBDMWQ
(d) QBDMWR

Q73. How many elements occur naturally?

(a) 95
(b) 93
(c) 94
(d) 92

Q74. The resistance of a metal wire of length 1 m is 50 Ω at 30°C. Suppose the diameter of the wire is 0.3 mm. Now another wire has the same material and the same length (at 30°C), but the diameter is increased to 0.6 mm. The resistance of the new wire is:

(a) 20.5 Ω
(b) 2.5 Ω
(c) 120.5 Ω
(d) 12.5 Ω

Q75. A group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/Symbol	2	&	5	^	@	6	4	•	3	•	#	7	%	9
Code Letter	A	O	B	Q	T	D	J	G	L	M	K	S	N	R

Conditions:

(i) If the first element is a symbol and the last element is a number, the codes for these two (the first and the last elements) are to be interchanged.

(ii) If the first element is an odd number and the last element is an even number, the first and last elements are to be coded as ©.

(iii) If both the second and third elements are perfect squares, the third element is to be coded as the code for the second element.

What will be the code for 3 * 6 2 ?

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(a) LGD©
(b) ©GDA
(c) ©GD©
(d) LGDA

Q76. Rishabh starts from his house and walks 14 m southwards. Then, he turns left and walks 30 m. Then, he turns left and walks 50 m. Then, he turns left and walks 10 m. He then turns left and walks 36 m. In which direction and how many meters away is he now from his house?

(a) 10 m, South
(b) 30 m, West
(c) 68 m, South-east
(d) 20 m, East

Q77. Which of the following is an example of revenue expenditure?

(a) Financial help given to other country as loan
(b) Construction of hospitals and school buildings
(c) Repayment of loans by the government
(d) Salaries of government employees

Q78. Which of the following Ministries of India released draft National Air Sports Policy, 2022 (NASP) for public comments?

(a) Ministry of Education
(b) Ministry of Youth Affairs and Sports
(c) Ministry of Civil Aviation
(d) Ministry of Culture

Q79. Air India's journey begins in the year _____, when the distinguished entrepreneur J.R.D. Tata founded the company.

(a) 1930
(b) 1942
(c) 1932
(d) 1947

Q80. Consider a wire of resistance 10 Ω If there is another wire of the same material and the same length as the previous one, but the cross-sectional area is double, then the resistance of the new wire is:

(a) 20 Ω
(b) 5 Ω
(c) 10 Ω
(d) 7.5 Ω

Q81. If x = a secn θ, y = b tann θ, then:

(a) (a/x)^(2/n) + (b/y)^(2/n) = 1
(b) (x/a)^(2/n) - (y/b)^(2/n) = 1
(c) (a/x)^(2/n) - (b/y)^(2/n) = 1
(d) (x/a)^(2/n) + (y/b)^(2/n) = 1

Q82. Which academic institution in India has installed the most powerful supercomputer in the country named as Param Pravega, the supercomputer is also the largest in an Indian academic institution as on February 2022?

(a) Indian Institute of Technology - Delhi
(b) Indian Institute of Science (IISc) - Bengaluru
(c) Inter-University Centre for Astronomy and Astrophysics(IUCAA) - Pune
(d) Indian Institutes of Science Education and Research(IISER) -Tirupati

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Q83. Each side of an equilateral triangle is 6 cm long. What is its area (in cm^2)?

(a) $9\sqrt{3}$
(b) $6\sqrt{3}$
(c) 210
(d) $21\sqrt{3}$

Q84. If one of the roots of a quadratic equation with rational coefficients is $2 + \sqrt{3}$, then the quadratic equation is given as _____.

(a) $x^2 = 2 - \sqrt{3}$
(b) x2 - 2 = 0
(c) x2 + 4x - 1 = 0
(d) x2 - 4x + 1 = 0

Q85. When a man travels equal distances at speeds of V1 and V2 km/h, his average speed is 5 km/h. But when he travels at these speeds for equal time periods, his average speed is 5.5 km/h. Find the positive difference between the two speeds.

(a) 11 km/h
(b) $\sqrt{10}$ km/h
(c) 10 km/h
(d) $\sqrt{11}$ km/h

Q86. Which hormone is particularly high in fruits?

(a) Cytokinin
(b) Gibberellins
(c) Abscisic acid
(d) Auxins

Q87. Bina and Neena together weave one dozen sweaters in 8 days working for 10 hours per day. If they have to finish the work in 5 days, for how many hours should they work per day?

(a) 11
(b) 14
(c) 16
(d) 12

Q88. A compound with molecular formula C3H4 belongs to the homologous series of _____.

(a) alkene only
(b) alkyne only
(c) alkane only
(d) alcohol

Q89. If $\sqrt{21} = 4.58$, then the value of $\sqrt{(7/3)}$, correct to 3 decimal places, is:

(a) 1.523
(b) 1.527
(c) 1.520
(d) 1.521

Q90. The fundamental duties of citizens were added to the constitution of India by the 42nd amendment in:

(a) 1974
(b) 1975
(c) 1973
(d) 1976

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Q91. Which of the following is calculated as the percentage change in the demand for the goods divided by the percentage change in the price for the goods?

(a) Elasticity of Demand
(b) Product Cost
(c) Surplus
(d) Total Utility

Q92. Seven friends, Anmol, Bhawna, Komal, Diksha, Ekta, Falak and Gopi, are sitting in a row facing north (but not necessarily in the same order). Falak is sitting to the immediate right of Ekta. Ekta is sitting fourth of the right to Gopi. Komal is an immediate neighbour of Bhawna and Diksha. The person who is sitting third to the left of Diksha is at one of the extreme ends.

Who among the following is an immediate neighbour of Gopi and Komal?

(a) Falak
(b) Bhawna
(c) Diksha
(d) Ekta

Q93. Under which ministry was Tele Counselling through SAMVEDNA started for children impacted by the Covid-19 pandemic in India in 2021?

(a) Ministry of Ayush
(b) Ministry of Health
(c) Ministry of Education
(d) Ministry of Women and Child Development

Q94. Which nitrogenous waste produced in the body is removed by the human kidney?

(a) Urea and uric acid
(b) Ammonia and uric acid
(c) Only ammonia
(d) Urea and ammonia

Q95. In Mendel's cross, a pure tall plant (TT) is crossed with a dwarf plant (t t). The Phenotypic ratio in F2 generation is:

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

Q96. Which of the following rivers flows into India from Nepal?

(a) Bhilangana
(b) Dhauliganga
(c) Karnali
(d) Son

Q97. Which of the following functions is NOT a part of District Administration?

(a) Rural Development
(b) Postal Services
(c) Revenue Collection
(d) Civil Justice

Q98. A, C, E, G, J, L, N and O 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. 'E' has 'A' and 'G' as immediate neighbours. The 'A' is at immediately left to 'C'. The 'O' is at the immediate right of 'J'. 'L' has 'J' and 'N' as immediate neighbours.

Who is sitting to the immediate left of G?

(a) N
(b) E

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(c) O
(d) C

Q99. If the monthly salary of a person is Rs. 28,000 and the expenditure for the month is 92% of his salary, then the remaining amount from that month's salary is _____.
(a) Rs. 2,200
(b) Rs. 2,400
(c) Rs. 2,240
(d) Rs. 2,340

Q100. A light ray enters from medium A to medium B, and as a result, it bends away from the normal in the medium B. The refractive index of medium B relative to medium A is:
(a) greater than unit
(b) equal to 2
(c) equal to unity
(d) less than unity

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) I weakens, while II strengthens the statement

Statement:

Reclaimed land should be avoided as it only has disadvantages.

Arguments:

I. Many countries have no option but to reclaim land to provide for the increasing population → In this argument, there is an advantage shared about the reclaimed land but the statement suggests that it has only disadvantages since both of them points are against each other, the argument weakens the statement.

II. Land that is reclaimed has a long-lasting effect on nature as it deteriorates ecosystems and biodiversity → Here the bad effects of reclaimed land are discussed which in turn favours the point indicated in the statement so both of them lead towards the same direction i.e., negative effects of reclaimed lands, therefore, the argument strengthens the statement.

So the argument I weaken the statement, while argument II strengthens the statement.

Hence the correct answer is "I weakens, while II strengthens the statement".

Q2. Answer: (d) Washing soda

The correct answer is Washing Powder.

Key Points

• Washing powder
• $Na_2CO_3.10H_2O$ is the chemical formula for washing soda.
• It is decahydrate sodium carbonate.

• It has ten molecules of water.

• Water of crystallisation

• The quantity of water molecules that chemically mix in a specific molecular ratio with the relevant salt in the crystalline state is known as the water of crystallisation.

• The crystals' geometrical pattern and colour are a result of this water.

Additional Information

Compound Name	Compound Formula
Baking Soda	NaHCO3
Bleaching Powder	Ca(ClO)2
Baking Powder	NaHCO3
Washing Soda	Na2CO3

Q3. Answer: (d) Saturday

Six students are appearing for their exams on different days of the week, from Monday to Saturday, their arrangement as per the information given in the question is shown below,

Step 1: Reshma has her exam on Tuesday.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Reshma				

Step 2: None of them has an exam before Unmukth.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Unmukth	Reshma				

Step 3: Sunayana has the exam on the day immediately after Reshma.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Unmukth	Reshma	Sunayana			

Step 4: Only one student has the exam between Pavan and Reshma.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Unmukth	Reshma	Sunayana	Pavan		

Step 5: Vinay has the exam on the day immediately after Pavan.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Unmukth	Reshma	Sunayana	Pavan	Vinay	

Step 6: Tarun will take the only place vacant, thus the final arrangement is

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Unmukth	Reshma	Sunayana	Pavan	Vinay	Tarun

From the arrangement we can say that Tarun has the exam on Saturday.

Hence the correct answer is 'Saturday'.

Q4. Answer: (c) Only conclusions II, III and IV follow.

Statements:

All carpets are scholars.

All scholars are trip advisors.

No hat is a trip advisor.

Venn diagram:

Conclusions:

I. No trip advisor is a scholar → Does not follow → We have 'all scholars are trip advisors' which means there has to be some trip advisors that are scholars and thus the conclusion does not follow.

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II. All carpets are trip advisors → Follow →Because 'all carpets are scholars' and 'all scholars are trip advisors' imply 'all carpets are trip advisors' and the same can be seen in the Venn diagram.

III. Some trip advisors are scholars → Follow → We have 'all scholars are trip advisors' which means there have to be some trip advisors that are scholars and thus the conclusion follows.

IV. No carpet is a hat → Follow → Since 'all carpets are trip advisors' and 'no hat is a trip advisor' then it is not possible that a carpet is a hat therefore the conclusion follows.

So, only conclusions II, III, and IV follow.

Hence, the correct answer is " Only conclusions II, III, IV follow ".

Q5. Answer: (c) I

We change each vowel to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order in the word 'MAJESTY', we get:

Now, arranging the newly formed letters in the alphabetical order → B F I L R S X

From the word formed, I is the letter third from the left.

Hence, the correct answer is " I ".

Q6. Answer: (d) 1/2

Shortcut Trick

Directly isolate the variable to find the positive root.

4x2 − 1 = 0

4x2 = 1 => x2 = 1/4

x = √(1/4) = 1/2

Therefore The correct answer is 1/2.

Alternate Method

Given:

The Quadratic Equation is 4x2 − 1 = 0.

Formula Used:

We use the Difference of Squares identity: a2 − b2 = (a − b)(a + b).

Calculations:

=> 4x2 − 1 = 0

=> (2x)2 − (1)2 = 0

=> (2x − 1)(2x + 1) = 0

Equating each factor to zero:

=> 2x − 1 = 0 OR 2x + 1 = 0

=> 2x = 1 OR 2x = −1

=> x = 1/2 OR x = −1/2

Since the question asks for the positive root:

=> x = 1/2

Therefore The correct answer is 1/2.

Additional Information

Nature of Roots

For a quadratic equation ax2 + bx + c = 0, the discriminant D = b2 − 4ac determine the roots. If D > 0, there are two distinct real roots.

Square Root Property

If x2 = k, then the solutions are x = √k and x = −√k. Always check if the question specifies positive or negative values.

Difference of Two Squares

An expression in the form a2 − b2 is a special product that always factors into (a − b)(a + b).

Q7. Answer: (d) -18

Shortcut Trick

Use the direct identity: $2(xy + yz + zx) = (x + y + z)^2 - (x^2 + y^2 + z^2)$

Substitute the given values: $2(xy + yz + zx) = (0)^2 - 36$

$2(xy + yz + zx) = -36$

$xy + yz + zx = -36 \div 2 = -18$

Therefore The correct answer is −18.

Alternate Method

Given:

Sum of variables (x + y + z) = 0

Sum of squares ($x^2 + y^2 + z^2$) = 36

Formula Used:

The algebraic identity for the square of a trinomial is:

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + zx)$

Calculations:

=> $(0)^2 = 36 + 2(xy + yz + zx)$

=> $0 = 36 + 2(xy + yz + zx)$

=> $2(xy + yz + zx) = 0 − 36$

=> $2(xy + yz + zx) = −36$

=> $xy + yz + zx = −36 ÷ 2$

=> $xy + yz + zx = −18$

Therefore The correct answer is −18.

Additional Information

Sum of Cubes Identity

If (x + y + z) = 0, then $x^3 + y^3 + z^3 = 3xyz$. This is a very common competitive exam property.

Square of Binomials

$(x + y)^2 = x^2 + y^2 + 2xy$ and $(x − y)^2 = x^2 + y^2 − 2xy$. These are fundamental expansion formulas.

Difference of Squares

$x^2 − y^2 = (x + y)(x − y)$. This is used for factorization and simplifying expressions.

Q8. Answer: (d) Rs. 2,028

Shortcut Trick

The ratio of shares A : B is given by (1 + r/100)^(t2−t1) : 1.

Difference in time = 9 − 7 = 2 years | Rate = 4% => Factor = 104/100 = 26/25.

Ratio A : B = $(26/25)^2$: 1 = 676 : 625.

Total ratio parts = 676 + 625 = 1301 units.

1301 units = Rs. 3,903 => 1 unit = Rs. 3 | A's share = 676 × 3 = Rs. 2,028.

Therefore The correct answer is Rs. 2,028.

Alternate Method

Given: Total amount = Rs. 3,903, Rate (r) = 4%, Time for A (t_A) = 7 years, Time for B (t_B) = 9 years.

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

Let A's share be x and B's share be y.

=> $x(1 + 4/100)^7 = y(1 + 4/100)^9$

=> $x/y = (1 + 4/100)^{(9−7)}$

=> $x/y = (104/100)^2 = (26/25)^2$

=> $x/y = 676/625$

=> x : y = 676 : 625

=> $x = [676 / (676 + 625)] × 3903$

=> $x = (676 / 1301) × 3903$

=> $x = 676 × 3$

=> $x = 2028$

Therefore The correct answer is Rs. 2,028.

Additional Information

Compound Interest Formula

The amount A accumulated on principal P at a rate r% compounded annually for n years is $A = P(1 + r/100)^n$.

Division of Sum for Equal Amounts

When a sum is divided such that amounts after t1 and t2 years are equal, the ratio of shares is P1 : P2 = (1 + r/100)^(t2) : (1 + r/100)^(t1).

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Difference between CI and SI

For 2 years, the difference is $D = P(r/100)^2$. For 3 years, it is $D = P(r/100)^2 \times (3 + r/100)$.

Q9. Answer: (b) 1937

The correct answer is 1937.

Key Points

• Federal Court of India:-

• Under the terms of the Government of India Act of 1935, the Federal Court of India was a judicial body with original, appellate, and advisory jurisdiction that was founded in India in 1937.

• Despite the Federal Court's location in Delhi, it continued operations until the Supreme Court of India was founded in 1950.

• In order to settle disagreements between provinces as well as between the center and the provinces, a federal court was established in Delhi.

• No more than six justices and one Chief Justice were to serve.

Additional Information

• The Supreme Court was established on January 28, 1950, two days after India became the Sovereign Democratic Republic.

• The Council of States and the House of the People of India's Parliament, which is housed in the same structure as the inauguration, meet in the Chamber of Princes.

• The Federal Court of India has met here, in this Chamber of Princes, for 12 years, from 1937 to 1950.

• This would serve as the Supreme Court's residence for years to come until it moved into its current location.

• The inaugural ceremonies were understated yet magnificent.

Q10. Answer: (c) Sushil Chandra

The correct answer is Sushil Chandra.

Key Points

• Sushil Chandra:-

• He is an Indian Revenue Service officer from the 1980 batch.

• He served as India's 24th Chief Election Commissioner.

• Prior to this, he presided over the Central Board of Direct Taxes.

• He served as the Delhi-based International Taxation's Commissioner of Income Tax (Appeals).

• He served as Gujarat's Director General of Investigation as well as Mumbai's Director of Investigation.

• He was appointed the Election Commissioner of India on February 15, 2019, and on April 13, 2021, he became the Chief Election Commissioner of India.

• He has participated in 16 elections, five of which he has presided over as chief election commissioner.

Additional Information

• India's electoral commission:-

• It is an independent constitutional body in charge of holding elections at the federal, state, and local levels.

• In article 324 of the constitution, the Indian Election Commission's authority is outlined. 1950 saw the creation of the Election Commission.

• The secretariat of the commission, which has its headquarters in New Delhi, is composed of the Election Commissioners, Deputy Election Commissioners (often IAS officers), Directors General, Principal Secretaries, Secretaries, and Under Secretaries.

Q11. Answer: (d) Rajasthan

The correct answer is Rajasthan.

Key Points

• Great Indian Bustard:-

• A big member of the bustard family (Otididae), the great Indian bustard (Ardeotis nigriceps) is one of the heaviest-flying birds in the world.

• On the Indian subcontinent, the great Indian bustard lives in dry grasslands and scrublands.

• The Indian state of Rajasthan has the highest concentrations of these birds.

• The tallest Great Indian Bustards can reach heights of 1.2 metres (4 feet), and they have long legs and a long neck.

Additional Information

• The largest individuals weigh 15 kg, with the sexes being nearly the same size (33 pounds).

• The colour of the feathers helps to distinguish between men and females.

• Great Indian bustards are opportunistic omnivores who consume anything that looks appetising in their immediate environment.

• They eat several kinds of arthropods, worms, tiny animals, and tiny reptiles.

• The majority of their diet consists of insects like locusts, crickets, and beetles during the summer monsoon when rainfall in India reaches its highest point and the bird's nesting season is largely through.

Q12. Answer: (b) South

From the given information:

Step 1: Rohini walked for 2 kilometres on a straight road, facing North.

Step 2: Then she took a right turn and walked for 1 kilometre.

Step 3: Then she again took a right turn and walked 2 kilometres.

From the diagram we can see that Rohini is facing towards south.

Hence the correct answer is " South ".

Q13. Answer: (b) 2017 - 18

The correct answer is 2017 - 18.

Key Points

• The government of India approved the merger of Railway Budget with the General Budget on September 21. 2016.

• The Government has decided to merge Rail Budget with the Union Budget from budget year 2017-18.

• The Committee headed by Shri Bibek Debroy, Member, NITI Aayog, and a separate paper on "Dispensing with the Railway Budget" by Shri Bibek Debroy and Shri Kishore Desai served as the foundation for the merger of the railway budget with the general budget.

• A committee made up of members from the Ministries of Finance and Railways looked at the relevant issues and worked out the procedural specifics.

Additional Information

• Following is a general list of the key characteristics of mergers and the advantages that are likely to result from them:

• Ministry of Railways will continue to operate as a department-run business venture.

• Railways shall have their own Statement of Budget Estimates and Grant Request.

• The Ministry of Finance will compile and propose to Parliament a single Appropriation Bill that includes the estimates for Railways, and the Ministry of Finance will manage all related legislative activities.

• Railways shall be excluded from making dividend payments to General Revenues, and their capital-at-charge will be eliminated.

• The Ministry of Finance will give the Ministry of Railways gross budgetary support to help cover some of its capital expenses.

• Railways may continue to finance their capital expenditures by using extra-budgetary resources to get resources from the market.

• The publication of a unified budget will assist in providing a comprehensive picture of the government's financial situation.

• Planning for multimodal transportation involving roads, railroads, and inland waterways would be made easier by the merger of the Rail Budget with the Union Budget.

• It will give the Ministry of Finance more flexibility during the mid-year review to better allocate resources, etc.

Q14. Answer: (c) 22

From the given information:

Step 1: Ruchi is ninth to the right of Pranavi. No student is to the left of Pranavi.

Step 2: Tanya is fifth to the right of Ruchi.

Step 3: Vipanchi is seventh to the right of Tanya, no other student is sitting in the row.

From the arrangement we can see that the total number of students is 22.

Hence, the correct answer is " 22 ".

Q15. Answer: (d) 20

Shortcut Trick

Present ratio Shinjan : Aamya = 3 : 4 (Difference = 1 unit)

Ratio after 10 years = 5 : 6 (Difference = 1 unit)

Increase in units for both = 5 − 3 = 6 − 4 = 2 units

Given, 2 units = 10 years => 1 unit = 5 years

Present age of Aamya = 4 units = 4 × 5 = 20 years

Therefore The correct answer is 20 years.

Alternate Method

Let the present ages of Shinjan and Aamya be 3x and 4x respectively.

=> After 10 years, Shinjan age = 3x + 10

=> After 10 years, Aamya age = 4x + 10

=> (3x + 10) / (4x + 10) = 5 / 6

=> 6(3x + 10) = 5(4x + 10)

=> 18x + 60 = 20x + 50

=> 20x − 18x = 60 − 50

=> 2x = 10 => x = 5

=> Present age of Aamya = 4x = 4 × 5 = 20 years

Therefore The correct answer is 20 years.

Additional Information

Ratio Difference Balancing

If the difference between ratio terms is not equal, multiply the ratios by the difference of the other ratio to balance the age gap.

Age Constant Concept

The difference between the ages of two people always remains constant regardless of the number of years passed.

Q16. Answer: (a) 162°

Given:

Calculations:

Agriculture expenditure is 45%.

Please note that 100% is 360°.

According to the question,

45% of 360

= 0.45 × 360

= 162°

Hence, The Required value is 162°.

Q17. Answer: (a) Delhi

The correct answer is Delhi.

Key Points

• According to police officials, the Tejaswini initiative, which was started to reduce crimes against women in Delhi, has produced excellent results.

• TEJASWINI: Women Centric Safety & Empowerment Initiative" was the name given to this project by the North-West District.

• The launch date was July 10, 2021.

• In the crime-ridden and sensitive beat districts of several police stations, 46 women-beat constables were placed.

• Its objectives included reaching out to women from all social classes and older women as well as defending the rights and dignity of women and children in the North-West District.

Additional Information

• The Tejaswini programme was launched in order to establish an environment where women would feel comfortable talking to these female constables and sharing their problems and worries.

• After three months of putting the programme into operation, a variety of gatherings, conversations, and open house events with women and female constables were arranged to assess the situation on the ground.

• The main goal of this activity or project is to raise awareness of the trends of various crimes against women, such as molestation, rape, sexual assault, domestic violence, child abuse, and harassment for dowry demand, among others, among women and girls of all age groups and their guardians/parents.

• It sought to give students the confidence to handle difficult and undesirable situations on their own while simultaneously educating them on how to get legal assistance.

Q18. Answer: (d) Three

We have to find the triad which looks like (7,3,9) in the given series:

We can see that there are 3 such triads where 3 is immediately preceded by 7 and immediately followed by 9.

Hence, the correct answer is " Three ".

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Q19. Answer: (a) D

We change each vowel to the letter preceding it in the English alphabetical order and each consonant is changed to the letter following it in the English alphabetical order in the word 'SCIENCE', we get:

From the word formed we can see that D occurs the most i.e., 4 times.

Hence, the correct answer is " D ".

Q20. Answer: (b) Nischal

Six professors: Jayanth, Kiran, Lasya, Mythili, Nischal and Omprakash

Six days: Monday to Saturday

From the given information:

Step 1: Only two professors have classes before Mythili's class.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Mythili			

Step 2: Jayanth has the class on Tuesday and Omprakash has the class on Saturday.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Jayanth	Mythili			Omprakash

Step 3: Only one professor has the class after the class of Kiran.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	Jayanth	Mythili		Kiran	Omprakash

Step 4: The class of Nischal is not on any of the days between the classes of Kiran and Mythili.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Nischal	Jayanth	Mythili		Kiran	Omprakash

Now we place Lasya at the only spot left,

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Nischal	Jayanth	Mythili	Lasya	Kiran	Omprakash

From the arrangement we can see that Nischal is has the class on Monday.

Hence the correct answer is option 2)

Q21. Answer: (c) 14 September 1949

The correct answer is 14 September 1949.

Key Points

• Hindi was declared the official language of the Union of India on September 14, 1949. There is no national language in India.

• Hindi written in the Devanagari script was designated as India's official language in the Constitution of India later that year.

• In addition to Hindi, English is acknowledged as one of India's official languages.

• Through legislation, various Indian states designate their own official languages.

Additional Information

• About 40% of Indians speak Hindi, which is one of the country's major tongues.

• To continue using English and Hindi for official purposes after 1965, the Official Languages Act of 1963 was passed by the Parliament with this in mind.

• English is the official language in some North Eastern states, including Arunachal Pradesh and Nagaland.

Q22. Answer: (c) 13

The correct answer is 13.

Key Points

• Electric Power

• The rate at which energy is converted into an electrical circuit or work is completed is known as electric power. To put it another way, it is a measure of how much energy is used over a time period.

• The formula for electric power is given by P=VI

where V is the potential difference in the circuit and P is the power.

I is the current of electricity.

• Power can also be written as $P=I^2R$ and $P= V^2/R$

• Ohm's law is used to get the above two expressions, where voltage, current, and resistance are related in the following way: $V=IR$

Additional Information

• Calculation

• Calculate the current For Electric lamps,

Given,

Power of AC, Pac= 2KW= 2000W

Power of lamps, Pl= 100W

We know,

Power, P=VI

The current drawn by the lamp or electric current, I= Pac/V= 2000/220= 9.09A

The main power supply of a house is through a 15 A fuse.

Maximum Electric current, which can pass through lamps= 15- 9.09= 5.91A

• Calculate the number of lamps connected in parallel

Let the number of lamps= n

and Current withdrawal by a single lamp, Ilamp

Electrical current, Ilamp = Pl/v= 100/220= 0.45A

Maximum number of lamps, n= 5.91/0.45= 13

Hence maximum,13 lamps can be connected in parallel with AC

Q23. Answer: (a) 86°

Shortcut Trick

The sum of all interior angles of a quadrilateral is always 360°.

Sum of given angles = 90° + 96° + 88° = 274°

Fourth Angle = 360° − 274° = 86°

Therefore The correct answer is 86°.

Alternate Method

Given:

First angle (A) = 90°

Second angle (B) = 96°

Third angle (C) = 88°

Formula used:

According to the Angle Sum Property of a quadrilateral, the sum of all four interior angles is 360°.

Sum = (n − 2) × 180°, where n is the number of sides (for a quadrilateral, n = 4).

Calculations:

=> Let the fourth angle be x.

=> 90° + 96° + 88° + x = 360°

=> 274° + x = 360°

=> x = 360° − 274°

=> x = 86°

Therefore The correct answer is 86°.

Additional Information

Angle Sum Property of Polygons

The sum of interior angles of any polygon with n sides is calculated as (n − 2) × 180°.

Cyclic Quadrilateral

In a cyclic quadrilateral (vertices on a circle), the sum of opposite angles is exactly 180°.

Sum of Exterior Angles

For any convex polygon, the sum of all exterior angles is always 360°, regardless of the number of sides.

Q24. Answer: (d) 90

Shortcut Trick

Divisor r leaving the same remainder = HCF of |x − y|, |y − z|, and |z − x|.

r = HCF of |71 − 41|, |91 − 71|, and |91 − 41|

r = HCF(30, 20, 50) = 10

Required LCM = LCM of 10 and 45 = 90

Therefore The correct answer is 90.

Alternate Method

Given:

Three numbers: 41, 71, and 91

Second number to find LCM with r: 45

Concept Used:

The greatest number r that divides x, y, and z leaving the same remainder is the HCF of their absolute differences.

Calculation:

=> Differences = |71 − 41|, |91 − 71|, and |91 − 41|

=> Differences = 30, 20, and 50

=> Now, we find the HCF of 30, 20, and 50 to get r.

=> $30 = 2 \times 3 \times 5$

=> $20 = 2^2 \times 5$

=> $50 = 2 \times 5^2$

=> Common prime factors are 2 and 5.

=> r = HCF(30, 20, 50) = $2 \times 5 = 10$

=> We need to find the LCM of r (which is 10) and 45.

=> $10 = 2 \times 5$

=> $45 = 3^2 \times 5$

=> LCM(10, 45) = $2 \times 3^2 \times 5$

=> LCM = $2 \times 9 \times 5 = 90$

Therefore The correct answer is 90.

Additional Information

Highest Common Factor (HCF)

The greatest number that perfectly divides two or more numbers. It is obtained by multiplying the lowest powers of all common prime factors.

Least Common Multiple (LCM)

The smallest number which is perfectly divisible by two or more given numbers. It is the product of the highest powers of all prime factors involved.

Property of Remainder Divisors

When asked to find the greatest number dividing x, y, and z to leave the same remainder, the required number is always the HCF of the absolute differences |x − y|, |y − z|, and |z − x|.

Q25. Answer: (a) Precipitation reaction

The correct answer is Precipitation Reaction.

Key Points

• Precipitation Reaction

• A "chemical reaction occurring in an aqueous solution when two ionic bonds combine, yielding the creation of an insoluble salt" is what is meant by the term "precipitation reaction."

• Precipitates are insoluble salts created during precipitation reactions.

• Precipitation reactions are often double displacement events that result in the formation of the precipitate, a solid form of residue.

• The creation of insoluble salts that precipitate out of the solution results from these reactions when two or more solutions with various salt concentrations are mixed.

• Example- The chemical reaction between potassium chloride and silver nitrate, in which solid silver chloride is precipitated out, is one of the greatest examples of precipitation reactions. This is the precipitation reaction's byproduct, the insoluble salt.

• The chemical equation for this precipitation reaction is provided below-

$AgNO_3(aqueous) + KCl(aqueous) \longrightarrow AgCl(precipitate) + KNO_3(aqueous)$

Additional Information

Reactions	About reactions
Catalytic reaction	The process of catalysis involves introducing a catalyst to a chemical reaction to speed up the process. Catalysts are not destroyed during the reaction and are unaffected by it.
Precipitation reaction	A "chemical reaction occurring in an aqueous solution when two ionic bonds combine, yielding the creation of an insoluble salt" is what is meant by the term "precipitation reaction."
Addition reaction	An organic reaction known as an addition occurs when two or more molecules join to form a larger molecule (the adduct). Because they also have double-bond nature, molecules containing carbon—hetero double bonds, such as carbonyl (C=O) or imine (C=N) groups, can be added.
Displacement reaction	When an atom or group of atoms in a molecule are replaced by another atom, this is referred to as a displacement reaction. For instance, copper metal is displaced when iron is added to a solution of copper sulphate. A + B + C = A + B + C. When A is more reactive than B, the aforementioned equation holds true.

Q26. Answer: (c) Only conclusion II follows.

Statements:

All eggs are millets.

All millets are balloons.

All balloons are prisoners.

Venn diagram:

Conclusions:

I. All balloons are eggs → Does not follow → From the given information we can say that all eggs are balloons but it will be wrong to say that all balloons are eggs and the same can be seen in the Venn diagram thus the conclusion does not follow.

II. Some prisoners are millets → Follow → We have 'all millets are balloons' and 'all balloons are prisoners' so we can say that all millets are prisoners, therefore, the conclusion follows.

III. All prisoners are balloons → Does not follow → From the statement, 'all balloons are prisoners' we can only say that some prisoners are balloons but we have no information about all the prisoners thus the conclusion does not follow.

So only conclusion II follows.

Hence the correct answer is option 3)

Q27. Answer: (a) 4

Shortcut Trick

Check the definition of prime numbers: they must be greater than 1 and have only 2 factors.

Smallest prime numbers are: 2, 3, 5, 7, 11...

Notice that 2 is a prime number but it is even.

Therefore, the statement 'All prime numbers are odd' is incorrect.

Therefore The correct answer is 4.

Alternate Method

Given: Statements regarding Prime Numbers.

Analysis of each statement:

=> Statement 1: Single-digit prime numbers are {2, 3, 5, 7}. Total count = 4. (Correct)

=> Statement 2: There is no largest prime number; they continue to infinity. (Correct)

=> Statement 3: By definition, a prime number has exactly two factors: 1 and itself. (Correct)

=> Statement 4: The number 2 is the only even prime number. All other primes are odd. Since 2 exists, not 'all' primes are odd. (Incorrect)

Therefore The correct answer is 4.

Additional Information

Even Prime Number

2 is the only even prime number and the smallest prime number.

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Composite Numbers

Numbers having more than two factors are called composite numbers. Note that 1 is neither prime nor composite.

Co-prime Numbers

Two numbers are co-prime if their HCF is 1, regardless of whether the numbers themselves are prime or composite.

Q28. Answer: (b) QCTKG

According to the English alphabets and their positional values:

The pattern followed in the given codes is:

The first alphabet is decreased to 6 positional values

The second alphabet is decreased to 5 positional values

The third alphabet is decreased to 4 positional values

The fourth alphabet is decreased to 3 positional values

The fifth alphabet is decreased to 2 positional values

The sixth alphabet is decreased to 1 positional value

The alphabet are arranged backward (right to left) to form the code.

Therefore code for TALCUM is LSZHVN

Therefore code for GRAINS is RLFWMA

Similarly,

Therefore code for LOWER is QCTKG

Hence the correct answer is option 2)

Q29. Answer: (d) 1.5%

Calculations:

Weighted average

= Marks × weightage /total weightage

= {90 × 2 + 92 × 2 + 93 × 3 + 78 × 1 + 86 × 2}/(2 + 2 + 3 + 1 + 2)

= (180 + 184 + 279 + 78 + 172)/10

= 893/10

= 89.3

And average when each has equal weightage

= (90 + 92 + 93 + 78 + 86)/5

= 439/5

= 87.8

Difference= 89.3 - 87.8 = 1.5

Hence, The Required value is 1.5.

Q30. Answer: (b) 0

Shortcut Trick

The median of 11 observations is the 6^(th) term when arranged in order.

Original 6^(th) term in ascending order: 33, 35, 41, 46, 55, 58 → 58 is the median.

Replacement 1: 41 → 43 (both are less than 58, so the position of 58 is unchanged).

Replacement 2: 92 → 99 (both are greater than 58, so the position of 58 is unchanged).

Since the 6^(th) term remains 58, the difference is 0.

Therefore The correct answer is 0.

Alternate Method

Given: Data set = {46, 64, 87, 41, 58, 77, 35, 90, 55, 92, 33}

Formula Used: Median for odd n = [(n + 1)/2]^(th) term (in ascending order).

Step 1: Old Median Calculation

=> Arrange in ascending order: 33, 35, 41, 46, 55, 58, 64, 77, 87, 90, 92

=> Total terms (n) = 11

=> Median = (11 + 1)/2 = 6^(th) term

=> Old Median = 58

Step 2: New Median Calculation

=> New data set (replacing 92 with 99 and 41 with 43): 46, 64, 87, 43, 58, 77, 35, 90, 55, 99, 33

=> Arrange in ascending order: 33, 35, 43, 46, 55, 58, 64, 77, 87, 90, 99

=> Median = 6^(th) term

=> New Median = 58

Step 3: Finding Difference

=> Difference = New Median − Old Median

=> Difference = 58 − 58 = 0

Therefore The correct answer is 0.

Additional Information

Median for Even Number of Observations

If n is even, the median is the average of the (n/2)^(th) and (n/2 + 1)^(th) terms.

Empirical Relationship

For a moderately skewed distribution: Mode = 3 × Median − 2 × Mean.

Resistance to Outliers

Unlike the Mean, the Median is not heavily affected by extreme values (outliers) in a data set.

Q31. Answer: (a) Visakhapatnam

The correct answer is Visakhapatnam.

Key Points

• The Ministry of Culture sponsors cultural acts as a part of the Azadi Ka Amrit Mahotsav in Visakhapatnam for "MILAN 2022."

• The Ministry of Culture will take part in "MILAN 2022," which was held from February 26–28, 2022, at Ramakrishna Beach and Milan Village in Visakhapatnam, and organised by the Indira Gandhi National Centre for the Arts (IGNCA) in partnership with the Eastern Naval Command and the Government of Andhra Pradesh.

• Every two years, a global naval exercise called MILAN is held.

• "Camaraderie, Cohesion, Collaboration" was the theme of MILAN 2022, and it truly embodies the exercise's spirit.

• For MILAN 2022, 46 friendly nations had been invited.

Additional Information

• The program's prominence was also enhanced by the presence of approximately 140 high-level foreign delegates, 14 foreign warships and planes, and Indian Navy troops.

• The officials from these nations will also see kites and Rangolis during the event.

• Through the online platform of AKAM, residents of Vishakhapatnam and others around the world can take in all of the cultural programmes.

Q32. Answer: (b) CABDHEFG

The pattern followed in the given series is:

Now we apply the options on the given series:

Option 1) BACDEFGH → D B B A / A C C D / E G F F / E G H H → No particular pattern follows

Option 2) CABDHEFG → D C B A / A B C D / H G F E / E F G H → Particular pattern follows

Option 3) BACDHEFG → D B B A / A C C D / H G F E / E F G H → No particular pattern follows

Option 4) CABDEFGH → D C B A / A B C D / E G F F / E G H H → No particular pattern follows

The pattern is followed in option 2)

Hence the correct answer is option 2)

Q33. Answer: (a) x + y

Shortcut Trick

Recognize the standard Algebraic Identity: $(a + b)(a^2 − ab + b^2) = a^3 + b^3$.

Here, let a = x^(1/3) and b = y^(1/3).

The expression simplifies to $a^3 + b^3 = (x^{(1/3)})^3 + (y^{(1/3)})^3 = x + y$.

Therefore The correct answer is x + y.

Alternate Method

Given: (x^(2/3) − x^(1/3)y^(1/3) + y^(2/3))(x^(1/3) + y^(1/3))

Formula used: Sum of two cubes identity, $(a + b)(a^2 − ab + b^2) = a^3 + b^3$

=> Let a = x^(1/3) and b = y^(1/3).

=> Then $a^2 = (x^{(1/3)})^2 = x^{(2/3)}$ and $b^2 = (y^{(1/3)})^2 = y^{(2/3)}$.

=> Also, $ab = x^{(1/3)} \times y^{(1/3)}$.

=> Substituting these into the given expression: $(a^2 - ab + b^2)(a + b)$

=> According to the identity, this equals $a^3 + b^3$.

=> Expression = $(x^{(1/3)})^3 + (y^{(1/3)})^3$

=> Since $(x^m)^n = x^{(m \times n)}$, we get $x^{((1/3)\times 3)} + y^{((1/3)\times 3)}$

=> Result = $x^1 + y^1 = x + y$

Therefore The correct answer is x + y.

Additional Information

Sum of Two Cubes

The identity for the sum of cubes is $(a + b)(a^2 - ab + b^2) = a^3 + b^3$.

Difference of Two Cubes

The identity for the difference of cubes is $(a - b)(a^2 + ab + b^2) = a^3 - b^3$.

Power Rule for Exponents

For any base x, the rule $(x^a)^b = x^{(a \times b)}$ allows simplification of fractional powers when multiplied by their reciprocal.

Q34. Answer: (a) decrease to 0.9 times of itself

The correct answer is decrease to 0.9 times of itself.

Key Points

• Resistance

• There is a relationship between the potential difference across a conductor and the current that flows through it, according to Ohm's law. It comes from,

V prop. to I V = IR

Where V is the potential difference measured across the conductor in volts, I is the conductor's current in amperes, and R is the resistance constant in ohms.

• The following factors influence a conductor's electrical resistance:

• The cross-sectional area of the conductor

• Length of the conductor

• The material of the conductor

• The temperature of the conducting material

• Electrical resistance is inversely proportional to the conductor's cross-sectional area (A) and directly proportional to its length (L). The relationship that follows provides it.

$R = \rho L/A$

Additional Information

• Calculation

• Given,

A silver wire of length L and cross-sectional area A is replaced by an aluminum wire of length 5 L and cross-sectional area 9 A.

$\rho_{(silver)} = 1.6 \times 10\text{-}8\ \Omega$ m and $\rho_{(Aluminium)} = 2.6 \times 10\text{-}8\ \Omega$m

We know,

$R = \rho L/A$

$R_{(silver)} = 1.6 \times 10\text{-}8\ L/A$

$R_{(aluminium)} = 2.6 \times 10\text{-}8 \times 5L/9A$

$R_{(silver)}/R_{(aluminum)} = 1.6\times 9/ 2.6\times 5 = 1.107$

$R_{(alluminium)}/R_{(silver)} = 0.90$

Q35. Answer: (d) Saprotrophic

The correct answer is Saprotrophic.

Key Points

• Saprotrophic

• As their main source of nutrition, saprophytes are organisms that devour dead or rotting organic matter.

• Mushrooms use the saprophytic mode of nutrition.

• For this reason, organisms like mushrooms can obtain nutrients from dead and decomposing plant or animal tissue.

• A few examples of saprophytes are fungi, mushrooms, yeast, and many bacterial species.

• Saprotrophs often have white skin, no leaves, and colorful blooms.

Additional Information

Nutrition Name	Explanation	Example
Chemotrophic Nutrition	An organism is said to be a chemotroph if it uses the environment's electron donors to oxidize them for energy. They can be either organic (chemoorganotrophs) or inorganic substances (chemolithotrophs). In contrast to phototrophs, which use photons, chemotrophs employ chemicals.	They consist of sulfur oxidizers, methanogens, halophiles, nitrifiers, thermoacidophiles, etc.
Symbiotic Nutrition	It describes the relationship between two creatures where they cooperate to benefit each other by sharing food and shelter. Commensalism is a type of symbiotic relationship in which one organism benefits without the other being harmed.	The interaction between nitrogen-fixing bacteria and leguminous plants like clover, alfalfa, and soybeans is an illustration of symbiosis.
Autotrophic Nutrition	When a creature uses simple inorganic ingredients like water, mineral salts, and carbon dioxide in the presence of sunshine, this process is known as autotrophic nourishment. "Autotrophic" is a phrase made up of the terms "auto," which means "self," and "trophic," which means nutrition.	Autotrophs include algae, plants, certain bacteria, and fungi.

Q36. Answer: (d) uniform at all points inside the solenoid

The correct answer is uniform at all points inside the solenoid.

Key Points

• solenoid

• A solenoid is a machine made of a casing, a coil of wire, and a moving plunger (armature).

• A magnetic field that generates around the coil when an electrical current is applied pulls the plunger in.

• A solenoid, to put it simply, transforms electrical energy into mechanical work.

• A solenoid operates by creating an electromagnetic field surrounding an armature, which is a moving core.

• The electromagnetic field causes that armature to move, and when it does, it opens and closes valves or switches, converting electrical energy into mechanical motion and force.

Additional Information

• Formula for Solenoid

	=solenoid magnetic flux density	
	= magnetic constant	
	=number of turns	
	= current	
	=length of the solenoid	

Q37. Answer: (b) Paper is biodegradable.

The correct answer is Paper is biodegradable.

Key Points

• Biodegradable waste

• Biodegradable wastes are those that spontaneously deteriorate or disintegrate.

• Wastes that do not break down quickly are referred to as non-biodegradable wastes.

• Biodegradable materials include things like plants, animals, their waste, paper, fruits, and vegetables.

Additional Information Difference between Biodegradable and Non- Biodegradable-

Biodegradable Waste	Non- Biodegradable waste

Biodegradable wastes are those that spontaneously deteriorate or disintegrate.	Wastes that do not break down quickly are referred to as non-biodegradable wastes.
Biodegradable materials include things like plants, animals, their waste, paper, fruits, and vegetables.	Non-biodegradable materials include those like rubber, plastic, chemicals, paint, and chemicals.
The biodegradable garbage is made up of natural materials like paper, food scraps, and organic waste.	Non-biodegradable compounds are often created chemically and do not occur in nature.
Waste that is biodegradable decomposes quickly.	Waste that is not biodegradable decomposes quickly.
The substance can be broken down and incorporated into the soil by microorganisms including fungi, bacteria, and others.	The non-biodegradable materials do not break down quickly or under the action of natural forces.
The biodegradable materials can be used to make compost, biogas, manure, fertilisers, and other products after they have broken down.	Non-biodegradable garbage degrades slowly, and recycling and separation are difficult and expensive processes.

Q38. Answer: (c) The boiling points increase with increasing molecular mass.

The correct answer is The boiling points increase with increasing molecular mass.

Key Points

• Homologous Series

• Any homologous sequence exhibits a gradation in physical attributes as the molecule mass rises.

• This is due to the fact that when molecule mass increases, melting and boiling points also rise.

• Similar gradations can be seen in other physical attributes like solubility in a particular solvent.

Additional Information

• Because only immediate dipole-induced dipole interactions can contribute to the intermolecular forces, alkanes have relatively low boiling points.

• Because of the carbon-chlorine polar link (+C-Cl-), which creates a permanent dipole and adds a tiny amount to the intermolecular forces, primary halogenoalkanes (n-alkyl halides) have somewhat higher boiling temperatures than alkanes.

• Because the N-H bond (-N-H+) is more polar than the C-Cl bond and this permanent dipole - permanent dipole interactions will result in hydrogen bonding, but not to the same extent as for alcohols, primary aliphatic amines are the second highest boiling compounds.

• Aldehydes and isomeric ketones are both primary aliphatic amines that are linear in structure. It would seem that the hydrogen bonding in the amines has roughly the same impact here as the permanent dipole - permanent dipole intermolecular attractive interactions caused by the polarised carbonyl bond (+C=O-).

• Due to the additional intermolecular tension of hydrogen bonds, alcohols (alkanols) exhibit much higher boiling temperatures than alkanes, BUT ONLY for the lower members.

• Because there are additional >C=O... >C=0 attractions in addition to hydrogen bonding, or you could argue that there are two sites on the molecule for hydrogen bonding, again only for the lower members of the series, and dimers are easily formed for the lower members of the series, carboxylic acids (also known as alkanoic acids) are even higher than alcohols.

Q39. Answer: (d) 125

The pattern followed in the given series is:

Hence the correct answer is option 4)

Q40. Answer: (a) Position 1

The correct answer is Position 1.

Key Points

• Gills

• The gills in fish are used to assist with breathing. The majority of fish have gills on each side of their heads.

• A huge surface area for gas exchange is provided by the tissues known as gills, which are composed of feathery structures known as gill filaments. Aquatic organisms need a lot of surface area for gas exchange because the water's dissolved oxygen content is so low.

• The rows of fish gill filaments are arranged in the gill arch. Lamellae, which are discs dotted with capillaries, make up each filament.

• Through these tiny blood arteries, blood enters and exits the gills. Even though fish's gills only cover a small portion of their bodies, the large respiratory surface that filaments create gives the entire creature effective gas exchange.

• Fish use their mouths to pump oxygen-rich water over their gills. The blood inside the capillary network absorbs the dissolved

oxygen as water flows over the gill filaments.

• The circulatory system then transports carbon dioxide from the body, which is expelled by the gills, and distributes oxygen to all body tissues before reaching the cells. Once the water has passed the gills, it leaves the fish's body through openings on the sides of the throat or through the operculum, a flap that is typically found in bony fish and covers and shields the gills.

• Several fish have several gill openings, including sharks and lampreys. Bony fish called rohu only has one gill opening on either side.

Additional Information

Position 2(Dorsal Fin)	**Dorsal fin: Like a horse's mane, the dorsal fin runs along the back of the fish. While it aids in body steering, it frequently acts as protection for fish. Some fish have dorsal fins that are spiky or spiny and can easily sever flesh.**
Position 3(Pectoral Fin)	Pectoral fin: A fish's pectoral fin is typically seen exactly next to its gills. Fish use these tiny, arm-like appendages to turn and steer in the water. Moreover, they manage depth.
Position 4(Pelvic Fin or Anal Fin)	The pelvic fin, often referred to as the ventral fin, is located near the base of a fish's body. This fin, which serves as both a brake and a propeller, is crucial for the majority of complex movements. Pelvic fins can also be utilised to hover and "ground walk" over objects. Anal fin: Anal fins are normally situated in the middle of the body, halfway between the pelvic and tail fins. Similar to the keel at the bottom of a boat, they are crucial for supporting the body of a fish. In order to maintain their erect posture, narrow or laterally compressed fish typically have longer anal fins.

Q41. Answer: (a) Iron displaces copper because iron is more reactive than copper.

The correct answer is Iron displaces copper because iron is more reactive than copper.

Key Points

• Fe is the reducing agent in the given reaction and CuSO4 is an oxidizing agent.

• The given reaction is an oxidation-reduction(redox) reaction.

• Displacement reaction

• Displacement reactions occur when an atom or group of atoms in a molecule are replaced by another atom

• When one element in a compound is replaced by another, it causes a single displacement reaction.

• A metal only replaces a metal in a displacement reaction, while a non-metal only replaces a non-metal.

• Less reactive components are replaced by more reactive ones.

• We can infer from the reaction that when iron is introduced to a solution of copper sulphate, it displaces the copper metal and produces ferrous sulphate. It is a displacement response as a result.

Additional Information

Metals	Atomic Number	Atomic Mass
Iron(Fe)	26	55.847
Copper(Cu)	29	63.546

Q42. Answer: (a) 15 years

Shortcut Trick

Present ages: Monu = 3x, Sonu = 4x

Condition: (3x − 5) / (4x + 5) = 2 / 5

Cross-multiply: 15x − 25 = 8x + 10 => 7x = 35 => x = 5

Monu's present age = 3 × 5 = 15 years

Therefore The correct answer is 15 years.

Alternate Method

Given: Ratio of present ages Monu : Sonu = 3 : 4. Ratio (Monu − 5) : (Sonu + 5) = 2 : 5.

Let the present age of Monu be 3x and Sonu be 4x.

According to the question:

=> (3x − 5) / (4x + 5) = 2 / 5

=> 5 × (3x − 5) = 2 × (4x + 5)

=> 15x − 25 = 8x + 10

=> 15x − 8x = 10 + 25

=> 7x = 35

=> x = 5

=> Monu's present age = 3x = 3 × 5 = 15 years

Therefore The correct answer is 15 years.

Additional Information

Ratio and Age Concept

If the ratio of ages is a : b, ages are taken as ax and bx. After n years, ages become (ax + n) and (bx + n).

Age Difference

The difference between the ages of two persons remains constant regardless of the number of years passed or preceding.

Cross-Multiplication Method

For equations like (ax+b)/(cx+d) = m/n, use cross-multiplication n(ax+b) = m(cx+d) to find the variable x quickly.

Q43. Answer: (a) 105

The pattern followed in the given series is:

The difference between the terms is +13.

Hence the correct answer is option 1)

Q44. Answer: (b) Kavita

Six persons: Mona, Rahul, Vikas, Kavita, Poonam and Khushi

From the given information:

1: Vikas is taller than only one person.

_ > _ > _ > _ > Vikas > _

2: Only Rahul is standing between Khushi and Vikas.

_ > _ > Khushi > Rahul > Vikas > _

3: Mona is shorter than only one person.

_ > Mona > Khushi > Rahul > Vikas > _

4: Exactly two people are standing between Poonam and Rahul.

Poonam > Mona > Khushi > Rahul > Vikas > _

Now we place Kavita at the only space left,

Poonam > Mona > Khushi > Rahul > Vikas > Kavita

From the arrangement, we can see that Kavita is the shortest.

Hence the correct answer is option 2)

Q45. Answer: (a) Buddhism

The correct answer is Buddhism.

Key Points

• The three holy texts of Buddhism are known as Tripitaka.

• The Tripitaka is regarded as the oral transmission of the Buddha's teachings that were preserved in writing by the Buddha's followers.

• The Buddha's successor, Mahakashypa, coordinated the reciting of these verses with the approval of other disciples.

• Buddhism regards the "Tripitaka" scriptures as its holy text.

• The Three Pitakas are:

• Vinaya Pitaka, which deals with order conduct.

• Sutta Pitaka, which is the largest collection of Buddha's teachings.

• The Abhidhamma Pitaka, a work on metaphysics.

• Many different Buddishit Councils are thought to have assembled these works.

Additional Information

• Zoroastrianism

• Zoroastrianism is an Iranian religion and one of the world's earliest organised faiths, founded on the teachings of Zoroaster, an Iranian-speaking prophet.

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• It has a dualistic cosmology of good and evil within the setting of a monotheistic ontology, as well as an eschatology that predicts the ultimate triumph of good over evil.

Jainism

• Jainism is an Indian religion also referred to as the Jain Dharma. Through the succession of twenty-four Tirthankaras (supreme preachers of Dharma), Jainism traces its spiritual ideas and history.

• The beginning of the present time cycle, according to tradition, was Rishabhadeva, who lived millions of years ago.

The twenty-third Tirthankara, Parshvanatha, is believed to have lived in the ninth century BCE. The twenty-fourth Tirthankara, Mahavira, is believed to have lived around 600 BCE.

Q46. Answer: (b) 2

Shortcut Trick

Identify the prime factors of 217800 and look for unpaired factors.

217800 = 2178 × 100 = (2 × 1089) × (10^2) = 2 × 33^2 × 10^2.

Factorized form: 2^1 × 3^2 × 11^2 × 2^2 × 5^2 = 2^3 × 3^2 × 5^2 × 11^2.

The power of 2 is 3 (odd), so we must multiply by 2 to make all powers even.

Therefore The correct answer is 2.

Alternate Method

Given: Number = 217800

Formula Used: For a number to be a perfect square, all exponents in its prime factorization must be even.

=> Prime factorization of 217800:

=> 217800 = 2 × 108900

=> 217800 = 2 × 2 × 54450

=> 217800 = 2 × 2 × 2 × 27225

=> 217800 = 2^3 × 3^2 × 5^2 × 11^2

=> To make it a perfect square, we need the power of 2 to be even (i.e., 2^4).

=> Multiplying factor = 2^((4−3)) = 2.

Therefore The correct answer is 2.

Additional Information

Perfect Square Property

A natural number is a perfect square if and only if each prime factor in its prime factorization appears an even number of times.

Smallest Multiplier/Divisor

To find the smallest number to multiply or divide to get a perfect square, identify factors with odd exponents and multiply/divide by those factors once.

Perfect Cube Property

A natural number is a perfect cube if the exponents of all its prime factors are multiples of 3.

Q47. Answer: (a) Rs. 2,500

Shortcut Trick

Let Marked Price be 100%.

After 20% discount, price = 80%.

After 5% GST on 80%, price = 80% × 1.05 = 84%.

According to question, 84% = 2100.

Marked Price (100%) = (2100 ÷ 84) × 100 = 25 × 100 = 2500.

Therefore The correct answer is Rs. 2,500.

Alternate Method

Given: Final price = Rs. 2,100, Discount = 20%, GST = 5%.

Formulas: Discounted Price = MP × (100 − D%) ÷ 100 | Final Price = Discounted Price × (100 + GST%) ÷ 100.

=> Let Marked Price be M.

=> Discounted Price = M × (80 ÷ 100) = 0.8M.

=> Final Price with GST = 0.8M × (105 ÷ 100) = 0.84M.

=> 0.84M = 2100.

=> M = 2100 ÷ 0.84 = 2500.

Therefore The correct answer is Rs. 2,500.

Additional Information

Successive Percentage Change

When a value is changed by a% and then by b%, the net effect is (a + b + ab/100)%. Here, -20% and +5% give -20 + 5 + (-20×5)/100 = -16% total change.

Marked Price & Discount

Discount is always calculated on the Marked Price (MP). Selling Price = MP − Discount.

Q48. Answer: (d) The atomic number increases by one unit.

The correct answer is the atomic number increases by one unit.

Key Points

• Atomic size Trends

• The term "atomic radius" refers to the distance that separates an atom's outermost shell from its center in the nucleus.

• As we move from one period to the next, the addition of shells to an atom makes it larger as a group.

• Atomic size decreases over time as nuclear charge increases while the number of shells stays the same.

• Because of this, electrons are pulled toward the nucleus from the outermost shell, reducing its size.

Additional Information

• Metallic character Trends

• Metals are the elements that lose electrons to form cations. As we move down the group, the atomic size increases, facilitating the easy loss of electrons, and resulting in a metallic character.

• On the other hand, as we move from left to right, it decreases over time. This occurs because an increase in nuclear charge makes it challenging for an atom to shed electrons.

• Non-metallic character Trends

• Non-metals are elements that are more likely to acquire electrons. As the atomic size decreases and the nuclear charge rises, the tendency to gain electrons rises as the period progresses.

• As a result, the non-metallic character develops over time. Due to an increase in atomic size as we move down the group, the non-metallic character decreases.

Q49. Answer: (d) 58

When '+' and '-' are interchanged and also '×' and '÷' are interchanged, the given equation becomes:

120 × 4 ÷ 2 - 8 + 10 = ?

After interchanging symbols:

120 ÷ 4 × 2 + 8 - 10 = ?

Now we solve the equation using the BODMAS rule:

120 ÷ 4 × 2 + 8 - 10 = ?

30 × 2 + 8 - 10 = ?

60 + 8 - 10 = ?

68 - 10 = ?

58 = Answer

Hence, the correct answer is 58.

Q50. Answer: (a) stamens and pistil

The correct answer is stamens and pistils.

Key Points

• A flower's reproductive parts include the following:

• Stamen-Also known as Androecium, this is the male reproductive organ. It is made up of two parts: an anther and filaments.

The anther is a yellowish sac-like structure that produces and stores pollen.

The filament is a thin, threadlike structure that serves as a support for the anther.

• Pistil- The pistil is the female reproductive organ of a flower and consists of three parts: the stigma, style, and ovary.

• Stigma- The uppermost component or receptive tip of carpels in a flower's gynoecium.

• Style: The stalk that joins the stigma and the ovary is long and slender, like a tube.

• Ovary- The ductless reproductive gland that contains a large number of ovules is known as the ovary. It is the portion of the plant where seed production occurs.

Additional Information

• The following are the components that make up the vegetative section of a flower:

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• Petals- These are the brightly coloured parts of the flower that attract bees, insects, and birds. The colour of the petals varies from plant to plant; some are bright, while others are pale. As a result, petals assist us in distinguishing one flower from another.

• Sepals- The sepal is the green part under the petals that protect the bud as it grows. Some flowers have fused petals and sepals, and some have petals and sepals that are separate.

Q51. Answer: (d) Rs. 5,569.20

Shortcut Trick

Successive discount formula: a + b − (a × b) ÷ 100

Net discount % = 9 + 15 − (9 × 15) ÷ 100 = 24 − 1.35 = 22.65%

Selling Price (SP) = Marked Price (MP) × (100 − Net Discount%) ÷ 100

SP = 7200 × (100 − 22.65) ÷ 100 = 7200 × 0.7735 = Rs. 5,569.20

Therefore The correct answer is Rs. 5,569.20.

Alternate Method

Given → Marked Price (MP) = Rs. 7,200, Discount1 = 9%, Discount2 = 15%.

Formulas → SP = MP × (100 − D1%) ÷ 100 × (100 − D2%) ÷ 100

=> Price after first discount = 7200 × (100 − 9) ÷ 100

=> Price after first discount = 7200 × 0.91 = Rs. 6,552

=> Final Selling Price = 6552 × (100 − 15) ÷ 100

=> Final Selling Price = 6552 × 0.85 = Rs. 5,569.20

Therefore The correct answer is Rs. 5,569.20.

Additional Information

Marked Price & Discount

The Marked Price is the price printed on an article. Discount is always calculated on the Marked Price to arrive at the Selling Price: SP = MP − Discount.

Successive Discounts

When multiple discounts are applied one after another, they are called Successive Discounts. The order of applying successive discounts does not change the final selling price.

Q52. Answer: (b) (21, 126, 7)

The pattern followed in the given series is:

First term × (Third term - 1) = Second term

Now we apply the pattern on the given sets:

(16, 64, 5)

16 × (5 - 1) = 64

16 × 4 = 64

64 = 64

Similarly,

(9, 27, 4)

9 × (4 - 1) = 27

9 × 3 = 27

27 = 27

Now we apply the pattern to the given options:

Option 1) (11, 56, 7)

11 × (7 - 1) = 56

11 × 6 = 56

66 ≠ 56

Option 2) (21, 126, 7)

21 × (7 - 1) = 126

21 × 6 = 126

126 = 126

Option 3) (10, 50, 5)

10 × (5 - 1) = 50

10 × 4 = 50

40 ≠ 50

Option 4) (13, 91, 10)

13 × (10 - 1) = 91

13 × 9 = 91

117 ≠ 91

Hence the correct answer is option 2)

Q53. Answer: (a) 19/25

Calculations:

3/5 × 16/21 × 7/10 × 3/4

= 6/25

To make it whole number

19/25 should be added to the number

Hence, The Required value is 19/25.

Q54. Answer: (a) 4

From the given information:

The circle represents ‘actors’, the square represents ‘directors’, and the triangle represents ‘producers’.

Now we have to find the number of actors who are directors and also producers which means we have to find the common between all the three shapes.

From the diagram we can see that there are 4 actors who are directors and also producers.

Hence the correct answer is option 1)

Q55. Answer: (c) increase to double

The correct answer is increase to double.

Key Points

• Relationship Between the Focal Length and the Radius of Curvature

• We are able to quickly establish the relationship thanks to the figure's geometry.

f = R/2

• Convex mirrors can also be described in terms of this relationship. It is assumed that the mirror's aperture is relatively small in this relationship.

• The radius of curvature is twice as long as the focal length when spherical mirrors with small apertures are used. Consequently, R = 2f.

• We can confidently assert that the center of a spherical mirror, between the pole and the center of curvature, is the primary focus.

Additional Information

• Focal Length

• A measure of how strongly an optical system converges or diverts light is the focal length; It is the opposite of the optical power of the system.

• The distance that separates two points in space is known as the focal length of an optical system.

• A system is bringing light closer together when its focal length increases, while a system is diverging light when its focal length decreases.

• Radius of Curvature

• The letter R stands for the radius of curvature, which is the radius of the circular arc that most closely resembles the curve at that particular point in time.

• The radius of a circle that best fits a normal section or combinations of normal sections is the definition of a surface's radius of curvature.

• If the vertex is to the left of the center of curvature, it is possible for the radius of curvature to be positive.

• If the vertex is situated to the right of the center of curvature, it is possible for the radius of curvature to be negative.

Q56. Answer: (d) × and ÷

We apply the options on the given equation and solve it using the BODMAS rule:

Option 1) ÷ and -

Given: 18 × 6 + 12 - 7 ÷ 2 = 1

After interchanging symbols:

18 × 6 + 12 ÷ 7 - 2 = 1

18 × 6 + 1.7 - 2 = 1

108 + 1.7 - 2 = 1

109.7 - 2 = 1

107.7 ≠ 1

Option 2) + and ×

Given: 18 × 6 + 12 - 7 ÷ 2 = 1

After interchanging symbols:

18 + 6 × 12 - 7 ÷ 2 = 1

18 + 6 × 12 - 3.5 = 1

18 + 72 - 3.5 = 1

90 - 3.5 = 1

86.5 ≠ 1

Option 3) - and +

Given: 18 × 6 + 12 - 7 ÷ 2 = 1

After interchanging symbols:

18 × 6 - 12 + 7 ÷ 2 = 1

18 × 6 - 12 + 3.5 = 1

108 - 12 + 3.5 = 1

111.5 - 12 = 1

99.5 ≠ 1

Option 4) × and ÷

Given: 18 × 6 + 12 - 7 ÷ 2 = 1

After interchanging symbols:

18 ÷ 6 + 12 - 7 × 2 = 1

3 + 12 - 7 × 2 = 1

3 + 12 - 14 = 1

15 - 14 = 1

1 = 1

Hence the correct answer is option 4)

Q57. Answer: (d) 64°

Shortcut Trick

In a rectangle, the angle between a diagonal and a side is complementary to the angle between the other diagonal and the adjacent side.

angle SQR = 90° − angle QPR

angle SQR = 90° − 26° = 64°

Therefore The correct answer is 64°.

Alternate Method

Given: angle QPR = 26° in rectangle PQRS.

Formula Used: Diagonals of a rectangle are equal and bisect each other.

=> In rectangle PQRS, diagonals PR and QS intersect at O.

=> Since diagonals are equal and bisect each other, OP = OQ.

=> In ΔPOQ, angle PQO = angle QPR = 26° (Angles opposite to equal sides).

=> angle PQR = 90° (Interior angle of a rectangle).

=> angle SQR = angle PQR − angle PQO

=> angle SQR = 90° − 26° = 64°.

Therefore The correct answer is 64°.

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Q58. Answer: (d) 2021

The correct answer is "2021".

Key Points

• On May 17, 2021, Tauktae, a tropical cyclone with very high winds, made landfall in Gujarat, India.

• The same mechanism resulted in Cyclone Tauktae when warm waters from the Arabian Sea (up to a depth of 50 metres) created a low-pressure system that intensified over time to become a cyclone.

• Cyclone Tauktae, the fifth-strongest cyclone to make landfall in the Arabian Sea since 1998, made four days of landfall on the west coast of India between May 14 and May 17, 2021.

• At least 91 people were killed by the storm, which also destroyed thousands of homes, boats, and public buildings across Kerala, Karnataka, Goa, Maharashtra, and Gujarat.

Additional Information

• The cyclone has been given the name "Tauktae" (pronounce Tau'Te) by Myanmar.

• It is a local term for the noisy reptile known as a "gecko" in Burmese.

• It had an effect on Kerala's and Karnataka's southern regions as well as Goa, Gujarat, and Lakshadweep's western regions.

• Along with Dadar and Die, it also hit Nagar Haveli, Dadar, and Dadar, which was followed by flash floods and heavy rain.

Q59. Answer: (a) 702

Shortcut Trick

If $x + 1/x = k$, then $x^3 + 1/x^3 = k^3 - 3k$

Given $a + 1/a = 9$, so here $k = 9$.

$\Rightarrow a^3 + 1/a^3 = 9^3 - 3 \times 9$

$\Rightarrow a^3 + 1/a^3 = 729 - 27 = 702$

Therefore The correct answer is 702.

Alternate Method

Given:

$a + 1/a = 9$

Formula Used:

$(x + y)^3 = x^3 + y^3 + 3xy(x + y)$

Calculations:

=> Cubing both sides of the given equation:

$\Rightarrow (a + 1/a)^3 = 9^3$

$\Rightarrow a^3 + 1/a^3 + 3 \times a \times (1/a) \times (a + 1/a) = 729$

$\Rightarrow a^3 + 1/a^3 + 3 \times 1 \times (a + 1/a) = 729$

=> Substituting the value of $(a + 1/a) = 9$:

$\Rightarrow a^3 + 1/a^3 + 3 \times 9 = 729$

$\Rightarrow a^3 + 1/a^3 + 27 = 729$

$\Rightarrow a^3 + 1/a^3 = 729 - 27$

$\Rightarrow a^3 + 1/a^3 = 702$

Therefore The correct answer is 702.

Additional Information

Square Algebraic Identity

If $x + 1/x = k$, then the squared value can be found using $x^2 + 1/x^2 = k^2 - 2$.

Minus to Plus Cube Identity

If $x - 1/x = k$, then the cubed value changes sign and can be found using $x^3 - 1/x^3 = k^3 + 3k$.

Minus to Plus Square Identity

If $x - 1/x = k$, the corresponding squared value is always positive and found using $x^2 + 1/x^2 = k^2 + 2$.

Fifth Power Equivalents

If $x + 1/x = k$, the fifth power can be quickly evaluated using the combined product trick: $x^5 + 1/x^5 = (x^2 + 1/x^2)(x^3 + 1/x^3) - (x + 1/x)$.

Q60. Answer: (d) 36

The pattern followed in the given series is:

$(\sqrt{\text{First term}} - 2)^2 = \text{Second term}$

Now we apply the pattern on the given series:
81 : 49 :: 36 : 16 :: 64 :: ?
(√81 - 2)2 = 49
(9 - 2)2 = 49
(7)2 = 49
49 = 49
81 : 49 :: 36 : 16 :: 64 :: ?
(√36 - 2)2 = 16
(6 - 2)2 = 16
(4)2 = 16
16 = 16
81 : 49 :: 36 : 16 :: 64 :: ?
(√64 - 2)2 = ?
(8 - 2)2 = ?
(6)2 = ?
36 = Answer
Hence the correct answer is option 4)

Q61. Answer: (b) 100

Shortcut Trick
In a right-triangle, Area = (1/2) × Base × Height.
Given Area = 25000 and Base = 500.
Height = (2 × Area) ÷ Base = (2 × 25000) ÷ 500 = 50000 ÷ 500 = 100.
Therefore The correct answer is 100 m.
Alternate Method
Given:
Area of right-angled field = 25000 m^2
Length of the Base (b) = 500 m
Formula Used:
Area of a Triangle = (1/2) × base × height
Calculations:
=> 25000 = (1/2) × 500 × Height
=> 25000 = 250 × Height
=> Height = 25000 ÷ 250
=> Height = 100 m
Therefore The correct answer is 100 m.
Additional Information
Pythagoras Theorem
In a right-angled triangle, the square of the hypotenuse (c) is equal to the sum of the squares of the other two sides (a, b): $a^2 + b^2 = c^2$.
Heron's Formula
For any triangle with sides a, b, and c, Area = √[s(s−a)(s−b)(s−c)], where s is the semi-perimeter (a+b+c)/2.
Perimeter of a Triangle
The perimeter is the total length of all three boundaries: P = Side1 + Side2 + Side3.

Q62. Answer: (b) Blood cancer

The correct answer is Blood cancer.
Key Points
• The first CAR-T cell treatment (a sort of gene therapy) was performed at the Bone Marrow Transplant unit at ACTREC, Tata Memorial Center in Mumbai on June 4, 2021, making it a momentous day for TMH, the IIT Bombay team, and cancer care in India.
• The Bioscience and Bioengineering (BSBE) department of IIT Bombay created and produced CAR-T cells.
• The BIRAC-PACE programme partially funds this work.

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• DBT/BIRAC further sponsors the TMC-IIT Bombay team through the National Biopharma Mission to prolong this initiative for conducting Phase I/II trials of their CAR-T product.

Additional Information

• Bone Transplant

• Changing the bone marrow of a patient is known as a stem cell transplant. If the bone marrow stops functioning and does not create enough healthy blood cells, patients may require a bone marrow transplant.

• Cells from a donor or one's own body can be used in a bone marrow transplant (autologous transplant).

• Lung Transplant

• One or both of the patient's lungs may be replaced via a surgical surgery known as a lung transplant, also known as a pulmonary transplant. Either a living or deceased donor can provide donors. A living donor is limited to giving one lung lobe.

• A recipient may only need to receive one lung if they have certain pulmonary conditions.

Q63. Answer: (d) PCRA

The correct answer is PCRA.

Key Points

• The Petroleum Conservation Research Association (PCRA) in India offers tips on how to reduce the amount of gasoline or diesel used when driving.

• The Petroleum Conservation Research Association (PCRA) was established in India in 1978 under the authority of the Ministry of Petroleum and Natural Gas of India.

• Its mission is to promote energy efficiency in a variety of economic sectors.

• In order to save money and lessen the impact of oil consumption on the environment, it aids the government in formulating policies and initiatives targeted at lowering India's reliance on oil.

Additional Information

• PRCA

• Pure red cell aplasia (PRCA), also known as erythroblastopenia, is a form of aplastic anaemia that primarily affects the progenitors of red blood cells but not usually those of white blood cells.

• The bone marrow stops producing red blood cells in PRCA. Many different aetiologies can result in PRCA. Paul Kaznelson initially wrote about the syndrome in 1922.

• PARC

• A research and development firm called PARC is located in Palo Alto, California (formerly Xerox PARC). Jacob E. "Jack" Goldman, the chief scientist of Xerox Corporation, founded the business in 1969.

• At the time, it was a branch of Xerox with the responsibility of developing hardware systems and products for the computer industry.

Q64. Answer: (b) Kunwar Digvijay Singh ‘Babu’

The correct answer is "Kunwar Digvijay Singh ‘Babu’".

Key Points

• Indian field hockey player Kunwar Digvijay Singh, also known as "Babu," played the sport from 2 February 1922 until 27 March 1978.

• He was born in Uttar Pradesh's Barabanki.

• He is well known for his captivating passing ability and is regarded by many as the best scorer in the game, next only to Dhyan Chand.

Additional Information

• As the finest hockey player in the world (1952) and the best sportsman in Asia, Singh was awarded the Helms Trophy in 1953. (1953).

• The Helms Trophy was given to an Indian for the first time ever.

• He received the prestigious Padmashri award from the Indian government in 1958.

• He has stadiums named after him in Barabanki and Lucknow. Both the K. D. Singh Babu Stadiums in Lucknow and Barabanki are so named.

• He has a street in Barabanki City named after him that runs between Chhaya Chauraha and Lucknow-Faizabad Road.

Q65. Answer: (d) Eight

We consider the given series and find the triad which looks like (vowel, consonant, vowel):

(Left) J B I S O E Z I L U B O P A R D I H O M A K O (Right)

Alternate Method

We can see that there are 8 such consonants, each of which is immediately preceded by a vowel and also immediately followed by a vowel.

Hence the correct answer is eight.

Q66. Answer: (c) scattering

The correct answer is scattering.

Key Points

• When dust particles are distributed across the air, the air gets suspended. The light is then scattered, allowing the path to be seen.

• Scattering of light-

• Light can be examined completely from its source.

• When light travels from one medium to another, such as air or a glass of water, some of it is absorbed by medium particles, followed by subsequent radiation in a specific direction. This is referred to as light scattering.

• The intensity of scattered light is determined by particle size and light wavelength.

Additional Information

• Light is a type of energy that can experience a variety of processes such as diffraction, reflection, refraction, interference, and polarisation.

• Refraction

• Refraction is the process that takes place when light bends as it travels from one medium to another.

• The bending is induced by density variations between the two substances.

• Light refraction is one of the most often observed phenomena, although other waves, such as sound waves and water waves, also exhibit refraction.

• Diffraction

• Diffraction is defined as the dispersion of waves when they pass through or around an obstacle. Diffraction of light occurs when a light wave passes by a corner or via an opening or slit that is physically the same size as, or even smaller than, the wavelength of that light.

• Reflection

• When a light ray hits a smooth, shiny surface and bounces back, this is called the reflection of light. The incident light rays hit the surface and are reflected off of it.

• Interference

• When two coherent light waves from separate sources collide, the energy distribution caused by the first wave is disturbed by the second. The term "interference of light" refers to this alteration in the distribution of light energy brought on by the superposition of two light waves.

• Polarisation

• Polarized waves are light waves with vibrations that occur in just one plane. Plane polarised light is made up of waves with the same direction of vibration for all of them. Polarization is the process of converting unpolarized light into polarised light.

Q67. Answer: (d) 8

The pattern follows here is:

When we apply the given condition '2 is added to each odd digit and 1 is subtracted from each even digit' to the number we get:

Second from the left is 5 & second from the right is 3.

Sum = 5 + 3 = 8

Hence the correct answer is 8.

Q68. Answer: (a) It turns into a hard solid after reacting with moisture present in air.

The correct answer is It turns into a hard solid after reacting with moisture present in air.

Key Points

• The most common use for the substance "Plaster of Paris" is for creating sculpting materials and gauze bandages.

• Plaster of Paris is synonymous with gypsum plaster, another common name for the substance.

• This is the chemical formula for Plaster of Paris- $CaSO_4. H_2O$

• Plaster of Paris is calcium sulfate, and a hard substance called gypsum is produced when crystallization water is added.

• It may react with any moisture in the air if it were not stored in a moisture-proof container.

• Upon combined with water, it transforms into gypsum, a hard substance having quite different characteristics from the plaster of Paris.

Additional Information

• Some of the things you can do with the plaster of Paris are the following:

• It is used in medicine to make plaster casts that keep broken bones from moving.

• It is also used to make and hold parts of ceiling plasterwork that are used for decoration. So, it is used to make decorations and toys.

• It can also be used to level out surfaces.

Q69. Answer: (b) Neither conclusion I nor II is true

Given statement:

H > L ≥ M ≥ N > O ≤ P ≤ Q

Conclusions:

I. L > P → False (We have L > O & O ≤ P, we get L > O ≤ P, so L > P cannot be true.)

II. M ≤ Q → False (We have M > O & O ≤ Q, we get M > O ≤ Q, so M ≤ Q cannot be true.)

So neither conclusion I nor II is true.

Hence the correct answer is option 2)

Q70. Answer: (a) between 20 cm and 40 cm from a concave mirror

The correct answer is between 20 cm and 40 cm from a concave mirror.

Key Points

• Image Formation in Concave Mirror

• When the object is placed at infinity, the image formed is highly diminished, point size, real and inverted.

• When the object is placed beyond C (center of curvature), The image thus formed is diminished, real, and inverted.

• When the object is placed at C, the image formed has the same size as that of the object and it is real and inverted.

• When the object is placed between C and F (principal focus), The image is larger compared to the size of the object and it is real and inverted.

• When the object is placed at F, this results in the formation of a highly enlarged image that is real and inverted, at infinity.

• When the object is placed between F and P (Pole), The image formed here is virtual and erect and it is larger than the object.

Additional Information

• The Object is Placed Between C and F

• One of the two rays under consideration here is parallel to the principal axis, and the other is passing through the concave mirror's principal focus.

• The image is real and inverted, it is larger than the object's size, and it is formed beyond C.

Q71. Answer: (a) Pooja

Given:

Name of the Student	Marks		
Paper I	Paper II	Paper III	
Anushri	83	79	83
Jay	71	90	60
Vinay	64	93	72
Pooja	81	88	87

Calculations:

Anushri's Total marks = 83 + 79 + 83 = 245

Jay's Total marks = 71 + 90 + 60 = 221

Vinay's Total marks = 64 + 93 + 72 = 229

Pooja's Total marks = 81 + 88 + 87 = 256

Hence, Pooja has highest marks.

Q72. Answer: (d) QBDMWR

According to the English alphabet and their positional values:

The pattern followed in the given codes is:

The first three alphabets are increased to 1 positional value.

The last three alphabets are increased to 2 positional values.

And,

Similarly,

Hence the correct answer is QBDMWR.

Q73. Answer: (c) 94

The correct answer is 94.

Key Points

• 94 of these 118 elements are found naturally on Earth. Six of these are found in extremely small amounts: technetium (atomic number 43), promethium (atomic number 61), astatine (atomic number 85), francium (atomic number 87), neptunium (atomic number 93), and plutonium (atomic number 94).

• These 94 elements have been discovered throughout the universe, in the spectra of stars and supernovae, when short-lived radioactive elements are created.

• The first 94 elements have been found directly on Earth as primordial nuclides present from the birth of the Solar System, or as fission or transmutation products of uranium and thorium.

• The atomic numbers 1 through 82 of the 94 naturally occurring elements each have at least one stable isotope (except for technetium, element 43, and promethium, element 61, which have no stable isotopes).

Additional Information

• The remaining 24 heavier elements, which are not found on Earth or in astronomical spectra, have been produced artificially

• They are all radioactive and have extremely short half-lives.

• If any atoms of these elements were present during the formation of the Earth, they are extremely likely to have already decayed, and if they were present in novae, they would have been in quantities too small to have been detected.

Q74. Answer: (d) 12.5 Ω

The correct answer is 12.5 Ω.

Key Points

• Factors Affecting Electrical Resistance

• The following factors influence a conductor's electrical resistance:

• The cross-sectional area of the conductor

• Length of the conductor

• The material of the conductor

• The temperature of the conducting material

• Electrical resistance is inversely proportional to the conductor's cross-sectional area (A) and directly proportional to its length (L). The relationship that follows provides it.

R= ρL/A (where ρ is the resistivity of the material (measured in Ωm, ohm meter)

• The ability of a material to resist the flow of an electric current is measured qualitatively by its resistivity. It goes without saying that the resistivity of insulators will be higher than that of conductors.

Additional Information

• Calculations

• Resistance of a metal wire, R1= 50 Ω

• length of wire, L= 1m

• diameter= 0.3mm= 0.3/1000= 0.0003m

• radius= 0.0003/2= 0.00015m= 1.5 × 10-4 m

• Area, A1= π r2= π× (1.5 ×10^(-4))² m²

• Now another wire has the same material and the same length.

• diameter= 0.6mm= 0.6/1000=0.0006m

• Radius= 0.0006/2= 0.0003m= 3× 10-4m

• Area, A2= π r² = π × (3× 10^(-4))² m².

• As wire has same material it has the same resistivity.

• Resistivity formula, R= ρL/A

• So, ρ= R× A/L

• R1× A1/L= R2× A2/L

• 50× π× (1.5 ×10-4)2= R2× π × (3× 10^(-4))²

• 50 × 2.25= R2× 9

• 112.5/9= R2

• R2= 12.5 Ω

Q75. Answer: (c) ©GD©

From the given information:

Number/Symbol	2	&	5	^	@	6	4	•	3	•	#	7	%	9
Code Letter	A	O	B	Q	T	D	J	G	L	M	K	S	N	R

The given code is : 3 * 6 2

Now we can see that condition (ii) have to be applied on the code which states 'if the first element is an odd number and the last element is an even number, the first and last elements are to be coded as ©' so the code becomes,

Hence the correct answer is ©GD©.

Q76. Answer: (d) 20 m, East

From the given information:

Step 1: Rishabh starts from his house and walks 14 m southwards. Then, he turns left and walks 30 m.

Step 2: Then, he turns left and walks 50 m. Then, he turns left and walks 10 m.

Step 3: He then turns left and walks 36 m.

Distance from house to end point = 30m - 10m = 20m

From the diagram we can see that Rishabh is 20m away from his home towards east.

Hence the correct answer is option 4)

Q77. Answer: (d) Salaries of government employees

The correct answer is "Salaries of government employees".

Key Points

• Revenue expenditures include things like employee salaries, interest payments on debt from the past, subsidies, pensions, etc. that neither increase assets nor decrease liabilities.

• Profits from sales are used to pay for them.

• According to a general definition, a revenue expenditure is any outlay that has no net impact on liabilities or assets.

Additional Information

• Revenue expenditures include things like salaries, wages, pensions, subsidies, and interest payments.

• In order to cover its operating needs, the government incurs income expenses.

• Every year, the Indian government releases a budget that includes both a revenue budget and a capital budget*,* as well as the total number of revenue expenditures.

Q78. Answer: (c) Ministry of Civil Aviation

The correct answer is "Ministry of Civil Aviation".

Key Points

• On Wednesday, January 22, the Ministry of Civil Aviation made a copy of the National Air Sports Policy (NASP) available for public comment.

• In addition to guaranteeing compliance with global safety standards, the strategy aims to maximize India's potential for air sports.

• By 2030, India should rank among the top nations for air sports, according to the policy's aim.

Additional Information

• The Government of India's Minister of Civil Aviation is Union Minister Jyotiraditya Scindia.

• The new permanent representative for India at the UN Conference on Disarmament is Anupam Ray.

• The next Indian ambassador to Mexico has been named, and he is Pankaj Sharma, a member of the 1991 batch of Indian Foreign Service officers.

• Indian diplomat Pradeep Kumar Rawat was chosen to serve as India's ambassador to China beginning in December 2021.

• The Foreign Contribution Regulation Act (FCRA) registration of NGOs with an expiration date between September 29, 2020, and March 31, 2022, has been extended by the Ministry of Home Affairs (MHA).

• In New Delhi, Sanjay Kumar Singh was appointed Secretary of the Ministry of Steel.

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Q79. Answer: (c) 1932

The correct answer is "1932".

Key Points

• On this date (15 October 1932), exactly 90 years ago, India's first commercial airmail trip departed from Karachi and arrived in Mumbai.

• JRD Tata piloted the first flight, which served as Air India's debut.

• Air India’s journey begins in the year 1932, when the distinguished entrepreneur J.R.D. Tata founded the company.

Additional Information

• The first commercial flight in India, which took out from Karachi to Mumbai on October 15, 1932, was piloted by Air India's previous chairman JRD Tata on that day.

• JRD Tata, an avid pilot who served as the longest-serving chairman of the Tata group, is credited with founding civil aviation in India.

• On October 15, 1932, he flew the first de Havilland Puss Moth, a single-engine aircraft, for the then-Tata Air Services from Karachi to Bombay via Ahmedabad, laying the foundation for Indian civil aviation.

Q80. Answer: (b) 5 Ω

The correct answer is 5 Ω.

Key Points

• Electrical Resistance

• Every material has an electrical resistance, which is why conductors emit heat when current passes through them.

• When an electric current flows through a bulb or any conductor, the conductor provides some obstruction to the current. This obstruction is referred to as electrical resistance and is denoted by R.

• The following factors influence a conductor's electrical resistance:

• The cross-sectional area of the conductor

• Length of the conductor

• The material of the conductor

• The temperature of the conducting material

Additional Information

• Calculation

• Resistance, R1= 10 Ω

Another wire of the same material and the same length so it has the same resistivity.

Resistivity formula, R= ρ×L/A

ρ= R×A/L

The cross-sectional area is double, A2= 2A1

So, R1×A1= R2× A2

10× A1= R2× 2A1

10/2= R2

R2= 5 Ω

Q81. Answer: (b) (x/a)^(2/n) - (y/b)^(2/n) = 1

Shortcut Trick

Isolate the trigonometric terms: $\sec^n \theta = x/a$ and $\tan^n \theta = y/b$.

Take the (1/n)^(th) power on both sides to get sec θ = (x/a)^(1/n) and tan θ = (y/b)^(1/n).

Apply the fundamental identity $\sec^2 \theta - \tan^2 \theta = 1$.

Substitute values: $((x/a)^{(1/n)})^2 - ((y/b)^{(1/n)})^2 = 1$.

Therefore The correct answer is (x/a)^(2/n) − (y/b)^(2/n) = 1.

Alternate Method

Given: $x = a \sec^n \theta$ and $y = b \tan^n \theta$

Formula Used: $\sec^2 \theta - \tan^2 \theta = 1$

=> From $x = a \sec^n \theta$, we get $\sec^n \theta = x/a$.

=> Raising to the power of 2/n on both sides: $(\sec^n \theta)^{(2/n)} = (x/a)^{(2/n)}$.

=> $\sec^2 \theta = (x/a)^{(2/n)}$.

=> Similarly, from $y = b \tan^n \theta$, we get $\tan^n \theta = y/b$.

=> Raising to the power of 2/n: $\tan^2 \theta = (y/b)^{(2/n)}$.

=> Using the identity $\sec^2 \theta - \tan^2 \theta = 1$:

=> $(x/a)^{(2/n)} - (y/b)^{(2/n)} = 1$.

Therefore The correct answer is $(x/a)^{(2/n)} - (y/b)^{(2/n)} = 1$.

Additional Information

Trigonometric Identities

Standard Pythagorean identities include: $\sin^2 \theta + \cos^2 \theta = 1$, $1 + \tan^2 \theta = \sec^2 \theta$, and $1 + \cot^2 \theta = \text{cosec}^2 \theta$.

Elimination of Parameter

To eliminate the parameter θ, express the trigonometric functions in terms of the variables and use standard identities to link them.

Power Rule

For any term $(k^n)^{(m/n)}$, the result is k^m. This property is used to normalize the powers of trigonometric functions to 2.

Q82. Answer: (b) Indian Institute of Science (IISc) - Bengaluru

The correct answer is the Indian Institute of Science (IISc) - Bengaluru.

Key Points

• One of the nation's most potent supercomputers, Param Pravega, has been installed and placed into service at the Indian Institute of Science (IISc) Bangalore.

• It is also the biggest university in India.

• It is now operational as part of the National Supercomputing Mission. (NSM).

• The Center for Development of Advanced Computing (CDAC) created it.

Additional Information

• The machine is capable of 3.3 petaflops of supercomputing in total. (1 petaflop equals a quadrillion or 1015 operations per second).

• The vast bulk of the system's components were produced and put together in the nation.

• The Param Pravega system at IISc is made up of a variety of heterogeneous nodes, using NVIDIA Tesla V100 cards on the GPU nodes and Intel Xeon Cascade Lake CPUs for the CPU nodes.

Q83. Answer: (a) 9√3

Shortcut Trick

Area of an equilateral triangle = $(\sqrt{3}/4) \times \text{side}^2$

Given side = 6 cm

Area = $(\sqrt{3}/4) \times 6 \times 6 = 9\sqrt{3}$ cm²

Therefore The correct answer is $9\sqrt{3}$ cm².

Alternate Method

Given:

Side of the equilateral triangle (a) = 6 cm

Formula Used:

Area of equilateral triangle = $(\sqrt{3} / 4) \times a^2$

Calculations:

=> Area = $(\sqrt{3} / 4) \times (6)^2$

=> Area = $(\sqrt{3} / 4) \times 36$

=> Area = $\sqrt{3} \times 9$

=> Area = $9\sqrt{3}$ cm²

Therefore The correct answer is $9\sqrt{3}$ cm².

Additional Information

Height of Equilateral Triangle

The altitude or height (h) of an equilateral triangle is given by the formula $h = (\sqrt{3}/2) \times a$.

Perimeter of Equilateral Triangle

Since all three sides are equal, the perimeter is 3 × side.

Inradius and Circumradius

For side 'a', Inradius (r) = $a/(2\sqrt{3})$ and Circumradius (R) = $a/\sqrt{3}$.

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Q84. Answer: (d) x2 - 4x + 1 = 0

Shortcut Trick

For a quadratic equation with rational coefficients, irrational roots always occur in conjugate pairs.

Given one root is 2 + √3, the second root must be 2 − √3.

Sum of roots = (2 + √3) + (2 − √3) = 4

Product of roots = (2 + √3) × (2 − √3) = $2^2 - (\sqrt{3})^2 = 1$

Equation is x^2 − (Sum)x + (Product) = 0 => $x^2 - 4x + 1 = 0$

Therefore The correct answer is $x^2 - 4x + 1 = 0$.

Alternate Method

Given:

One root of the quadratic equation = 2 + √3

The coefficients of the quadratic equation are rational.

Formula Used:

Quadratic equation with roots α and β: $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Algebraic identity: $(a + b)(a - b) = a^2 - b^2$

Calculations:

=> Let the roots of the quadratic equation be α and β.

=> α = 2 + √3

=> Since the coefficients are rational, irrational roots occur in conjugate pairs.

=> Therefore, the second root β = 2 − √3

=> Sum of roots (α + β) = (2 + √3) + (2 − √3)

=> α + β = 2 + 2 = 4

=> Product of roots (αβ) = (2 + √3) × (2 − √3)

=> $\alpha\beta = (2)^2 - (\sqrt{3})^2$

=> αβ = 4 − 3 = 1

=> The required quadratic equation is $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

=> Substituting the values of sum and product, we get: $x^2 - 4x + 1 = 0$

Therefore The correct answer is $x^2 - 4x + 1 = 0$.

Additional Information

Conjugate Roots Theorem

If a polynomial has rational coefficients, its irrational roots of the form a + √b always appear in conjugate pairs (a + √b and a − √b).

Complex Roots Pair

Similarly, for an equation with real coefficients, complex roots also appear in conjugate pairs of the form a + ib and a − ib.

Nature of Roots

For any general quadratic equation $ax^2 + bx + c = 0$, the discriminant $D = b^2 - 4ac$. If D is not a perfect square, the roots are irrational and unequal.

Q85. Answer: (d) √11 km/h

Shortcut Trick

When equal distances are covered, Average Speed (H.M.) = 2V1V2 / (V1 + V2) = 5 km/h.

When equal time is taken, Average Speed (A.M.) = (V1 + V2) / 2 = 5.5 km/h.

From A.M., V1 + V2 = 11. Substitute in H.M.: 2V1V2 / 11 = 5 => V1V2 = 27.5.

Difference $(V1 - V2)^2 = (V1 + V2)^2 - 4V1V2 = 11^2 - 4(27.5) = 121 - 110 = 11$.

Therefore The correct answer is √11 km/h.

Alternate Method

Given: Average speed for equal distance = 5 km/h, Average speed for equal time = 5.5 km/h.

Formula Used: Avg Speed (Distance) = 2V1V2/(V1+V2); Avg Speed (Time) = (V1+V2)/2.

=> Case 1 (Equal Time): (V1 + V2) / 2 = 5.5

=> V1 + V2 = 11 km/h

=> Case 2 (Equal Distance): 2V1V2 / (V1 + V2) = 5

=> 2V1V2 / 11 = 5 => V1V2 = 55 / 2 = 27.5

=> Using identity: $(V1 - V2)^2 = (V1 + V2)^2 - 4V1V2$

=> $(V1 - V2)^2 = 11^2 - 4 \times 27.5 = 121 - 110 = 11$

=> $V1 - V2 = \sqrt{11}$ km/h

Therefore The correct answer is $\sqrt{11}$ km/h.

Additional Information

Average Speed Concepts

For equal time intervals, Average Speed is the Arithmetic Mean (A.M.) of the speeds. For equal distance intervals, Average Speed is the Harmonic Mean (H.M.) of the speeds.

A.M. and H.M. Relationship

For any two positive numbers, Arithmetic Mean (A.M.) ≥ Geometric Mean (G.M.) ≥ Harmonic Mean (H.M.). Here 5.5 > 5 confirms the logic.

Algebraic Identity

Difference between two variables can be found using $(a-b)^2 = (a+b)^2 - 4ab$ when sum and product are known.

Q86. Answer: (a) Cytokinin

The correct answer is Cytokinin.

Key Points

• Cytokinin stimulates cell division and growth.

• It is more concentrated in developing parts, such as young fruits and seeds.

• The primary function of cytokinesis is to promote cell division, resulting in the formation of new cells that enable the plant to grow.

• It separates the parent cell's cytoplasm into two daughter cells.

• It mostly happens during two stages called mitosis and meiosis.

• Additionally, they are found at the apical parts of roots and shoots.

• Cytokinins postpone senescence or the normal aging process that leads to plant death.

Additional Information

• Gibberellins

• Gibberellin (GA), a plant hormone, regulates many aspects of plant growth, including germination, elongation growth, flower development, and flowering period.

• Abscisic acid

• Abscisic acid (ABA) is a hormone found in plants that control various processes related to development, growth, and stress responses.

• Auxins

• Auxins are essential for the growth of the plant body and play an important role in coordinating numerous developmental and behavioral processes throughout the plant life cycle.

Q87. Answer: (c) 16

Shortcut Trick

Use the M1D1H1 = M2D2H2 formula where work is constant.

Initial: 8 days × 10 hours = 80 total man-hours.

Final: 5 days × H2 hours = 80 total man-hours.

=> H2 = 80 ÷ 5 = 16 hours.

Therefore The correct answer is 16 hours.

Alternate Method

Given:

Initial Days (D1) = 8 days

Initial Hours (H1) = 10 hours/day

Final Days (D2) = 5 days

Work (W) = 1 dozen sweaters (constant)

Formula Used:

M1 × D1 × H1 / W1 = M2 × D2 × H2 / W2

Person	Days	Total Work	Efficiency
Bina + Neena	8	80 units	10 (hrs/day)

Calculations:

Since the group of people and the work remain the same, we equate the total hours:

=> D1 × H1 = D2 × H2

=> 8 × 10 = 5 × H2

=> 80 = 5 × H2

=> H2 = 80 ÷ 5

=> H2 = 16 hours

Therefore The correct answer is 16 hours.

Additional Information

Chain Rule in Time and Work

The relation between Men (M), Days (D), Hours (H) and Work (W) is given by (M × D × H) / W = Constant.

Inverse Proportion

When the work is constant, the number of Days is inversely proportional to the Hours worked per day (D prop. to 1/H).

Q88. Answer: (b) alkyne only

The correct answer is alkyne only.

Key Points

• A homologous series is a collection of compounds that have similar chemical properties and functional groups.

• The general formula for alkynes is CnH2n-2, where n is the number of carbon atoms.

• C3H4 thus belongs to the homologous series of alkynes based on the given options.

Additional Information

• Alkanes are saturated compounds with a single bond between carbon atoms.

• Alkene is inherently unsaturated and has a double bond between the carbon atoms.

• Alkynes are highly unsaturated compounds with triple bonds connecting the carbon atoms.

• Alcohol is a kind of organic compound that has a saturated carbon atom and at least one hydroxyl (OH) functional group.

Q89. Answer: (b) 1.527

Given:

= 4.58

Calculations:

√(7/3)

= √(7×3)/(3×3)

= √(21/9)

= √21/3

= 4.58/3

= 1.52666 ≈ 1.527

Hence, The Required value is 1.527.

Q90. Answer: (d) 1976

The correct answer is 1976.

Key Points

• The Sardar Swaran Singh Committee was established by the Congress Party in 1976 to offer suggestions regarding Fundamental Duties.

• During the internal situation, it became clear how important it is for the Indian Constitution to have Fundamental Duties (1975-1977).

• The committee suggested that the Constitution include a distinct chapter on Fundamental Duties.

• The federal Congress administration embraced these recommendations and in 1976 passed the 42nd Constitutional Amendment Act.

• With this modification, the Constitution gained a new section called Part IVA, which contains Fundamental Duties.

Additional Information

• The Constitution (Forty-second Amendment) Act, 1976, sometimes known as the 42nd Amendment, was passed by the Indian National Congress government led by Indira Gandhi between 25 June 1975 and 21 March 1977.

• While some of the amendment's provisions took effect on 1 February and Section 27 on 1 April 1977, the majority of its provisions did so on 3 January 1977.

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• The 42nd Amendment is thought to be the most divisive constitutional change in history.

Q91. Answer: (a) Elasticity of Demand

The correct answer is "Elasticity of Demand".

Key Points

• The quantity change in percentage terms divided by the price change in percentage terms is used to compute the price elasticity of demand.

• As a result, the demand is inelastic between these two positions, as indicated by the value of the elasticity of demand, which is 6.9% 15.4%, or 0.45, which is less than one.

Additional Information

• Price elasticity of demand measures how much a product's consumption changes in response to price changes.

• If a good's price elasticity is infinite, it is perfectly elastic (if demand changes substantially even with minimal price change).

• The good is elastic if price elasticity is more than 1, and inelastic if it is less than 1.

• A good is completely inelastic if its price elasticity is zero, meaning that no amount of price variation will alter demand.

• Price elasticity is referred to as unitary elasticity if it is exactly 1 (price change causes an equal proportion change in demand).

Q92. Answer: (b) Bhawna

From the given information:

1: The person who is sitting third to the left of Diksha is at one of the extreme ends.

We place Diksha third to the left of the extreme left.

2: Ekta is sitting fourth of the right to Gopi. Falak is sitting to the immediate right of Ekta.

Case 1:

Case 2:

3: Komal is an immediate neighbour of Bhawna and Diksha. Therefore Case 2 is eliminated.

Now we place Bhawna and Komal such that Komal becomes the immediate neighbor of Bhawna & Diksha.

Now we place Anmol at the only space left,

From the arrangement, we can see that Bhawna is the immediate neighbour of Gopi and Komal.

Hence the correct answer is option 2)

Q93. Answer: (d) Ministry of Women and Child Development

The correct answer is Ministry of Women and Child Development.

Key Points:

• For children afflicted by the COVID-19 Pandemic, SAMVEDNA (Sensitizing Action on Mental Health Vulnerability through Emotional Development and Necessary Acceptance) was introduced in September 2020.

• Through SAMVEDNA, the National Commission for Protection of Child Rights (NCPCR) offers telecounseling to kids.

• Three types of youngsters are to receive tele-counselling.

• Here are some of them:

• Children whose parents passed away as a result of COVID-19.

• Children at COVID care facilities under quarantine.

• Children whose parents or other relatives had a COVID-19 positive result.

• SAMVEDNA's primary goal is to offer psychological first aid and emotional assistance to children impacted by COVID-19.

• The National Commission of Child Rights, is a division of the Ministry of Women and Child Development.

• Experts from the National Institute of Mental Health and Neurosciences, including psychologists, counsellors, and specialists.

Additional Information:

• In order to address the anxiety experienced by abandoned and orphaned children following the loss of family members due to COVID-19, The SAMVAD at NIMHANS is launching a four-part special series.

• This will arm those working in the field of mental health, child protection officials, and any other concerned people.

• It will give service providers and carers specific strategies for telling children bad news and assisting them in processing their feelings of loss and sadness.

Q94. Answer: (a) Urea and uric acid

The correct answer is Urea and uric acid.

Key Points

• Urea, which makes up about 80% of nitrogenous waste, is the most important one.

• Urea is produced in the liver and eliminated in the urine by the kidneys together with other forms of protein waste products.
• The breakdown of proteins in the body produces two types of waste products: nitrogenous and non-nitrogenous.
• Carbon dioxide and water are examples of non-nitrogenous waste products.
• Nitrogenous waste products are only related to proteins because nitrogen is only found in proteins.
• Urea, uric acid, creatinine, and hippuric acid are nitrogenous waste products.

Additional Information

• Every organism produces waste within the body. These wastes must be eliminated from the body.
• They would poison the organism if they were not expelled.
• Excretion is the process of eliminating metabolic waste from the body.
• The excretory system in humans consists of two kidneys, one pair of ureters, a urinary bladder, and a urethra.

Q95. Answer: (c) 3 : 1

The correct answer is 3:1.

Key Points

• Gregor John Mendel did experiments on pea grains to find out what the laws of genetics are.
• Mendel used a symbol to describe the factors involved in the inheritance of characteristics.
• He chose seven pairs of properties of peas, each of which had the ability to suppress another property during the experiment.
• For example, "T" for tallness and "t" for dwarfism are represented as capital letters in English letters.
• The crossing of two plants based on a single trait is called a monohybrid cross.
• Mendel chose two of these subspecies of pea plants, one tall and the other short because they had opposite traits.
• When they were crossed, all of the plants that grew from the seeds in the first generation were tall. All of these F1 plants are the first generation of plants.
• Then, he self-pollinated the plants obtained from the F1 generation and discovered that the ratio of tall to short plants in the F2 generation was 3:1. This ratio is also known as a hybrid ratio.
• Therefore, the Phenotypic ratio is - 3 :1 (3 tall and 1 dwarf)

Additional Information

• Genetics is the branch of biology that studies heredity and variation.
• With his scientific discoveries, Gregor John Mendel created the foundation for modern genetics.
• As a result, he is also known as the Father of Genetics.

Q96. Answer: (c) Karnali

The correct answer is Karnali.

Key Points:

• The Ghaghara River:-
• It is also known as the Karnali River in Nepal and the Mapcha Tsangpo in Tibet is a perennial river that flows across international borders.
• It rises on the Tibetan Plateau's northern Himalayan slopes, passes through Nepal's Himalayas, and then merges with the Sharda River at Brahmaghat in India.
• Together, they make up the Ghaghara River, a significant Ganges tributary on its left bank.
• The longest river in Nepal, it spans 507 km (315 mi).
• The Ghaghara River runs through Bihar for 1,080 kilometers before joining the Ganges near Revelganj (670 mi).
• It is the second-biggest tributary of the Ganges in terms of length after the Yamuna and the largest by volume.

Additional Information:

• Bhilangana:
• The main tributary of the Bhagirathi River, the mother stream of the Ganges River in India, the Bhilangna River is a Himalayan river in Uttarakhand, India.
• Bhil and Ganga are combined to become Bhilangana.
• Dhauliganga:
• A tumultuous Himalayan river, the Dhauliganga rises in the borderlands of India and China before flowing into the Garhwal district of Uttarakhand, India.
• It merges with the Alaknanda, the Ganges river's principal source stream.
• Son:
• Central India is home to the perennial Son River.

• It starts near Amarkantak Hill in the Chhattisgarh district of Gaurela-Pendra-Marwahi, and eventually, it joins the Ganges River close to Patna, Bihar.

Q97. Answer: (b) Postal Services

The correct answer is Postal Services.

Key Points

• District Administration is the term used to describe the management of governmental duties inasmuch as they pertain to an area that is formally recognized as a district.

• The district collector, also known as the district magistrate, is in charge of a district's administration and is a member of the Indian Administrative Services (IAS).

Additional Information

• Functions of District Administrator:

• To keep the district's law and order.

• Executing relief operations in the event of emergencies like famine and floods.

• Keeping up with land documents and obtaining money.

• Supplying public services and keeping an eye on the development process as a whole.

• Monitoring how the Panchayati Raj System is being used.

Q98. Answer: (c) O

From the given information:

1: The ‘A’ is immediately left to 'C'.‘E’ has 'A’ and ‘G' as immediate neighbours.

We place C and then place A to its left, then we place E & G such that A and G become immediate neighbors of E.

2: The ‘O' is at the immediate right of ‘J'. 'L’ has ‘J' and 'N' as immediate neighbours.

We place J & N such that both of them becomes immediate neighbors of L also we leave a space to the right of J to place O.

From the arrangement we can see that O sits to the immediate left of G.

Hence the correct answer is option 3)

Q99. Answer: (c) Rs. 2,240

Shortcut Trick

Remaining percentage = 100% − 92% = 8%

Remaining amount = 8% of Rs. 28,000

=> 280 × 8 = Rs. 2,240

Therefore The correct answer is Rs. 2,240.

Alternate Method

Given:

Monthly Salary = Rs. 28,000

Expenditure = 92% of Salary

Formula: Savings = Salary − Expenditure

Calculations:

=> Expenditure amount = (92/100) × 28,000

=> Expenditure amount = 92 × 280 = Rs. 25,760

=> Remaining amount = 28,000 − 25,760

=> Remaining amount = Rs. 2,240

Therefore The correct answer is Rs. 2,240.

Additional Information

Percentage Change

Percentage change = (Difference / Original Value) × 100. It helps in calculating the growth or reduction in income or expenses.

Savings Ratio

If expenditure is E% of income, then the ratio of Expenditure to Savings is E : (100 − E).

Base Value Concept

In salary problems, the total salary is always considered as the 100% base value.

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Q100. Answer: (d) less than unity

The correct answer is less than unity.

Key Points:

• Refraction is the process by which a wave bends when it encounters a medium that has a speed that is different from its own.

• The light beam is refracted as it passes through a fast medium and enters a slow medium, which causes it to bend in the direction of the boundary between the two media.

• The degree of bending depends on the two media's indexes of refraction.

• The refractive index determines how much a light beam bends when it passes through one medium and then another.

• When moving from medium A to medium B,if medium A is rarer and medium B is denser, the ray of light bends towards the normal in this circumstance.

• In contrast to denser media, rarer media have a greater light speed than denser media do.

Additional Information:

• Refraction in physics is the change in direction that results from a wave's change in speed as it passes through a medium.

• For instance, waves move more quickly in deep water than they do in shallow.

• When an ocean wave hits a beach at an angle, the wave's farther-reaching section will travel quicker than its nearer-the-beach component.

• The outcome is that the wave will turn until it is traveling perpendicular to the coastline.

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