RRB Group D Previous Year Paper (Held on: 9 Sept 2022 Shift 2)

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

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CBT

Q1. Based on the given statement, four conclusions are drawn. Find out which conclusion is NOT true based on the statement.

Statement: H < N ≤ C ≤ K = X > T > F

(a) X ≥ N
(b) H < X
(c) K > F
(d) N > X

Q2. If the power of a convex lens is 3 dioptre, then its focal length will be:

(a) −0.33 m
(b) +3 m
(c) −3 m
(d) +0.33 m

Q3. In India, the western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the _____.

(a) Mediterranean region
(b) Pacific Ocean region
(c) Arabian Sea region
(d) Bay of Bengal region

Q4. The cost of a washing machine is 40% less than the cost of a TV. If the cost of the washing machine increases by 18% and that of the TV decreases by 10%, then what is the change in the total cost of 5 washing machines and 2 TVs?

(a) Decreases by 6.4%
(b) Decreases by 6.5%
(c) Increases by 6.5%
(d) Increases by 6.8%

Q5. Find the surface area of a sphere of radius 3.5 cm.

(a) 142 cm2
(b) 154 cm2
(c) 120 cm2
(d) 210 cm2

Q6. If ' '+' means '÷', '−' means '+', '×' means '−' and '÷' means '×', then, what will be the value of the following expression?

[{(35 × 26) − (4 ÷ 3)} + (3 − 4)] ÷ 5

(a) 10
(b) 18
(c) 20

(d) 15

Q7. 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 he numbers into its constituent digits. E.g. 12 - Operations on 12 such as adding/ subtracting/multiplying etc. to 12 can be performed. Breaking down 12 into 1 and 2 and then performing mathematical operations on 1 and 2 is not allowed)

(11, 154, 7)

(6, 180, 15)

(a) (25, 375, 5)
(b) (5, 20, 60)
(c) (3, 90, 15)
(d) (23, 46, 2)

Q8. Which of the following statements is true about the nature of roots for the equation

$x(x + 3) - 8 = 2(x + 3)(x - 3)$?

(a) Two imaginary or non-real roots
(b) Roots are irrational
(c) Two real and distinct roots
(d) Roots are real and equal

Q9. Refer to the following letter, number, symbol series and answer the question.

(Left) N & 2 G 9 S P T B 4 @ H # 1 8 S B A 3 P (Right)

If all numbers are dropped from the series, which of the following will be seventh from the right?

(a) #
(b) H
(c) @
(d) B

Q10. If

A means 'addition',

B means 'multiplication',

C means 'subtraction' and

D means 'division',

then 40 D 2 A 3 B 8 C 5 = ?

(a) 33
(b) 45
(c) 39
(d) 40

Q11. Select the number from among the given options that can replace the question mark (?) in the following series.

154, 134, 116, ?, 86, 74, 64, 56

(a) 98
(b) 100
(c) 101
(d) 96

Q12. In ΔMNO, angle N = angle O and NO = 12 cm, MO = 10 cm and MP be the altitude, then the length of MP is:

(a) 3 cm
(b) 11 cm
(c) 10 cm
(d) 8 cm

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Q13. What is the measure of each interior angle of a regular polygon with 10 sides?

(a) 156°
(b) 174°
(c) 144°
(d) 180°

Q14. If the resistance of a conductor is 4.2 Ω and 220 V is applied across it then the current passing through the conductor is:

(a) 5238 ampere
(b) 0.02 ampere
(c) 924 ampere
(d) 52.38 ampere

Q15. Which of the following sports events is NOT included in the scheme of cash awards in India to medal winners and their coaches in international sports events?

(a) Wrestling
(b) Chess
(c) Billiards
(d) Cricket

Q16. Refer to the following letter series and answer the question that follows.

S S G Y U N G T R F C E D A W X C V U N J O K L E C D

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

(a) 6
(b) 8
(c) 5
(d) 3

Q17. In which of the following locations is the Brahmaputra river known as Tsang Po?

(a) Pakistan
(b) Tibet
(c) Nepal
(d) Bangladesh

Q18. The formula for resultant resistance of three resistors connected in parallel combination is:

(a) 1/R = R1 + R2 + R3
(b) 1/R=1/R1+1/R2+1/R3
(c) R = R1 + R2 + R3
(d) R = 1/R1+1/R2+1/R3

Q19. Which of the following interchanges of numbers would make the given equation correct?

10 ÷ 6 × 4 + 14 − 24 = 30

(a) 4, 6
(b) 10, 6
(c) 14, 24
(d) 10, 30

Q20. When Kavita took an aqueous solution of copper sulphate and added some granules of aluminium, the colour of the solution changed. This is because of the formation of:

(a) CuO
(b) Al(OH)3
(c) Al2O3
(d) Al2(SO4)3

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Q21. Which of the following chemical reactions is balanced?

(a) $Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$
(b) $Fe + H_2O \rightarrow Fe_3O_4 + H_2$
(c) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$
(d) $Mg + O_2 \rightarrow MgO$

Q22. If in the word 'DISCOUNT' all the letters are arranged in alphabetical order from left to right, then the position of how many letters will be remain unchanged?

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

Q23. VM 19 is related to SJ 25 in a certain way. In the same way, HN 17 is related to EK 23. To which of the following is SL 15 related following the same logic?

(a) MQ 24
(b) PI 21
(c) RJ 19
(d) QI 21

Q24. During a school tour one among the group of 15 students was elected as the group leader. If there are total 11 such groups, how many students are going for the tour?

(a) 154
(b) 174
(c) 165
(d) 176

Q25. As per the rule change in IPL 2022 duration of strategic time out changed from 2:30 minutes to _____ minutes.

(a) 4:30
(b) 3
(c) 3:30
(d) 4

Q26. If $p + q + r = 13$ and $pq + qr + rp = 30$, then the value of $p^3 + q^3 + r^3 - 3pqr$ is:

(a) 1027
(b) 1125
(c) 1145
(d) 1216

Q27. From the options given below, select the organism having a three-chambered heart.

(a) Pigeon
(b) Fish
(c) Salamander
(d) Tiger

Q28. Amit told Shweta, "To reach our apartment, your mother must walk 560 m towards the east from her restaurant. She must then take a right turn and walk 543 m. She must take another right turn and walk 560 m. Then she must take one final right turn and walk 120 m". How far and in which direction is the apartment from the restaurant? (All turns are 90 degree turns only)

(a) 397 m, South
(b) 397 m, North
(c) 423 m, South
(d) 423 m, North

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Q29. A, B, C, D, E, F, G and H are sitting around a square table facing the centre of the table. Some of them are sitting at the corners, while some are sitting at the exact centre of the sides. H is sitting at any one of the sides and is exactly opposite to C. G is sitting second to the right of H and second to the left of C. E is sitting exactly opposite to G. B is sitting third to the right of H and is exactly opposite to A. Both G and H are the immediate neighbours of D. Which of the following statements is NOT true with reference to F?

(a) F is exactly opposite to D
(b) B is sitting to F's second left.
(c) E and C are F's immediate neighbours
(d) H is sitting to F's third left

Q30. If a reactant gains oxygen in a reaction, it is said to be undergoing:

(a) dissociation
(b) reduction
(c) Oxidation
(d) redox process

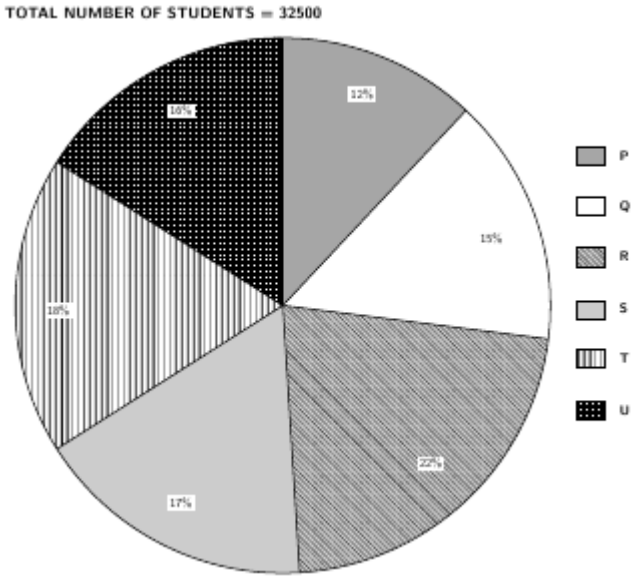
Q31. The first Digital Food Museum in India was launched in _____ in the year 2021.

(a) Karnataka
(b) Maharashtra
(c) Kerala
(d) Tamil Nadu

Q32. The quadratic equation with real coefficients which has real roots 4 and −5 is:

(a) x2 − x − 30 = 0
(b) x2 − 5x − 24 = 0
(c) x2 − 4x − 20 = 0
(d) x2 + x − 20 = 0

Q33. The following pie-chart shows the distribution of students of graduate levels in seven different colleges. Distribution of students at graduate levels in seven different colleges:



What is the sum of students in College of P and T studying at graduate level?

(a) 3900
(b) 9750
(c) 8925
(d) 9875

Q34. Simplify $(4x - 5y)^2 + (5x + 4y)^2 + (4x + 5y)(4x - 5y)$.

(a) −58x2 + 16y2
(b) 57x2 + 16y2
(c) 58x2 + 16y2
(d) −57x2 − 16y2

Q35. Given below is a statement followed by two possible underlying assumptions I and II. Read the information carefully and select the correct option.

Statement:

Research has suggested that regular physical activity not only reduces the chances of physical illness but also of mental illnesses.

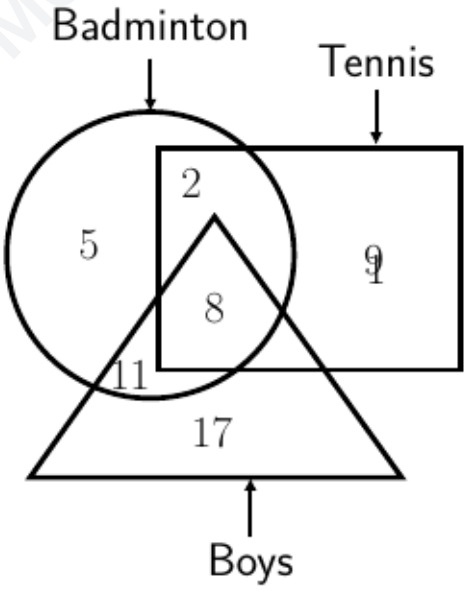
Which of the following can be assumed by the given statement?

I. The medicines for mental illness would work faster if the patient also exercises daily.

II. Patients who are bedridden have a greater chance of developing some mental illness as compared to those who are not bedridden.

(a) Both I and II can be assumed
(b) Only II can be assumed
(c) Neither I nor II can be assumed
(d) Only I can be assumed

Q36. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many such boys are there who play badminton but NOT tennis?

(a) 9
(b) 17
(c) 8
(d) 11

Q37. Induced current is maximum when _____.

(a) direction of motion of the coil is perpendicular to the magnetic field
(b) coil is kept in the direction parallel to the magnetic field
(c) direction of motion of the coil is parallel to the magnetic field
(d) coil is kept in the direction perpendicular to the magnetic field

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Q38. What product(s) is/are transported by the plant transport system from the leaves and roots?

(a) Water only
(b) Carbohydrates and minerals
(c) Energy stores and raw materials
(d) Carbohydrates only

Q39. 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. E.g. 13 - Operations on 13 such as adding /deleting /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)

(3, 6, 18)

(15, 30, 450)

(a) (1, 2, 2)
(b) (6, 12, 64)
(c) (9, 18, 166)
(d) (11, 22, 44)

Q40. When did the ozone levels in the atmosphere start to reduce?

(a) 1995
(b) 1965
(c) 1990
(d) 1980

Q41. Which element has non-metallic properties?

(a) Na
(b) Cl
(c) Li
(d) K

Q42. As of July 2022, who among the following is the CEO of HelpAge India that works for 'the cause and care of disadvantaged older persons to improve their quality of life'?

(a) Rohit Prasad
(b) Ravi Venkatesan
(c) Madhav Chavan
(d) Deepak Kumar

Q43. The listed price of an article is Rs. 200. A customer purchases it at Rs. 150 after two successive discounts. If one discount is 10%, then the other discount percentage (rounded off to two decimal places) is:

(a) 16.66%
(b) 20%
(c) 12.5%
(d) 11.11%

Q44. Which of the following statements about plant nutrition is INCORRECT?

(a) Carbon is taken up by green plants from atmospheric carbon dioxide.
(b) Minerals and nutrients are poorly absorbed by water.
(c) Iron and manganese are both considered micronutrients.
(d) Plants, in general, make use of the water in the soil at the root zone.

Q45. Six persons, P, Q, R, S, T and U travelled in different months of the same year viz. January, February, March, July, September and December.

U travelled in September. Only one person travelled between U and Q. No one travelled between P and S. S travelled in a month after P. More than two people travelled between S and T. Who among them travelled in March?

(a) R
(b) T

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(c) P
(d) Q

Q46. Study the given table and wer the question that follows.

The table presents the cost price and profit percentage of various products being sold by an electronic superstore.

	2021	
Products	Cost Price (in thousands)	Profit Percentage
Refrigerators	48	22
Air Conditioners	39	17
Washing Machines	13	12
Televisions	59	23
Music Systems	65	18

If the cost price of all the products increased by 10% in the next year and profit percentage remained the same, which of the following products will record maximum increase in the sales price?

(a) Refrigerators
(b) Music systems
(c) Air conditioners
(d) Televisions

Q47. If $\sqrt{(1-99/2500)}=49/\sqrt{x}$, then the value of x is:

(a) 2401
(b) 50
(c) 49
(d) 2500

Q48. The focal length of a convex mirror is:

(a) positive
(b) negative
(c) zero
(d) infinite

Q49. Read the given statements and conclusions carefully and decide which of the given conclusions logically follow the statements.

Statements:

1) $G \geq M$
2) $O < K$
3) $K < H$
4) $F = Q$
5) $M < O$
6) $F > H$

Conclusions:

I. $G < F$
II. $Q > M$
III. $O > Q$
IV. $M < Q$

(a) Conclusions I and II follow
(b) Conclusions I and IV follow
(c) Conclusions II and III follow
(d) Conclusions II and IV follow

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Q50. This question is based on the five, three-digit numbers given below.

(left) 434 353 423 224 322 (right)

(Example: 246 - first digit = 2, second digit = 4, third digit = 6)

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

If 4 is added to the second digit of every number, in how many numbers thus formed will the second digit be exactly divisible by the third digit?

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

Q51. Article 51 A of the Constitution of India deals with _____.

(a) union territories
(b) fundamental duties
(c) panchayats
(d) fundamental rights

Q52. Who among the following is known as the architect of Indian planning?

(a) Dhananjay Ramchandra Gadgil
(b) Dattatreya Gopal Karve
(c) Prasanta Chandra Mahalanobis
(d) Kakkadan Nandanath Rajan

Q53. Starting from point A, Ravi walks 30 m towards the north. He then takes a right turn and walks 100 m. Then, he takes another right turn and walks 30 m. From there, he turns to his right and walks 70 m. Then, he takes a left turn and walks 50 m. Finally, he takes a right turn and walks 30 m. How far and in which direction is Ravi now from point A? (All turns are 90 degree turns only)

(a) 30 m, West
(b) 50 m, North
(c) 50 m, South
(d) 30 m, North

Q54. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

1. Some parks are libraries.
2. Some banks are libraries.
3. All schools are banks.

Conclusions:

I. Some banks are schools.

II. Some parks are banks.

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

Q55. Which of the following is the largest coal field in India?

(a) Raniganj Coal Fields
(b) Bokaro Coal Fields
(c) Jharia Coal Fields
(d) Karanpura Coal Fields

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Q56. In which of the following years was the Shri Jagannath Temple Act passed?

(a) 1955
(b) 1935
(c) 1965
(d) 1945

Q57. A person covers certain distance in 8 hours at a speed of 6 km/h and some more distance in 10 hours at a speed of 4 km/h. Find his average speed for the entire distance covered.

(a) 3 8/9 km/h
(b) 6 8/9 km/h
(c) 5 8/9 km/h
(d) 4 8/9 km/h

Q58. Generally, the value of MPC (Marginal Propensity to Consume) _____.

(a) varies between 1 and 2
(b) varies between (−)1 and (−)2
(c) does not exceed 1 or fall below 0
(d) remains constant at (−)1

Q59. Some educational institutions in India were established in response to Mahatma Gandhi's call for non-cooperation with the British. Which of the following is NOT one of them?

(a) Kashi Vidyapith
(b) Serampore College
(c) Gujarat Vidyapith
(d) Jamia Millia Islamia

Q60. An object is placed in front of a convex mirror of focal length 9 cm, at a distance of 18 cm. The magnification produced by the mirror is _____.

(a) 1/3
(b) −1/3
(c) 1
(d) −1

Q61. To combat eve teasing, sexual harassment and other crimes against women, 91 Nirbhaya Squads comprising of specially trained police officers were launched in _____ on 26 January 2022.

(a) Delhi
(b) Mumbai
(c) Bengaluru
(d) Chennai

Q62. The average weight of all children in a group is 45 kg. If 10 children of average weight 42 kg leave the group and 2 children of average weight 55 kg join the group, then the average weight of the children in the group increases by 1 1/4 kg. The number of children in the group initially was:

(a) 38
(b) 42
(c) 48
(d) 52

Q63. A man saves 30% of his monthly income. If his monthly income increases by 10%, then he saves 20% more than the previous savings. The percentage increase in his expenditure is _____ (rounded off to one decimal place).

(a) 4.8%
(b) 5.7%
(c) 6.8%
(d) 7.3%

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Q64. Three years ago, a man was six times as old as his grandson. Three years later, his age will be 6 more than four times the age of the grandson. The present age of the grandson is:

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

Q65. The functions of bile juice are mentioned below. Select the option that is NOT the function of bile juice.

(a) Increases the efficiency of the action of pancreatic enzymes
(b) Breaks down large fat globules into smaller ones
(c) Provides alkaline medium to the food for the action of pancreatic enzymes
(d) Has a protein digesting enzyme that helps in the digestion of proteins

Q66. Wires of copper, silver, nichrome and glass are made having similar length and diameter. Which will have the highest resistance?

(a) Silver
(b) Glass
(c) Nichrome
(d) Copper

Q67. Under perfect competition, a firm earns _____ profits in the long run.

(a) normal
(b) zero
(c) super normal
(d) negative

Q68. The value of (cosec x + cot x + 1) (sec x − tan x - 1) is:

(a) −1
(b) 1
(c) −2
(d) 0

Q69. The part of the magnet from where magnetic field lines emerge is known as:

(a) north pole
(b) middle of the magnet
(c) north and south pole
(d) south pole

Q70. Which of the following is NOT a natural indicator for acids or bases?

(a) Turmeric
(b) Coloured petals of Hydrangea
(c) Coloured petals of Petunia
(d) Methyl orange

Q71. Eight girls, A, B, C, D, E, F, G and H, are seated around a square table, facing the centre. A sits 2^(nd) to the right of B. F sits 2^(nd) to the right of E, who sits fourth to the left of H. G sits between A and B. D sits to the immediate left of H, who is to the immediate left of B. Only one person sits between C and D. Who is fourth to the right of G?

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

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Q72. 10 years ago, the ratio of the ages of A and B was 5 : 9. 15 years from now, the ratio of their ages will be 15 : 17. What will be A's age 15 years from now?

(a) 26 years
(b) 38 years
(c) 30 years
(d) 35 years

Q73. The largest four-digit number which when divided by 7, 11 and 13 leaves remainder 4 in each case is:

(a) 9999
(b) 9013
(c) 9009
(d) 1005

Q74. Three statements are given followed by three conclusions. Consider the statements and conclusions to be true even if they vary from commonly known facts and then decide which of the conclusions follow(s) from the given statements.

Statements:

1. All bags are books.
2. All books are copies.
3. No pen is a copies.

Conclusions:

I. Some books are pens.
II. No bag is a pen.
III. Some copies are bags.

(a) Only conclusion II follows.
(b) Only conclusion III follows.
(c) None of the conclusions follow.
(d) Only conclusions II and III follow.

Q75. It is found that during dispersion of white light by a glass prism, the more a colour component is bent, the more is the refractive index of the glass for that colour component. If μ_R, μ_V and μ_Y are refractive indices for red, violet and yellow lights, respectively, then which of the following relations between them is correct?

(a) μY > μR > μV
(b) μV > μY > μR
(c) μR = μV = μY
(d) μR > μV > μY

Q76. The Karve Committee, which was constituted in the year 1955, dealt with:

(a) foreign trade
(b) insurance regulation
(c) small scale industries
(d) railways

Q77. The new Centre for Water Management and Policy, Aqua MAP was inaugurated in March 2022 by the Principal Scientific Adviser to the Government of India, K Vijay Raghavan at which of the following IITs?

(a) IIT-Delhi
(b) IIT-Madras
(c) IIT-Bombay
(d) IIT-Kharagpur

Q78. Three pipes A, B and C together can fill a tank in 8 hours. Three pipes were opened for 2 hours, after that C was closed. Later A and B fill the remaining part in 9 hours. The number of hours taken by C alone to fill the tank is:

(a) 13
(b) 20

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(c) 24
(d) 12

Q79. 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.

N L A _ X N _ B F _ N L _ F _ N L _ _ X

(a) F L C E X A F
(b) F N X C X C F
(c) F L X N X D C
(d) F L X C X D F

Q80. When a substance combines with O2, it gets:

(a) oxidised
(b) Reduced
(c) back its shine
(d) dissolved in air

Q81. Which of the following statements is correct?

(a) For every protein, there is a specific gene.
(b) For every protein, there is a specific RNA.
(c) For every hormone, there is a specific chromosome.
(d) For every hormone, there is a specific protein.

Q82. Who took oath as the Cabinet Minister of the Ministry of Parliamentary Affairs in 2019?

(a) Subrahmanyam Jaishankar
(b) Sarbananda Sonowal
(c) Narayan Rane
(d) Pralhad Venkatesh Joshi

Q83. The HCF of the numbers 310, 208 and 180 is:

(a) 8
(b) 6
(c) 2
(d) 4

Q84. Which of the following objectives is NOT a part of watershed management?

(a) Mitigating droughts and floods
(b) Generating electricity
(c) Restoring water levels in downstream rivers
(d) Recharging of groundwater

Q85. In a certain code language, 'JUPITER' is written as 'KSSEYYY' and 'URANUS' is written as 'VPDJZM'. How will 'EARTH' be written in the same code language?

(a) FCUPM
(b) FYUXM
(c) FYUPM
(d) FYOPM

Q86. The value of (279 ÷ 31) + (363 ÷ 33) − (512 ÷ 16) is:

(a) 9
(b) 10
(c) −12
(d) −11

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Q87. Which of the following characteristics of the pea plant was NOT used by Mendel in his experiments?

(a) Length of pea plant
(b) Shape of leaves
(c) Shape of seeds
(d) Colour of flowers

Q88. In a certain code language, 'BLISS' is written as 'KSNVT' and 'LIGHT' is written as 'UPLKU'. How will 'WHITE' be written in that language?

(a) FONVF
(b) FONWF
(c) FONWG
(d) FOMWF

Q89. The hydrocarbons which have a double bond between two carbon atoms are called:

(a) inorganic compounds
(b) natural compounds
(c) saturated compounds
(d) unsaturated compounds

Q90. Express 0.43535... in the form rmp/q, where p and q are integers and q ≠ 0.

(a) 430/991
(b) 431/990
(c) 425/990
(d) 456/991

Q91. Select the number from among the given options that can replace the question mark (?) in the following series.

4, 9, 16, 29, 50, ?

(a) 78
(b) 85
(c) 71
(d) 73

Q92. The Kharchi Pooja festival is widely celebrated in the state of _____.

(a) Telangana
(b) Tripura
(c) Gujarat
(d) Uttarakhand

Q93. Rohan lives in a seven-storeyed building. The top floor of the building is numbered as seven and the lowermost floor is numbered as one. Diya who is Rohan's friend lives somewhere above the floor where Rohan lives. Every Sunday Rohan goes two floors below to his colleague Atul's flat to eat and drink together. If there are three floors between Rohan's and Diya's floor, on which floor does Rohan live?

(a) Fourth floor
(b) Third floor
(c) Second floor
(d) First floor

Q94. In which of the following years was the Ministry of Panchayati Raj created?

(a) 2004
(b) 2002
(c) 2001
(d) 2003

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Q95. The cost price of an article is Rs. 5,000. What should the selling price of the article be so that a profit of 25% is earned?

(a) Rs. 8,250
(b) Rs. 7,250
(c) Rs. 5,250
(d) Rs. 6,250

Q96. Newlands' Law of Octaves worked well with:

(a) radioactive elements only
(b) lighter elements only
(c) metallic elements only
(d) noble gases only

Q97. The area of a triangle having base 9 cm and height 16 cm is:

(a) 92 cm2
(b) 82 cm2
(c) 62 cm2
(d) 72 cm2

Q98. What is the mean of the following distribution?

Marks	10	30	50	70	90
Number of students	17	28	32	24	19

(a) 51
(b) 50
(c) 52.4
(d) 49.2

Q99. Suman invested a sum of Rs. 20,000 at 10% per annum compound interest. If she received an amount of Rs. 26,620 after n years, the value of n is:

(a) 2.8 years
(b) 2.5 years
(c) 3 years
(d) 2 years

Q100. _____ is spoken by around 2.5 million people, mainly on the central west coast of India, and it is the official language of Goa.

(a) Dogri
(b) Marathi
(c) Dhivehi
(d) Konkani

ANSWER KEY

1	d	2	d	3	a	4	d	5	b	6	d	7	c	8	c	9	c	10	c
11	b	12	d	13	c	14	d	15	d	16	a	17	b	18	b	19	d	20	d
21	c	22	d	23	b	24	c	25	b	26	a	27	c	28	c	29	d	30	c
31	d	32	d	33	b	34	b	35	b	36	d	37	a	38	c	39	a	40	d
41	b	42	a	43	a	44	b	45	d	46	b	47	d	48	a	49	d	50	d
51	b	52	c	53	c	54	b	55	c	56	a	57	d	58	c	59	b	60	a
61	b	62	c	63	b	64	c	65	d	66	b	67	a	68	c	69	a	70	d

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71	c	72	c	73	b	74	d	75	b	76	c	77	b	78	c	79	d	80	a
81	a	82	d	83	c	84	b	85	c	86	c	87	b	88	b	89	d	90	b
91	b	92	b	93	b	94	a	95	d	96	b	97	d	98	b	99	c	100	d

SOLUTIONS

Q1. Answer: (d) N > X

Given statement:

H < N ≤ C ≤ K = X > T > F

Let us check each option:

option 1) X ≥ N → True (N ≤ C ≤ K = X)

option 2) H < X → True (X = K ≥ C ≥ N > H)

option 3) K > F → True (K = X > T > F)

option 4) N > X → False (As H < N ≤ C ≤ K = X, here we can see that N ≤ X)

Hence, "N > X" is NOT true based on the statement.

Q2. Answer: (d) +0.33 m

The correct answer is +0.33 m.

Key Points:

• The given power is 3 Dioptre.

• P = 3D.

• We know that the focal length is:

• f = 1/power

• Therefore, f = 1/3

• f = 0.333 m

• Therefore, the focal length of the 3D power is +0.33m.

Additional Information:

• The focal length of a convex lens is defined as the distance between the lens's center and its focus.

• The point where light rays converge parallel to the main axis is where the real focus resides.

• In a convex lens, incident light constantly moves from left to right since the object is always on the left side of the lens.

• All measures are regarded as positive distances when taken from the right side of the lens to its optical center.

Q3. Answer: (a) Mediterranean region

The correct answer is Mediterranean region.

Key Points

• Mediterranean region

• The area surrounding the Mediterranean Sea is known as the Mediterranean region. This includes places in Asia, Africa, and Europe.

• The majority of the region has a Mediterranean climate with mild to mildly wet winters and summers that range from hot to dry.

• The short trees and shrubs that grow there can withstand the annual summer drought. It is a popular getaway location.

• The largest portion of the region is located along the shores of the Mediterranean Sea, which is why it is referred to as the Mediterranean Region.

• On the western margins of continents in the latitudinal belt, between 30° and 45° North and South latitudes, are the regions with similarities to the Mediterranean Region.

Additional Information

• Pacific Ocean region

• Out of Earth's five oceanic divisions, the Pacific Ocean is the largest and deepest.

• It is bounded by the continents of Asia and Oceania in the west and the Americas in the east, and it stretches from the Arctic Ocean in the north to the Southern Ocean (or, depending on how you define it, Antarctica) in the south.

• Arabian Sea region

• The Arabian Sea is a part of the northern Indian Ocean that is bounded to the north by Pakistan, Iran, and the Gulf of Oman; to the west by the Gulf of Aden, the Guardafui Channel, and the Arabian Peninsula; to the southeast by the Laccadive Sea and the

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Maldives; to the southwest by Somalia; and to the east by India.

• It has a total surface area of 3,862,000 km²(or 1,491,000 sq mi) and a maximum depth of 4,652 meters (or 15,262 feet). Through the Bab-el-Mandeb strait, the Gulf of Aden in the west links the Arabian Sea to the Red Sea, and the Gulf of Oman in the northwest links it to the Persian Gulf.

• Bay of Bengal region

• The northeastern portion of the Indian Ocean is the Bay of Bengal. It is bounded on the west and northwest by India, on the north by Bangladesh, on the east by Myanmar and the Andaman and Nicobar Islands of India, and on the west and northwest by Bangladesh.

• A line running from Sri Lanka's Sangaman Kanda to Indonesia's Sumatra's northwesternmost point serves as its southern boundary. It is the world's largest bay, or body of water.

Q4. Answer: (d) Increases by 6.8%

Shortcut Trick

Let the cost of a TV be 100. Then the cost of a Washing Machine (WM) = 60.

Total initial cost for 5 WM and 2 TVs = 5 × 60 + 2 × 100 = 300 + 200 = 500.

Net change = [5 × 60 × (+18%) + 2 × 100 × (−10%)] = [+5400 − 2000] / 100 = +34.

Percentage change = (34 / 500) × 100 = 6.8%.

Therefore The correct answer is Increases by 6.8%.

Alternate Method

Given:

=> Let Cost of TV = Rs. 100

=> Cost of Washing Machine (WM) = 100 − 40% of 100 = Rs. 60

Initial Total Cost:

=> Total Cost = (5 × WM) + (2 × TV)

=> Total Cost = (5 × 60) + (2 × 100) = 300 + 200 = Rs. 500

New Costs after change:

=> New WM cost = 60 + 18% of 60 = 60 + 10.8 = Rs. 70.8

=> New TV cost = 100 − 10% of 100 = 100 − 10 = Rs. 90

Final Total Cost:

=> New Total Cost = (5 × 70.8) + (2 × 90) = 354 + 180 = Rs. 534

Percentage Change:

=> Increase in cost = 534 − 500 = Rs. 34

=> % Increase = (34 / 500) × 100 = 6.8%

Therefore The correct answer is Increases by 6.8%.

Additional Information

Percentage Change Formula

Percentage change is calculated as [(New Value − Old Value) / Old Value] × 100.

Weighted Average Method

When components of a total change by different percentages, the net percentage change is the sum of (weight × individual percentage change) divided by the total initial value.

Successive Percentage Change

If a value changes by x% and then y%, the net change is [x + y + (xy/100)]%.

Q5. Answer: (b) 154 cm2

Shortcut Trick

For Radius (r) = 7 cm, the Surface Area of a Sphere is 616 cm².

Since Area is proportional to the square of the Radius (r²):

New Radius = 3.5 cm (which is 1/2 of 7 cm).

New Surface Area = 616 × (1/2)² = 616 ÷ 4 = 154 cm².

Therefore The correct answer is 154 cm².

Alternate Method

Given:

Radius (r) = 3.5 cm = 7/2 cm

Formula Used:

Surface Area of Sphere = $4\pi r^2$

Calculations:

=> Surface Area = $4 \times (22/7) \times (3.5) \times (3.5)$

=> Surface Area = $4 \times (22/7) \times (7/2) \times (7/2)$

=> Surface Area = $4 \times (22/7) \times (49/4)$

=> Surface Area = 22×7

=> Surface Area = 154 cm^2

Therefore The correct answer is 154 cm^2.

Additional Information

Volume of a Sphere

The total space occupied by a 3D sphere is given by $V = (4/3)\pi r^3$.

Surface Area of Hemisphere

Curved Surface Area (CSA) = $2\pi r^2$ and Total Surface Area (TSA) = $3\pi r^2$.

Ratio Property

If the Radii of two spheres are in ratio a:b, then their Surface Areas are in ratio $a^2:b^2$.

Q6. Answer: (d) 15

Symbol	Meaning
•	÷
•	•
×	•
÷	×

Given expression:

[{(35 × 26) − (4 ÷ 3)} + (3 − 4)] ÷ 5

By putting values in given series by using the BODMAS rule we get,

= [{(35 - 26) + (4 × 3)} ÷ (3 + 4)] × 5

= [{9 + 12} ÷ 7] × 5

= [21 ÷ 7] × 5

= 3 × 5

= 15

Hence, the correct answer is "15".

Q7. Answer: (c) (3, 90, 15)

Logic: (First number × Third number) × 2 = Second number

(11, 154, 7) → 11 × 7 => 77 × 2 = 154

And,

(6, 180, 15) → 6 × 15 => 90 × 2 = 180

Similarly, let us check each option:

1) (25, 375, 5) → 25 × 5 => 125 × 2 = 250

2) (5, 20, 60) → 60 × 5 => 300 × 2 = 600

3) (3, 90, 15) → 3 × 15 => 45 × 2 = 90

4) (23, 46, 2) → 23 × 2 => 46 × 2 = 92

Hence, the set of numbers related to the above logic is "(3, 90, 15)".

Q8. Answer: (c) Two real and distinct roots

Shortcut Trick

Simplify the equation directly to find its standard form.

$x(x + 3) - 8 = 2(x^2 - 9)$

=> $x^2 + 3x - 8 = 2x^2 - 18$

=> $x^2 - 3x - 10 = 0$

Factorise to get: (x − 5)(x + 2) = 0. The roots are 5 and −2.
Since 5 ≠ −2, the roots are real and distinct.
Therefore The correct answer is Two real and distinct roots.
Alternate Method
Given:
x(x + 3) − 8 = 2(x + 3)(x − 3)
Formula Used:
For a quadratic equation ax2 + bx + c = 0,
Discriminant (D) = b2 − 4ac
If D > 0, roots are real and distinct.
If D = 0, roots are real and equal.
If D < 0, roots are imaginary.
Calculation:
=> x(x + 3) − 8 = 2(x2 − 9)
=> x2 + 3x − 8 = 2x2 − 18
=> 2x2 − x2 − 3x − 18 + 8 = 0
=> x2 − 3x − 10 = 0
Comparing with ax2 + bx + c = 0,
Here, a = 1, b = −3, c = −10
=> D = (−3)2 − 4 × 1 × (−10)
=> D = 9 + 40 = 49
Since D > 0, the roots are real and distinct.
Therefore The correct answer is Two real and distinct roots.
Additional Information
Sum and Product of Roots
For ax2 + bx + c = 0, Sum of roots = −b/a and Product of roots = c/a.
Irrational Roots
If D > 0 but is not a perfect square, roots are irrational and occur in conjugate pairs like a + √b and a − √b.
Complex Roots
If D < 0, the roots are imaginary and always occur in conjugate pairs like p + iq and p − iq.

Q9. Answer: (c) @

Given series:
(Left) N & 2 G 9 S P T B 4 @ H # 1 8 S B A 3 P (Right)
After dropping all numbers from the series
(Left) N & G S P T B @ H # S B A P(Right)
The element which is seventh from the right is:
(Left) N & G S P T B @ H # S B A P(Right)
Therefore after dropping all the numbers, @ symbol is seventh from the right.
Hence, the correct answer is "@".

Q10. Answer: (c) 39

Letter	Symbol
A	•
B	×
C	•
D	÷

Given expression:
40 D 2 A 3 B 8 C 5
By putting values and solving as per the Bodmas rule:

= 40 ÷ 2 + 3 × 8 - 5

= 20 + 3 × 8 - 5

= 20 + 24 - 5

= 44 - 5

= 39

Hence, the correct answer is "39".

Q11. Answer: (b) 100

The pattern followed here is:

Hence, the number that can replace the question mark (?) is "100".

Q12. Answer: (d) 8 cm

Shortcut Trick

In ΔMNO, since angle N = angle O, it is an isosceles triangle with MN = MO = 10 cm.

The altitude MP bisects the base NO, so NP = 12 ÷ 2 = 6 cm.

Using the Pythagorean triplet (6, 8, 10) in right-angled ΔMPN:

MP = 8 cm.

Therefore The correct answer is 8 cm.

Alternate Method

Given: NO = 12 cm, MO = 10 cm, angle N = angle O.

Formula Used: In an isosceles triangle, the altitude to the base bisects the base. Pythagoras Theorem: Hypotenuse² = Base² + Perpendicular².

=> Since angle N = angle O, MN = MO = 10 cm (Sides opposite to equal angles are equal).

=> MP is the altitude on NO, so P is the midpoint of NO.

=> NP = PO = NO ÷ 2 = 12 ÷ 2 = 6 cm

Q13. Answer: (c) 144°

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Q14. Answer: (d) 52.38 ampere

The correct answer is 52.38 ampere.

Key Points

• Calculation

• V= 220V and R= 4.2Ω [Given]

According to ohm's law,

V= IR

Putting the values,

220= I × 4.2

I= 220/4.2

I= 52.38 A

Additional Information

• Ohm's law

• Ohm’s law states that the voltage across a conductor is directly proportional to the current flowing through it, provided all physical conditions and temperatures remain constant.

• The formula for this current-voltage relationship is,

• V= IR

• The constant of proportionality, R, is denoted by the symbol Ω in units of ohms in the equation.

• The provided temperature and the other physical factors must remain constant for Ohm's law to apply.

• The temperature rises when the current is increased in some components.

• The filament of a light bulb is an illustration of this, as its temperature rises with increasing current.

• Ohm's law cannot be applied in this circumstance.

Q15. Answer: (d) Cricket

The correct answer is Cricket.

Key Points

• Scheme of Cash Awards to Medal Winners in International Sports Events and their Coaches

• The cash awards were first given out in 1986, and they were changed in 2020.

• To reward outstanding athletes for their accomplishments, to inspire and motivate them to achieve greater heights, and to serve as role models that encourage younger people to take up sports.

• The following fields will receive the awards:

• Chess,

• Billiards, and

• Snooker

are Olympic, Asian, and Commonwealth Games sports.

Additional Information

• Schemes of Cash Awards, National Welfare and Pension to Sportspersons

• The revised Cash Awards, National Welfare, and Pension schemes for athletes were announced by the Union Minister for the Ministry of Youth Affairs and Sports.

• Amendments in the Schemes

• Direct Applicability for these Schemes: Previously, proposals were received through Sports Federations/SAI, which typically took more than one to two years. Now, any individual sportsperson can directly apply for all three schemes.

• Pension to Meritorious Sportspersons: The Deaflympics athletes have also been included in the expansion of pension benefits.

• National Sports Development Fund’ (NSDF): Corporate social responsibility contributions from Central and State Governments, Public Sector Undertakings (PSUs), private businesses, individuals, and others make up the foundation of this fund. for the country's sports development and promotion.

Q16. Answer: (a) 6

Given series:-

S S G Y U N G T R F C E D A W X C V U N J O K L E C D

The logic followed here is:

Consonant → Vowel → Consonant

Vowels are → A, E, I, O, U

Vowels that are immediately preceded by a consonant and also immediately followed by a consonant in the given series are:-

• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → U)

• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → E)

• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → A)
• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → U)
• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → O)
• S S G Y U N G T R F C E D A W X C V U N J O K L E C D (Vowel → E)

There are 6 vowels (U, E, A, U, O, and E) that are immediately preceded by a consonant and followed by a consonant in the given series.

Hence, the correct answer is "6".

Q17. Answer: (b) Tibet

The correct answer is Tibet.

Key Points

• Yarlung Tsangpo
• The upper stream of the Brahmaputra River, also known as the Yarlung Tsangpo or Yarlung Zangbo, can be found in China's Tibet Autonomous Region.
• It is the fifth-longest river in China and the longest in Tibet. Dangque Zangbu, which translates to "Horse River," is another name for the upper section.
• It began at the Angsi Glacier in western Tibet, southeast of Mount Kailash and Lake Manasarovar. From there, it created the South Tibet Valley and the Yarlung Tsangpo Grand Canyon before entering the Indian state of Arunachal Pradesh.
• Nyangchu River, Lhasa River, Nyang River, and Parlung Tsangpo are the primary tributaries of Yarlung Tsangpo.

Additional Information

• Brahmaputra river
• The Brahmaputra is a river that connects Tibet, northeast India, and Bangladesh. It is transboundary. It is also referred to as the Jamuna River in Bangla, the Siang/Dihang River in Arunachali, the Luit in Assamese, and the Yarlung Tsangpo in Tibetan. By discharge, it ranks 9th largest and 15th longest river in the world.
• The Yarlung Tsangpo River originates in the Manasarovar Lake region, near Mount Kailash, on the northern side of the Himalayas in Burang County, Tibet.
• It is not to be confused with the Indian Yamuna and flows south through Bangladesh as the Jamuna, passing through the Assam Valley in the southwest.
• It eventually joins the Ganges, which is commonly referred to as the Padma in Bangladesh, in the vast Ganges Delta, where it becomes the Meghna before draining into the Bay of Bengal.

Q18. Answer: (b) 1/R=1/R1+1/R2+1/R3

The correct answer is 1/R= 1/R1+ 1/R2+ 1/R_(3.)

Key Points

• The parallel combination of resistance
• The terminals in a parallel combination circuit can travel in multiple directions.
• All of the cells' positive and negative terminals are joined together in a parallel combination.
• The current will be distributed among the various cells when the cells are connected in parallel.
• We can see that two cells are connected in parallel from the figure. Cell 1 has an emf of 1 and cell 2 has an emf of 2.
• Cell 1's internal resistance is r1, while cell 2's is r2.
• There are two parts to the current: i1 and i2.
• The total current is i = i1 + i2.
• The combination's subsequent internal resistance is,
• 1/r_(eq)= 1/r1+ 1/r2.
• When it is not being used, the potential difference between A and B (VA – VB) equals the equivalent EMF (eq).
• Kirchoff's loop rule should be used to figure out the equivalent EMF.

Additional Information

• Advantages of Cells Connected in Parallel
• The other cells are unaffected if any one of the parallel cells is damaged.
• The cells will not quickly exhaust if they are connected in parallel.
• Disadvantages of Cells Connected in Parallel
• The number of cells in the parallel combination will not increase the voltage that is produced.
• One cell determines the output power.
• As a result, the connected bulb will not have a particularly bright light.

Q19. Answer: (d) 10, 30

Given equation:

10 ÷ 6 × 4 + 14 − 24 = 30

Checking options one by one by interchanging the numbers and applying the BODMAS rule:-

option 1) 4, 6

10 ÷ 4 × 6 + 14 − 24 = 30

2.5 × 6 + 14 - 24 = 30

15 + 14 - 24 = 30

29 - 24 = 30

5 ≠ 30

option 2) 10, 6

6 ÷ 10 × 4 + 14 - 24 = 30

0.6 × 4 + 14 - 24 = 30

2.4 + 14 - 24 = 30

16.4 - 24 = 30

-7.6 ≠ 30

option 3) 14, 24

10 ÷ 6 × 4 + 24 - 14 = 30

1.66 × 4 + 24 - 14 = 30

6.64 + 24 - 14 = 30

30.64 - 14 = 30

16.64 ≠ 30

option 4) 10, 30

30 ÷ 6 × 4 + 14 - 24 = 10

5 × 4 + 14 - 24 = 10

20 + 14 - 24 = 10

34 - 24 = 10

10 = 10 (Left hand side = Right hand side)

Hence, the correct pair of numbers that satisfies the equation is "(10, 30)".

Q20. Answer: (d) Al2(SO4)3

The correct answer is Al2(SO4)3.

Key Points:

• A more reactive element displacing a less reactive element from a chemical reaction is known as a single displacement reaction.

• A series known as the reactivity series determines a metal's reactivity.

• In the series, the metals that are higher up are more reactive than the metals that are lower down.

• In the reaction 2 Al + 3CuSO4 = Al2(SO4)3 + 3Cu; Aluminum may easily substitute copper in a chemical equation since it is higher in the series than copper.

• Therefore, the colour of the solution changed because of the formation of Al2(SO4)3.

Additional Information:

• When an atom or group of atoms in a molecule is replaced by another atom, this is referred to as a displacement reaction.

• For instance, copper metal is moved when the iron is added to a solution of copper sulfate.

• A-C+B = A + B-C

• When A is more reactive than B, the preceding equation holds true.

• A and B must either be:

• Halogens with the cation symbol C.

• Various metals, where C denotes an anion.

Q21. Answer: (c) Zn + H2SO4 → ZnSO4 + H2

The correct answer is Zn + H2SO4 → ZnSO4 + H2.

Key Points:

• A chemical equation is said to be balanced if the quantity of each type of atom in the reaction is the same on both the reactant and product sides.

• In a balanced chemical equation, the mass and the change are both equal.

• A chemical equation must balance according to the rule of the conservation of mass.

• According to this rule, mass cannot be generated or removed during a chemical process.

• This necessitates proper balancing of chemical equations.

• Zn + H2SO4 → ZnSO4 + H2 is a balanced equation because each element is present in equal amounts in both the reactants and products.

Additional Information:

• To balance the chemical equations, stoichiometric coefficients must be added to the reactants and products.

• This is important because chemical equations must follow the rules of conservation of mass and constant proportions, which require that the same number of atoms of each element be present on both the reactant and product sides of the equation.

• A chemical equation can be balanced in one of two ways:

• The standard method of balancing.

• The process of algebraic balancing.

Q22. Answer: (d) One

Given word:

Left 'DISCOUNT' Right

Arranging the letters of the given word in alphabetical order:

There is only one alphabet i.e. O whose position remains unchanged after the arrangement.

Hence, the correct answer is "One".

Q23. Answer: (b) PI 21

The logic followed here is:

VM 19 is related to SJ 25 as:

And,

HN 17 is related to EK 23 as:

Similarly,

SL 15 is related to PI 21 as:

Hence, the correct answer is "PI 21".

Q24. Answer: (c) 165

Shortcut Trick

Identify the total number of groups and students per group.

Total students = Number of groups × Students in each group

=> Total students = 11 × 15 = 165

Therefore The correct answer is 165 students.

Alternate Method

Given:

Number of students in one group = 15

Total number of such groups = 11

Calculations:

=> Total students = 15 + 15 + 15 + ... (up to 11 times)

=> Total students = 15 × 11

=> Total students = 165

Therefore The correct answer is 165 students.

Additional Information

Unitary Method

If the value of 1 unit is given, the value of 'n' units is found by multiplying 1 unit value × n.

Multiplication by 11 Shortcut

To multiply a two-digit number by 11, add the two digits and place the sum in between (e.g., 15 × 11: 1, (1+5), 5 = 165).

Q25. Answer: (b) 3

The correct answer is 3.

Key Points

• IPL 2022

• The fifteenth season of the Indian Premier League (IPL), a professional Twenty20 cricket league established in 2007 by the Board of Control for Cricket in India (BCCI), was referred to as IPL 15, or Tata IPL 2022 for sponsorship reasons.

• The tournament ran from the 26th of March to the 29th of May in 2022.

• Mumbai and Pune served as the tournament's host cities for the entirety of the state of Maharashtra's group stage. On March 6, 2022, the tournament's complete schedule was made public.

• The league grew during the season, with two new teams joining the fold. Therefore, following the tournament in 2011, this was the second season with ten teams. Having won their fourth title the season before, Chennai Super Kings were the defending champions.

• Gujarat Titans won their first IPL title by defeating Rajasthan Royals by seven wickets in the final.

Additional Information

• TATA IPL Auction - 2022

• During the two-day TATA Indian Premier League (IPL) 2022 Auction in Bengaluru, 204 players were sold and INR 5,51,70,00,000 was spent by the ten teams.

• The auction was dominated by young Indian cricketers, with Ishan Kishan receiving the highest bid of INR 15.25 million, which allowed him to return to MI.

• In the meantime, Deepak Chahar became the most expensive Indian pace bowler ever purchased at the IPL Auction after returning to CSK for INR 14 crore.

• Shreyas Iyer was bought by KKR for INR 12.25 billion, breaking the bank in the process.

• At the Auction, Liam Livingstone, Wanindu Hasaranga, Nicholas Pooran, Shardul Thakur, and Lockie Ferguson also had a good time. Meanwhile, Avesh Khan became the most expensive uncapped player in the IPL's history when the new IPL team LSG paid him INR 10 crore.

Q26. Answer: (a) 1027

Shortcut Trick

Apply the direct identity: $p^3 + q^3 + r^3 - 3pqr = (p + q + r) \times [(p + q + r)^2 - 3(pq + qr + rp)]$

Substitute the given values: $p + q + r = 13$ and $pq + qr + rp = 30$

Value = $13 \times [13^2 - 3(30)] = 13 \times [169 - 90]$

Value = $13 \times 79 = 1027$

Therefore The correct answer is 1027.

Alternate Method

Given:

$p + q + r = 13$

$pq + qr + rp = 30$

Formula Used:

1. $(p + q + r)^2 = p^2 + q^2 + r^2 + 2(pq + qr + rp)$

2. $p^3 + q^3 + r^3 - 3pqr = (p + q + r)(p^2 + q^2 + r^2 - (pq + qr + rp))$

Calculations:

$\Rightarrow (13)^2 = p^2 + q^2 + r^2 + 2(30)$

$\Rightarrow 169 = p^2 + q^2 + r^2 + 60$

$\Rightarrow p^2 + q^2 + r^2 = 169 - 60 = 109$

$\Rightarrow p^3 + q^3 + r^3 - 3pqr = 13 \times (109 - 30)$

$\Rightarrow p^3 + q^3 + r^3 - 3pqr = 13 \times 79$

$\Rightarrow p^3 + q^3 + r^3 - 3pqr = 1027$

Therefore The correct answer is 1027.

Additional Information

Conditional Identity

If $p + q + r = 0$, then the expression $p^3 + q^3 + r^3 - 3pqr$ becomes zero, which implies $p^3 + q^3 + r^3 = 3pqr$.

Alternative Cubic Form

$p^3 + q^3 + r^3 - 3pqr = (1/2) \times (p + q + r) \times [(p - q)^2 + (q - r)^2 + (r - p)^2]$.

Square of a Trinomial

$(p + q + r)^2 = p^2 + q^2 + r^2 + 2pq + 2qr + 2rp$, which is essential for finding the sum of individual squares.

Q27. Answer: (c) Salamander

The correct answer is Salamander.

Key Points:

• The salamander family of amphibians is known for having slender bodies, blunt snouts, short limbs that extend at right angles to the body, and tails in both larvae and adults.

• These characteristics give salamanders a lizard-like look.

• The order Urodela includes all 10 of the known salamander families.

• Salamanders typically have four front toes and five back toes, while some species have fewer toes or no hind limbs.

• An amphibian having a three-chambered heart is the salamander.

• It has one ventricle and two atria.

• For oxygenating and distributing blood, some animals also have separate or different blood channel circuits.

Additional Information:

• Pigeon:

• A 4-chambered heart with 2 atria and 2 ventricles is a feature of members of the Aves class.

• Blood that is oxygenated and blood that is not oxygenated are separated in birds.

• Fish:

• Fish have hearts with two chambers.

• One atrium and one ventricle make up its heart.

• Tiger:

• The cardiovascular system of tigers is a closed, two-loop system with a four-chamber heart.

• Deoxygenated blood passes through the body of a tiger twice, once to the heart and lungs and once back in the other direction, much like the cardiovascular system in humans.

Q28. Answer: (c) 423 m, South

According to the given information

Amit told Shweta,

1) To reach our apartment, your mother must walk 560 m towards the east from her restaurant.

2) She must then take a right turn and walk 543 m.

3) She must take another right turn and walk 560 m.

4) Then she must take one final right turn and walk 120 m.

5) The distance and the direction of the apartment from the restaurant is

From the above diagram, we can conclude that the apartment is 423 m far and is in the South direction of the restaurant.

Hence, the correct answer is "423 m, South".

Q29. Answer: (d) H is sitting to F's third left

Given:

A, B, C, D, E, F, G, and H are sitting around a square table facing the centre of the table.

1) H is sitting at any one of the sides and is exactly opposite to C.

2) G is sitting second to the right of H and second to the left of C.

3) E is sitting exactly opposite to G.

4) B is sitting third to the right of H and is exactly opposite to A.

5) Both G and H are the immediate neighbours of D.

6) The empty position around the square table will be occupied by the only person left i.e. F.

Let us check each statement on the basis of seating arrangement:

option 1) F is exactly opposite to D → True (It can be clearly seen that F sits exactly opposite to D at the corner)

option 2) B is sitting to F's second left → True (It can be seen clearly that B sits to the second left of F at the corner)

option 3) E and C are F's immediate neighbours → True (It is clear from the arrangement that F is the immediate neighbour of both E and C)

option 4) H is sitting to F's third left → False (It can be seen clearly that H is sitting to F's fifth left and also H is sitting to F's third right)

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Hence, "H is sitting to F's third left" is NOT true with reference to F.

Q30. Answer: (c) Oxidation

The correct answer is Oxidation.

Key Points:

• Originally, the term "oxidation" meant a reaction with oxygen to produce an oxide.

• Later, the word was broadened to include compounds that functioned in parallel chemical reactions and were similar to oxygen.

• In the end, the significance was broadened to cover any procedures involving the loss of electrons.

• Oxidative or oxidizing chemicals are referred to as oxidizing agents, oxidants, or oxidizers and have the capacity to oxidize other compounds (causing them to lose electrons).

• The oxidant (oxidizing agent) reduces itself by taking electrons away from another substance.

• Additionally, the oxidizing agent is frequently referred to as an electron acceptor because it "accepts" electrons.

• Chemical substances known as oxidants typically contain elements with high oxidation states, such as H2O2.

Additional Information:

• Dissociation:

• In general, molecules (or ionic compounds like salts, or complexes) separate or split into other substances like atoms, ions, or radicals during the dissociation process in chemistry.

• Typically, this process is reversible.

• Reduction:

• Reducing or reductive compounds are referred to as reducing agents, reductants, or reducers and have the capacity to reduce other substances (causing them to gain electrons).

• The reductant (reducing agent) becomes oxidized as a result of transferring electrons to another substance.

• Redox process:

• Chemical reactions known as redox occur when the oxidation states of the substrate change.

Q31. Answer: (d) Tamil Nadu

The correct answer is Tamil Nadu.

Key Points

• The first digital food museum in India electronically opened in Thanjavur, Tamil Nadu, in November 2021, thanks to Union Minister Piyush Goyal.

• Thanjavur was chosen as the location for India's first digital food museum since it is the birthplace of the FCI.

• Established by -

• Food Corporation of India (FCI) and Visvesvaraya Industrial and Technological Museum (VITM), both located in Bengaluru, collaborated to construct the museum with an estimated investment of Rs. 1.1 crore.

• Area - 1,860 square foot museum

• Museum display includes -

• The Indian food progression from nomadic hunters and gatherers to sedentary agricultural producers.

• The history of humanity from foragers to producers along with the tale of the first harvest, the development of villages, and the planning of demand days.

• Indian grains and discuss the many food cultures around the world.

• The journey of the food grain from the farm to the consumer's plate and the part played by FCI in it.

Additional Information

• According to the Food Corporation Act of 1964, the Food Corporation of India was established to carry out the goals of the Food Policy as the country was facing a major shortage of food grain, especially wheat.

• The objectives of FCI are -

• Operationally sound price support to protect the interests of farmers

• distribution of food grains for public distribution systems around the nation.

• Maintaining operational and buffer inventories of food grains is necessary to guarantee the ongoing availability of staple foods.

• Food grain market prices should be regulated to keep them reasonable for the general public to purchase.

Q32. Answer: (d) $x2 + x - 20 = 0$

Shortcut Trick

Given roots are $\alpha = 4$ and $\beta = -5$.

Sum of roots (S) = $4 + (-5) = -1$

Product of roots (P) = 4 × (−5) = −20
Direct equation formula: x2 − (Sum)x + (Product) = 0
=> x2 − (−1)x + (−20) = 0 => x2 + x − 20 = 0
Therefore The correct answer is x2 + x − 20 = 0.
Alternate Method
Given: The real roots of the quadratic equation are 4 and −5.
Formula Used: If α and β are the roots, then the quadratic equation is (x − α)(x − β) = 0 or x2 − (α + β)x + αβ = 0.
=> Let α = 4 and β = −5.
=> Sum of roots = α + β = 4 + (−5) = −1
=> Product of roots = α × β = 4 × (−5) = −20
=> Substituting these values into the standard form:
=> x2 − (−1)x + (−20) = 0
=> x2 + x − 20 = 0
Therefore The correct answer is x2 + x − 20 = 0.
Additional Information
Relation between Roots and Coefficients
For a quadratic equation ax2 + bx + c = 0, the sum of roots is −b/a and the product of roots is c/a.
Nature of Roots (Discriminant)
The discriminant D = b2 − 4ac determines the nature: D > 0 (Real & Distinct), D = 0 (Real & Equal), and D < 0 (Imaginary).
Factor Theorem
If k is a root of the polynomial P(x), then (x − k) is a factor of that polynomial.

Q33. Answer: (b) 9750

Given:
Total number of students = 32500
Concept used:
100% = Total number of students
Calculation:
Here, the total number of students = 32500
So, 100% = 32500
=> 1% = 325
Students in College (P) = 12% and College (T) = 18%
Students of college (P) and (T) = 12% + 18% = 30%
=> 30% × 325 = 30/100 × 100 = 9750
Hence, the sum of students in the College of P and T studying at the graduate level is 9750.

Q34. Answer: (b) 57x2 + 16y2

Shortcut Trick
Identify the special identity: $(ax - by)^2 + (ay + bx)^2 = (a^2 + b^2)(x^2 + y^2)$.
For the first two terms: $(4x - 5y)^2 + (5x + 4y)^2 = (4^2 + 5^2)(x^2 + y^2) = 41x^2 + 41y^2$.
For the third term: $(4x + 5y)(4x - 5y) = (4x)^2 - (5y)^2 = 16x^2 - 25y^2$.
Summing them up: $(41x^2 + 41y^2) + (16x^2 - 25y^2) = 57x^2 + 16y^2$.
Therefore The correct answer is $57x^2 + 16y^2$.
Alternate Method
Given: $(4x - 5y)^2 + (5x + 4y)^2 + (4x + 5y)(4x - 5y)$
Formula Used:
1) $(a - b)^2 = a^2 - 2ab + b^2$
2) $(a + b)^2 = a^2 + 2ab + b^2$
3) $(a + b)(a - b) = a^2 - b^2$
Calculations:
=> $[(4x)^2 - 2(4x)(5y) + (5y)^2] + [(5x)^2 + 2(5x)(4y) + (4y)^2] + [(4x)^2 - (5y)^2]$
=> $(16x^2 - 40xy + 25y^2) + (25x^2 + 40xy + 16y^2) + (16x^2 - 25y^2)$

=> $16x^2 + 25x^2 + 16x^2 - 40xy + 40xy + 25y^2 + 16y^2 - 25y^2$

=> $(16 + 25 + 16)x^2 + (-40 + 40)xy + (25 + 16 - 25)y^2$

=> $57x^2 + 0 + 16y^2$

=> $57x^2 + 16y^2$

Therefore The correct answer is $57x^2 + 16y^2$.

Additional Information

Square of a Binomial

The expansion of $(a \pm b)^2$ results in a trinomial: $a^2 \pm 2ab + b^2$. These are fundamental identities in algebraic simplification.

Difference of Two Squares

The product $(a + b)(a - b)$ is simplified to $a^2 - b^2$, which is used to rationalize denominators or simplify complex polynomial products.

Lagrange Identity Variation

The specific form $(ax - by)^2 + (bx + ay)^2$ simplifies to $(a^2 + b^2)(x^2 + y^2)$, showcasing a symmetrical property of quadratic forms.

Q35. Answer: (b) Only II can be assumed

According to the given statement, Research has suggested that regular physical activity not only reduces the chances of physical illness but also of mental illnesses.

• We cannot assume anything not mentioned in the statement. So, we cannot conclude whether medicines work faster for mental illness if the patient also exercises daily or not as in the research there is nowhere discussed about the impact of medicine on mental illness.

Therefore, assumption I is not implicit in the statement.

• As, research has suggested physical activity is beneficial for both mental and physical illness. So if the patients are bedridden, they are more likely to develop mental illness problems compared to those who are not bedridden.

Therefore, assumption II is implicit.

Hence, the correct answer is 'Only II can be assumed'.

Q36. Answer: (d) 11

The Venn Diagram is given below:

Thus, the shaded portion indicates that 11 such boys are there who play badminton but NOT tennis.

Hence, the correct answer is '11'.

Q37. Answer: (a) direction of motion of the coil is perpendicular to the magnetic field

The correct answer is direction of motion of the coil is perpendicular to the magnetic field.

Key Points

• Induced current

• The current that results from the phenomenon of electromagnetic induction is known as the induced current.

• When a magnetic field and a coil move in opposite directions, electromagnetic induction occurs.

• The charged particles inside the coil are pushed in one direction along the coil by electromagnetic force.

• A current flow occurs when the coil's ends are closed.

• The induced current is the name given to this current.

• Electric power generation relies heavily on electromagnetic induction.

• Michael Faraday discovered the phenomenon of electromagnetic induction in the year 1831.

Additional Information

• Laws of induction

• The first law of induction of Faraday

• "An electromotive force will be induced in a wire placed in a varying magnetic field," states Faraday's first law of induction.

• The second law of induction of Faraday

• "The magnitude of the induced EMF is proportional to the rate of change of the magnetic field in which the wire is placed," states Faraday's second law of induction.

• Formula for induction

• $e = -N(\varphi/dt)$

• Where "e" is the magnitude of the induced emf, "N" is the number of turns on the coil, and "φ" is the amount of magnetic flux that connects the coil. The induced current will flow in the opposite direction of the change in the magnetic field, as indicated by the negative sign.

Q38. Answer: (c) Energy stores and raw materials

The correct answer is Energy stores and raw materials.

Key Points

• "Transportation is the process of moving water and the nutrients a plant needs to survive to all parts of the plant."

• In the case of plants, there are three levels of transportation:

• Substance transfer from one cell to another.

• Transport of sap over long distances within the phloem and xylem.

• The individual cells release and absorption of water and solutes.

• Plants use two kinds of conducting tissues to transport minerals and water:

• Xylem: The non-living xylem is a long tube that runs through the stem from the roots to the leaves. The root hair takes in the water and moves it from one cell to another through osmosis until it reaches the xylem. After that, the xylem vessels carry this water to the leaves, where transpiration causes it to evaporate.

• Phloem: The phloem is in charge of moving nutrients and sugars like carbohydrates produced by the leaves to metabolically active parts of the plant.

• Sieve plates are tiny holes made by the cell walls at the ends of these cells.

Additional Information

• Means of Transportation in Plants

• Diffusion

• It is a process of transportation that involves the passive movement of a substance from one plant part to another or from one cell to another.

• The substance moves here from a region with a higher concentration to a region with a lower concentration.

• In the case of plants, the only method of transport for gases is diffusion.

• Temperature, pressure, and, most importantly, a concentration gradient influences the rate of diffusion.

• Facilitated Diffusion

• The diffusion process relies heavily on the gradient. As a result, smaller substances must be dispersed more quickly than larger ones. Antiport, uniport, and symport are all parts of the passive process known as Facilitated Diffusion.

• The solutes are exchanged by antiport proteins as they enter and exit the cell.

• Active Transport

• Molecules are moved against the concentration gradient by active transport. The pump is pushed here by the ATP energy. A phosphate is given to a specific gateway molecule by the ATP, which then pumps the desired molecule across the membrane.

Q39. Answer: (a) (1, 2, 2)

Logic: First Number x Second Number = Third Number

Given:

(3, 6, 18) → 3 × 6 = 18

(15, 30, 450) → 15 × 30 = 450

Applying the same logic to the given options, we get

1. (1, 2, 2) → 1 × 2 = 2

2. (6, 12, 64) → 6 × 12 = 72 ≠ 64

3. (9, 18, 166) → 9 × 18 = 162 ≠ 166

4. (11, 22, 44) → 11 × 22 = 242 ≠ 44

Hence, the set '(1, 2, 2)' follows the same logic as the given set.

Q40. Answer: (d) 1980

The correct answer is 1980.

Key Points

• Ozone layer

• A portion of Earth's stratosphere known as the ozone layer or ozone shield is responsible for absorbing the majority of the Sun's ultraviolet light.

• In comparison to other regions of the atmosphere, it has a high concentration of ozone (O3), despite being relatively insignificant in comparison to other gases in the stratosphere.

• The average ozone concentration in the Earth's atmosphere is approximately 0.3 parts per million, while the ozone concentration in the ozone layer is less than 10 parts per million.

• Although its thickness varies seasonally and geographically, the ozone layer is mostly found in the lower stratosphere, between

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15 and 35 kilometers (9 to 22 miles) above the surface of the Earth.

Additional Information

• Depletion of ozone layer

• Free radical catalysts like nitric oxide (NO), nitrous oxide (N2O), hydroxyl (OH), atomic chlorine (Cl), and atomic bromine (Br) have the potential to deplete the ozone layer.

• Nitrous oxide was the most significant ozone-depleting substance (ODS) emitted by humans in 2009.

• Since the late 1970s, ozone levels have decreased by an average of about 4% globally.

• Around the north and south poles, about 5% of the Earth's surface has experienced much larger seasonal declines that are referred to as "ozone holes."

• Joe Farman, Brian Gardiner, and Jonathan Shanklin first made the discovery of the annual depletion of ozone above the Antarctic in a paper that was published in Nature on May 16, 1985.

Q41. Answer: (b) Cl

The correct answer is Cl.

Key Points:

• Metals are electropositive elements that have the potential to transmit electrons in nature.

• They have good electrical conductivity, are ductile and malleable, and are strong and hard.

• Non-metals are substances found in nature that are electronegative and capable of accepting electrons.

• They are weak electrical conductors and neither ductile nor bendable.

• Yellowish-green in colour, chlorine is a gas that reacts with many different metals to form a wide range of compounds.

• Its atomic weight is 17.

• One additional valence electron is needed to complete its octet; it now possesses seven.

• Chlorine is an element that often exists as a bimolecular gas.

• It typically takes electrons, i.e an oxidant, which is a characteristic of a non-metal.

Additional Information:

• In chemistry, a metal is an element with metallic bonding and the ability to easily produce positive ions (cations).

• A metalloid is a type of chemical element with properties that fall between those of metals and nonmetals or that are a combination of both.

• Na:

• Since Na belongs to the first category, it is the most metallic.

• K:

• The most metallic elements in nature are alkali metals like potassium.

• Li:

• Li is a delicate, metallic silver colour.

• Of all the metals, it has the lowest density.

• Water and Li react violently.

Q42. Answer: (a) Rohit Prasad

The correct answer is Rohit Prasad.

Key Points

• Rohit Prasad

• Rohit Prasad has been appointed CEO of HelpAge India, India's leading non-profit dedicated to eldercare.

• Rohit Prasad holds a Bachelor of Arts in Economics from Shri Ram College of Commerce (SRCC) in Delhi and an MBA from the Faculty of Management Studies (FMS) in Delhi.

• On October 30, 2017, Rohit became CEO of HelpAge. He brought with him more than 20 years of experience in general management and organization building in the corporate and development sectors, with a focus on public health and healthcare.

• He has successfully led program strategy, operations, and implementation for the past three years in the core mission areas of HelpAge, working closely with state units all over the country.

• HelpAge India

• Under the Societies' Registration Act of 1860, HelpAge India is a secular, not-for-profit organization that has been registered.

• HelpAge India envisions a society in which the elderly has the right to live a dignified, active life.

• It has been working for 42 years to improve the lives of disadvantaged older people and their care, making it India's leading charitable organization.

• It is in charge of healthcare, senior care, and livelihood programs all over the country. It also strongly supports the elderly and

fights for their rights.

• Additionally, it assists and advises the government in formulating elderly-related policy.

Q43. Answer: (a) 16.66%

Shortcut Trick

Successive multiplier: MP × (100−d1)% × (100−d2)% = SP.

200 × (90 ÷ 100) × (100−x) ÷ 100 = 150.

180 × (100−x) ÷ 100 = 150 => (100−x) = (150 × 100) ÷ 180 = 83.33.

x = 100 − 83.33 = 16.67%.

Therefore The correct answer is 16.66%.

Alternate Method

Given: Listed Price (MP) = Rs. 200, Final Selling Price (SP) = Rs. 150, First Discount = 10%.

Formulas: Price after first discount = MP × (100 − d1) ÷ 100 | Second Discount% = (Price diff ÷ Intermediate price) × 100.

=> Price after 1^(st) discount = 200 − (10% of 200) = 200 − 20 = Rs. 180.

=> Discount amount needed for second step = 180 − 150 = Rs. 30.

=> Second discount percentage = (30 ÷ 180) × 100.

=> Second discount percentage = (1 ÷ 6) × 100 = 16.666%.

Therefore The correct answer is 16.66%.

Additional Information

Successive Discounts

When two discounts a% and b% are given, the equivalent single discount is given by (a + b − ab ÷ 100)%.

Marked Price vs Selling Price

The Marked Price (MP) is the price printed on the label, and Selling Price (SP) is the final amount paid after all discounts are applied.

Q44. Answer: (b) Minerals and nutrients are poorly absorbed by water.

The correct answer is Minerals and nutrients are poorly absorbed by water.

Key Points

• Nutrition in plants

• The components of our food, such as carbohydrates, vitamins, minerals, and fats, are called nutrients.

• Living things can't survive without these parts.

• Animals and humans, on the other hand, do not produce their own food.

• There are two modes of nutrition:

• Autotrophic – Plants are referred to as primary producers because they provide their own nutrition. Light, carbon dioxide, and water are used by plants to make their food.

• Heterotrophic – Due to their reliance on plants for food, both animals and humans are referred to as heterotrophs.

Additional Information

• Photosynthesis

• Photosynthesis is the process by which plants can make their own food.

• Leaves are the primary source of food production.

• The root takes in water and minerals from the soil and sends them through vessels to the leaves.

• Stomata, which are tiny pores on the leaves that are surrounded by guard cells, are how carbon dioxide reaches the leaves.

• Chlorophyll is a green pigment found in leaves that helps them use sunlight's energy to prepare food.

• Photosynthesis is the process by which plants produce food in the presence of sunlight.

• Consequently, all living things get their primary energy from the sun.

• In the presence of sunlight, water, and carbon dioxide are utilized to produce carbohydrates and oxygen during photosynthesis.

Q45. Answer: (d) Q

There are six persons, P, Q, R, S, T, and U travelling in different months, i.e. January, February, March, July, September, and December.

Arranging the travel schedule according to the given information:

1) U travelled in September and Only one person travelled between U and Q.

January	

February	
March	Q
July	
September	U
December	

2) No one travelled between P and S. S travelled in a month after P.

January	**P**
February	S
March	Q
July	
September	U
December	

3) More than two people travelled between S and T.

So the final arrangement will be,

January	**P**
February	S
March	Q
July	R
September	U
December	T

Thus, person Q travelled in the month of March.

Hence, the correct answer is 'Q'.

Q46. Answer: (b) Music systems

Formula used:

S.P. = (100 + P%) × C.P.

Where, S.P. = Selling price

P% = Profit percentage

C.P. = Cost price

Calculation:

This question we will solve by options

On considering option (1), we have

=> Cost price of refrigerators = Rs. 48000

=> Cost price after 10% increase = 48000 × 110/100 = Rs. 52,800

=> Also, profit% = 22%

=> So, S.P. = (100 + P%) × C.P.

=> S.P. = 122/100 × 52800 = Rs. 64,416

On considering option (2), we have

=> Cost price of music systems = Rs. 65000

=> Cost price after 10% increase = 65000 × 110/100 = Rs. 71,500

=> Profit% = 18%

=> S.P. = (100 + 18%) × 71500

=> 118/100 × 71500 = Rs. 84,370

On considering option (3), we have

=> Cost price of air conditioners = Rs. 39000

=> Cost price after 10% increase = 39000 × 110/100 = Rs. 42,900

=> Profit% = 17%

=> S.P. = 117/100 × 42900 = Rs. 50,193

On considering option (4), we have

=> Cost price of televisions = Rs. 59000

=> Cost price after 10% increase = 59000 × 110/100 = Rs. 64,900

=> Profit% = 23%

=> S.P. = 123/100 × 64,900 = Rs. 79,827

It is clear that the music system has a maximum increase in sales price

=> Hence, Option 2 is correct.

Q47. Answer: (d) 2500

Given:

$\sqrt{((1-99/2500))}=49/\sqrt{x}$

Calculation:

Here, we have $\sqrt{((1-99/2500))}=49/\sqrt{x}$

On squaring both sides, we get

=> $(1-99/2500)=2401/x$

=> $(2500-99)/2500=2401/x$

=> $2401/2500=2401/x$

=> $x = 2500$

Hence, the required value is 2500.

Q48. Answer: (a) positive

The correct answer is positive.

Key Points

• Focal length

• The focal length of a mirror or lens is the distance between its focal point and its pole, also known as the optical center of the lens.

• After reflecting in the mirror, a parallel beam of light is "focused" at the focal point (F) of the device.

• In the case of a convex mirror and lens, the focal length is regarded as positive.

• It is considered a negative for a concave mirror and lens. The letter f denotes it.

Additional Information

• Convex mirror

• A convex mirror is a kind of spherical mirror in which the reflecting surface is part of the sphere that is bulging out toward the incident light source.

• Convex mirrors always produce virtual, erect, and diminished images regardless of the distance between the object and the mirror.

• Concave mirror

• A mirror with its inner surface serving as the reflecting surface is created when a hollow sphere is cut into pieces and its outer surface is painted. A concave mirror is a name given to this kind of mirror.

• A virtual, magnified image is produced when the concave mirror is placed very close to the object.

Q49. Answer: (d) Conclusions II and IV follow

Given statement:

$G \geq M; O < K; K < H; F = Q; M < O; F > H$

Combining the above-given statements, we get

$G \geq M < O < K < H < F = Q$

Conclusions:

I. $G < F$ → Does not follow. (There is no definite relation between G and F, $G \geq M < O < K < H < F = Q$)

II. $Q > M$ → Follows. (As $M < O < K < H < F = Q \Rightarrow M < Q \Rightarrow Q > M$.)

III. $O > Q$ → Does not follow. (As $G \geq M < O < K < H < F = Q \Rightarrow O < Q$).

IV. $M < Q$ → Follows (As $G \geq M < O < K < H < F = Q \Rightarrow M < Q$).

Hence, the correct answer is 'Conclusions II and IV follow'.

Q50. Answer: (d) Three

Given:

(left) 434 353 423 224 322 (right)

After 4 is added to the second digit of every number we will get,

(left) 474 393 463 264 362 (right)

Let us check whether the second digit is exactly divisible by the third digit of the number thus formed or not:

474 => 7 ÷ 4 => (Not divisible).

393 => 9 ÷ 3 = 3 (Divisilbe).

463 => 6 ÷ 3 = 2 (Divisible).

264 => 6 ÷ 4 => (Not divisible).

362 => 6 ÷ 2 = 3 (Divisible).

Thus, there are only three such numbers whose second digit is exactly divisible by the third digit.

Hence, the correct answer is 'Three'.

Q51. Answer: (b) fundamental duties

The correct answer is fundamental duties.

Key Points

• These Fundamental Duties are referred to in Article 51(A), which lists 11 Fundamental Duties that Citizens are obliged to carry out (there were 10 earlier and 11 later added by the 86th amendment).

• 42nd amendment -

• It was introduced as 42nd amendment in 1976 based on the report of the Swaran Singh Committee.

• Introduction of the bill -

• H. R. Gokhale, then-Minister of Law, Justice, and Corporate Affairs, introduced the Constitution (Forty-Second Amendment) Bill, 1976 (Bill No. 91 of 1976) in the Lok Sabha on September 1st.

Additional Information The 11 fundamental rights are -

1. We must uphold our Constitution and show respect for our national anthem and flag.
2. Must adhere to the principles of the freedom struggle.
3. Uphold our nation's sovereignty and dignity.
4. Defend our country and, if required, offer national duties.
5. There needs to be a spirit of fraternity among all people.
6. Protect the culture of our nation.
7. Preserving the climate of our nation.
8. Provide rationale based on science for each emotion.
9. To protect government property.
10. Make an effort to be perfect.
11. Between the ages of 6 and 14, it is the duty of every parent to enrol their children in school.

Q52. Answer: (c) Prasanta Chandra Mahalanobis

The correct answer is Prasanta Chandra Mahalanobis.

Key Points

• Prasanta Chandra Mahalanobis OBE, FNA, FASc, FRS (29 June 1893– 28 June 1972) was an Indian scientist and statistician.

• Born to an academically oriented family, Mahalanobis pursued his early education in Calcutta (now Kolkata).

• After graduating with honors in physics from Presidency College, Calcutta, in 1912, he moved to England to study physics and mathematics at the University of Cambridge.

• Mahalanobis held several national and international portfolios. He served as the chairman of the United Nations Sub-Commission on Sampling from 1947 to 1951 and was appointed the honorary statistical adviser to the government of India in 1949.

• He served on the Planning Commission of India from 1955 to 1967, where he applied his mathematical reasoning to Indian industry.

Additional Information

• Prasanta Chandra Mahalanobis was an eminent statistician, best known for founding the Indian Statistical Institute (ISI) in 1932.

• Dr. Mahalanobis made several contributions to the field of statistics, including the ‘Mahalanobis distance’, a statistical measure.

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• He also developed the Feldman-Mahalanobis model, a Neo-Marxian model of economic development, which was employed in the Second Five Year Plan of India, which promoted rapid industrialization of the country.

• He was also conferred with several awards including the Padma Vibhushan.

Q53. Answer: (c) 50 m, South

Given:-

1) Starting from point A, Ravi walks 30 m towards the north.

2) He then takes a right turn and walks 100 m.

3) Then, he takes another right turn and walks 30 m.

4) From there, he turns to his right and walks 70 m.

5) Then, he takes a left turn and walks 50 m.

6) Finally, he takes a right turn and walks 30 m.

The distance and the direction of the Ravi now from point A.

Hence, the correct answer is "50 m, South".

Q54. Answer: (b) Only conclusion I follows.

The least possible diagram for the given statements as follows:

Conclusions:

I. Some banks are schools → Follows (Since given all schools are banks and so some banks are schools is true)

II. Some parks are banks → Doesn't Follow (Since given some parks are libraries and some libraries are banks. So, some parks are banks is not true)

Hence, the correct answer is "Only conclusion I follows".

Q55. Answer: (c) Jharia Coal Fields

The correct answer is Jharia Coal Fields.

Key Points

• One of India’s largest and most productive coal fields is also home to some of the longest-burning fires in the world.

• Jharia coalfield is a large coal field located in the east of India in Jharia, Jharkhand.

• Jharia represents the largest coal reserves in India having estimated reserves of 19.4 billion tons of coking coal.

• The coal field lies in the Damodar River Valley and covers about 110 square miles (280 square km) and produces bituminous coal suitable for coke.

Additional Information

• India’s government reportedly hopes to increase production at the fiery mine, even as representatives from New Delhi discuss the effects of carbon emissions on climate change at the COP21 summit in Paris.

• Jharia is famous for a coal field fire that has burned underground for nearly a century. A 2007 estimate described 37 million tons of coal consumed by the fires since their start.

• The first Indians to arrive and break monopoly of British in Coal mining were Gujarati railway contractors from Kutch.

• The first fire was detected in 1916. According to records, it was the Khas Jharia mines of Seth Khora Ramji Chawda (1860–1923), who was a pioneer of Indian coalmines, whose mines were one of the firsts to collapse in underground fire in 1930.

Q56. Answer: (a) 1955

The correct answer is 1955.

Key Points

• In the year 1806, the British government issued regulations for the management of the Jagannath temple which was referred to as the Juggernaut temple by the colonial rulers.

• The powers of management of the temple were passed on to the King of Khordha after three years while the colonial government continued to retain some control.

• After India gained Independence, the Jagannath Temple Act was introduced in the year 1952, which came into effect in 1954.

• The Act contains provisions on land rights of the temple, duties of the sevayat (priests), administrative powers of the Shri Jagannath Temple Managing Committee, rights and privileges of the Raja of Puri and other persons connected with the management and administration of the temple.

Additional Information

• The temple is believed to have been constructed in the 12th century by King Anatavarman Chodaganga Deva of the Eastern Ganga Dynasty.

• Jagannath Puri temple is called ‘Yamanika Tirtha’ where, according to Hindu beliefs, the power of ‘Yama’, the god of death has

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been nullified in Puri due to the presence of Lord Jagannath.

• This temple was called the “White Pagoda” and is a part of Char Dham pilgrimages (Badrinath, Dwaraka, Puri, Rameswaram).

• There are four gates to the temple- Eastern ‘Singhdwara’ which is the main gate with two crouching lions, Southern ‘Ashwadwara’, Western 'Vyaghra Dwara and Northern ‘Hastidwara’. There is a carving of each form at each gate.

Q57. Answer: (d) 4 8/9 km/h

Shortcut Trick

Average Speed = Total Distance ÷ Total Time

Total Distance = (8 × 6) + (10 × 4) = 48 + 40 = 88 km

Total Time = 8 + 10 = 18 hours

Average Speed = 88 ÷ 18 = 44 ÷ 9 = 4 8/9 km/h

Therefore The correct answer is 4 8/9 km/h.

Alternate Method

Given:

Time1 = 8 hours, Speed1 = 6 km/h

Time2 = 10 hours, Speed2 = 4 km/h

Formula Used:

Distance = Speed × Time

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

Calculations:

=> Distance1 = 6 × 8 = 48 km

=> Distance2 = 4 × 10 = 40 km

=> Total Distance = 48 + 40 = 88 km

=> Total Time = 8 + 10 = 18 hours

=> Average Speed = 88 ÷ 18

=> Average Speed = 44/9 = 4 8/9 km/h

Therefore The correct answer is 4 8/9 km/h.

Additional Information

Average Speed (Equal Distances)

When two equal distances are covered at speeds x and y, Average Speed = 2xy/(x+y).

Average Speed (General Case)

Always calculate total distance and total time separately if segments or speeds are different.

Relative Speed

Same direction: S1 − S2 | Opposite direction: S1 + S2.

Q58. Answer: (c) does not exceed 1 or fall below 0

The correct answer is does not exceed 1 or fall below 0.

Key Points

• In economics, the marginal propensity to consume (MPC) is defined as the proportion of an aggregate raise in pay that a consumer spends on the consumption of goods and services, as opposed to saving it.

• Marginal propensity to consume is a component of Keynesian macroeconomic theory and is calculated as the change in consumption divided by the change in income.

• Marginal Propensity to Consume is the proportion of an increase in income that gets spent on consumption.

• MPC is the key determinant of the Keynesian multiplier, which describes the effect of increased investment or government spending as an economic stimulus.

Additional Information

• In Keynesian macroeconomic theory, the marginal propensity to consume is a key variable in showing the multiplier effect of economic stimulus spending.

• To calculate the marginal propensity to consume, the change in consumption is divided by the change in income.

• The marginal propensity to consume measures the degree to which a consumer will spend or save in relation to an aggregate raise in pay.

• According to Keynesian theory, an increase in investment or government spending increases consumers’ income, and they will then spend more.

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Q59. Answer: (b) Serampore College

The correct answer is Serampore College.

Key Points

• Serampore College is located in Serampore, in West Bengal state, India. Established in 1818, it is the third oldest college in the country.

• The college consists of two entities: The theological faculty and a separate college with faculties of arts, science, commerce.

• The Senate of Serampore College (University) is in charge of the academic administration of all the theological colleges affiliated with it.

• The college motto is from Proverbs 3:35 in the Vulgate: Gloriam Sapientes Possidebunt, "The wise shall possess glory".

Additional Information

• The Serampore Trio - William Ward, William Carey & Joshua Marshman, started the college with 37 students in 1818.

• With the later establishment of the University of Calcutta in 1857 the arts, science and commerce parts of Serampore College were affiliated to the University of Calcutta.

• Since Serampore was then a Danish colony, King Frederick VI, the King of Denmark, issued Serampore College its Royal Charter of Incorporation on 23 February 1827, in Copenhagen, Denmark (Charter, 1, Charter, 2, Charter, 3).

• The college was open to all persons of any caste or creed, and the founders ensured that no denominational test would apply to faculty members. The charter has also been confirmed by the Bengal Govt Act. IV of 1918.

Q60. Answer: (a) 1/3

Calculation:

Given,

Focal length, f = +9 cm

Object distance, u = -18 cm

Using the mirror formula:

1/f = 1/v + 1/u

1/9 = 1/v + 1/(-18)

=> 1/v = 1/9 + 1/18

=> 1/v = (2+1)/18 = 3/18 = 1/6

=> v = 6 cm

Now, using the magnification formula:

m = (-v)/u

=> m = (-6)/(-18) = 1/3

Therefore The magnification produced by the mirror is 1/3.

Additional Information

• Magnification of mirror

• Spherical mirrors increase the size of the image relative to the size of the object to produce magnification.

• The value of m is the ratio of the image's height to the object's height.

• A spherical mirror's magnification, m, can be expressed as:

• m= h'/h

• In this case, h denotes the image's height, and h' denotes the object's height.

• The object's height is always positive because it is always above the principal axis. However, the kind of image that is created may alter the height sign. When compared to the height of actual images, the height of virtual images should be considered positive.

• Magnification is also equal to the distance between the object and the image.

• m= -v/u

• The image is virtual and erect when the magnification is positive.

• The image is real and inverted when the magnification is negative.

Q61. Answer: (b) Mumbai

The correct answer is Mumbai.

Key Points

• Eve teasing can be understood to mean sexual harassment of women in public places such as streets, public transportation, workplace etc.

• Eve teasing is one of the forms of gendered crimes against women. It is one of the methods of enjoyment of men who sees

women as mere objects.

• Eve is believed to be the first woman that God made on earth. All women are therefore generically termed as eve. The literal meaning of teasing is to make fun of a person, playfully, unkindly or annoyingly.

• The section 294 IPC (vi) penalizes certain acts of obscenity in public places i.e., whoever sings, recites, utters any obscene song, ballad, words to the annoyance of others is made punishable.

Additional Information

• The article 'Eve Teasing: The Social Evil' attempts to explain the present scenario of eve-teasing and the legislative provisions associated with the same. It also discusses how any victim of such a crime can successfully file a complaint.

• Eve teasing is considered a civil wrong in society. The perpetrator hurts the victim both physically and psychologically. Her dignity and the right of women to privacy are being violated.

• According to Section 292 of the Indian Penal Code, 1860, a man who displays any pornographic or obscene images, books, or papers to a woman or a girl faces a fine of Rs. 2000 and a 2-year prison sentence.

• According to Section 354, if force is used to affront a woman's modesty, the offender will be penalized under this section provided that there was a conscious effort on his part to do so.

Q62. Answer: (c) 48

Shortcut Trick

Net weight change = (Weight of Joiners) − (Weight of Leavers) = (2 × 55) − (10 × 42) = −310 kg.

New average = 45 + 1.25 = 46.25 kg.

Let initial children be n. Final children = n − 8.

Final Total Weight − Initial Total Weight = Net weight change.

(n − 8) × 46.25 − 45n = −310 => 1.25n = 60 => n = 48.

Therefore The correct answer is 48.

Alternate Method

Given:

Initial average weight of children = 45 kg

Weight of 10 children leaving = 42 kg each

Weight of 2 children joining = 55 kg each

Increase in average weight = 1¼ kg = 1.25 kg

Formula Used: Average = (Total Sum of weights) ÷ (Number of children)

=> Let the initial number of children be n.

=> Total initial weight = n × 45 = 45n kg

=> Total weight of 10 children who left = 10 × 42 = 420 kg

=> Total weight of 2 children who joined = 2 × 55 = 110 kg

=> New number of children = n − 10 + 2 = n − 8

=> New average weight = 45 + 1.25 = 46.25 kg

=> Total new weight = (n − 8) × 46.25

=> 45n − 420 + 110 = (n − 8) × 46.25

=> 45n − 310 = 46.25n − 370

=> 46.25n − 45n = 370 − 310

=> 1.25n = 60

=> n = 60 ÷ 1.25 = 48

Therefore The correct answer is 48.

Additional Information

Weighted Average Formula

The combined average of two groups is given by: A_(avg) = (n1a1 + n2a2) ÷ (n1 + n2).

Effect of Exclusion

If an item is excluded, New Sum = (Old Average × Old Count) − Excluded Value.

Net Deviation Method

Net Change in Total Sum = ∑(Values added) − ∑(Values removed). This change causes the average to shift across the remaining count.

Q63. Answer: (b) 5.7%

Shortcut Trick

Assume Initial Income = 100. Initial Savings = 30 and Expenditure = 70.

New Income = 100 + 10% of 100 = 110.

New Savings = 30 + 20% of 30 = 36.

New Expenditure = 110 − 36 = 74.

% Increase in Expenditure = (74 − 70) ÷ 70 × 100 = 400 ÷ 70 ≈ 5.7%.

Therefore The correct answer is 5.7%.

Alternate Method

Given:

Initial Income (I1) = 100

Initial Savings (S1) = 30% of 100 = 30

Initial Expenditure (E1) = 100 − 30 = 70

Calculations:

=> New Income (I2) = 100 × (110/100) = 110

=> New Savings (S2) = 30 × (120/100) = 36

=> New Expenditure (E2) = I2 − S2 = 110 − 36 = 74

=> Increase in Expenditure = 74 − 70 = 4

=> % Increase = (4 ÷ 70) × 100 = 400 ÷ 70 = 5.714...

=> Rounded to one decimal place = 5.7%

Therefore The correct answer is 5.7%.

Additional Information

Income-Expenditure Relation

Income = Expenditure + Savings. Any change in one component affects the others accordingly.

Percentage Change Formula

Percentage change = [(New Value − Original Value) ÷ Original Value] × 100.

Base Value Concept

Always calculate the percentage increase or decrease on the original (previous) value of that specific category.

Q64. Answer: (c) 15 years

Shortcut Trick

Let the grandson's age 3 years ago be x.

Man's age 3 years ago = 6x.

After 6 years (3 years from now): (6x + 6) = 4(x + 6) + 6.

6x + 6 = 4x + 24 + 6 => 2x = 24 => x = 12.

Present age of grandson = x + 3 = 12 + 3 = 15 years.

Therefore The correct answer is 15 years.

Alternate Method

Given: 3 years ago, Man = 6 × Grandson. 3 years later, Man = 4 × Grandson + 6.

Let Grandson's present age be G and Man's present age be M.

=> (M − 3) = 6(G − 3)

=> M − 3 = 6G − 18 => M = 6G − 15 ----(i)

=> (M + 3) = 4(G + 3) + 6

=> M + 3 = 4G + 12 + 6 => M = 4G + 15 ----(ii)

Equating (i) and (ii):

=> 6G − 15 = 4G + 15

=> 2G = 30

=> G = 15 years.

Therefore The correct answer is 15 years.

Additional Information

Age Difference Constant

The difference between the ages of two people remains constant throughout their lives, regardless of the number of years passed.

Ratio Method for Ages

If the ratio of ages is given for two different time periods, ensure the difference between ratio parts is balanced to find the value of one unit.

Linear Equations in Ages

Always define variables based on either the present age or the age at the first mentioned time period to simplify calculations.

Q65. Answer: (d) Has a protein digesting enzyme that helps in the digestion of proteins

The correct answer is Has a protein digesting enzyme that helps in the digestion of proteins.

Key Points

• Bile juice

• The Latin word "Bilis," which refers to a fluid that may be dark green to yellowish-brown and produced by the liver of most vertebrates and aids in the digestion of lipids in the intestine, is the origin of the word "bile."

• Bile is constantly secreted from the liver and stored and concentrated in the gallbladder in humans.

• Bile or gall is made by the liver and helps to emulsify food lipids by acting as a surfactant.

• This stored bile is released into the duodenum to carry out the digestion process after food is consumed.

• The following is the composition of hepatic bile: 97–98% water, 0.7 % bile salts, 0.2% bilirubin, 0.51 % fats like cholesterol, fatty acids, and lecithin.

Additional Information

• Liver

• The liver can be found in the abdomen's upper right. It is the largest gland in the human body, and it is responsible for a number of essential functions. It is the only organ capable of effective regeneration.

• A larger right lobe and a smaller left lobe make up the triangular, bilobed liver structure. The two lobes are separated by the falciform ligament.

• The liver is covered by Glisson's capsule, a fibrous tissue layer. The peritoneum covers this capsule. The liver is shielded from physical harm by this.

• Vitamin K is absorbed by bile, and if bile isn't produced, clotting factors won't be produced either.

• Kuffer cells that are involved in immune activity are found in the liver. Any disease-causing agents are destroyed by these.

Q66. Answer: (b) Glass

The correct answer is Glass.

Key Points

• Resistance

• Electrical resistance, denoted by R, occurs when an electric current passes through a conductor, such as a light bulb. This obstruction is known as electrical resistance.

• Conductors generate heat when current passes through them because every material has electrical 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.

Additional Information

• Factors Affecting 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).

Q67. Answer: (a) normal

The correct answer is Normal.

Key Points

• In the long run, all factors of production are variable. Also, two of the assumptions of firms in perfect competition are free entry and exit, as well as perfect resource mobility.

• In the long run, firms making an abnormal profit will attract new firms, which will enter freely due to the two assumptions already stated.

• This would increase the industry supply (and shift the supply curve to the right) which will decrease the industry price. New firms will stop entering the market once existing firms make zero economic profit.

• The long run is a period of time which is sufficiently long to allow the firms to make changes in all factors of production. In the long run, all factors are variable, and none are fixed.

Additional Information

• Under perfect competition, price determination takes place at the level of industry while firm behaves as a price taker. It produces a quantity depending upon its cost structure.

• There are two methods of finding the equilibrium of a firm– TR-TC method and MR-MC method. Price determination in the industry takes place through price mechanism, i.e., through the interaction of demand and supply forces.

• In the long run under perfect competition, the firm earns only normal profit. As entry of a new firm reduces the abnormal profit. The long-run equilibrium occurs where demand intersects marginal cost and the minimum point of average cost.

• In economics, specifically general equilibrium theory, a perfect market, also known as an atomistic market, is defined by several idealizing conditions, collectively called perfect competition.

Q68. Answer: (c) −2

Shortcut Trick

For trigonometric identities, the fastest method is value substitution using standard angles.

Substitute x = 45°: cosec 45° = √2, cot 45° = 1, sec 45° = √2, tan 45° = 1.

Expression = (√2 + 1 + 1) × (√2 − 1 − 1) = (√2 + 2) × (√2 − 2).

Apply (a + b)(a − b) = $a^2 - b^2$ => $(\sqrt{2})^2 - 2^2 = 2 - 4 = -2$.

Therefore The correct answer is −2.

Alternate Method

Given: (cosec x + cot x + 1) (sec x − tan x − 1)

Formula Used: cosec x = 1/sin x; cot x = cos x/sin x; sec x = 1/cos x; tan x = sin x/cos x

=> [(1 + cos x + sin x) / sin x] × [(1 − (sin x + cos x)) / cos x]

=> $[1^2 - (\sin x + \cos x)^2] / (\sin x \cos x)$

=> $[1 - (\sin^2 x + \cos^2 x + 2 \sin x \cos x)] / (\sin x \cos x)$

=> $[1 - (1 + 2 \sin x \cos x)] / (\sin x \cos x)$

=> $-2 \sin x \cos x / \sin x \cos x = -2$

Therefore The correct answer is −2.

Additional Information

Pythagorean Identities

Fundamental relations: $\sin^2 x + \cos^2 x = 1$, $\sec^2 x - \tan^2 x = 1$, and $\text{cosec}^2 x - \cot^2 x = 1$.

Algebraic Simplification

The identity $(a + b)(a - b) = a^2 - b^2$ is frequently used to simplify trigonometric products after rearranging terms.

Reciprocal Identities

Standard conversions: cosec x = 1/sin x and sec x = 1/cos x are the primary steps for reducing complex expressions.

Q69. Answer: (a) north pole

The correct answer is north pole.

Key Points

• Magnetic field lines

• By drawing imaginary lines around a magnet or a magnetized object, one can see a magnetic field. Lines of force or magnetic field lines are the names given to these lines.

• Because it is a vector quantity, the magnetic field will have magnitude as well as direction, as shown in the image below. The number of lines perpendicular to the lines that cross a unit area indicates the strength of the magnetic field.

• The direction of the magnetic field can be determined by drawing a line tangentially at any point along the field lines (refer to the

red arrows in the image). Electric field lines are similar to magnetic field lines.

Additional Information

• Magnet

• A material or object that generates a magnetic field is called a magnet. Despite being invisible, this magnetic field is responsible for a magnet's most notable property: a force that pulls on iron, steel, nickel, cobalt, and other ferromagnetic materials. and either draws or repels additional magnets.

• An object made of a material that has been magnetized and generates its own persistent magnetic field is known as a permanent magnet. A refrigerator magnet used to hang notes on the door of a refrigerator is an everyday example.

• Ferromagnetic (or ferrimagnetic) materials are those that can be magnetized and are also strongly attracted to a magnet.

-

Q70. Answer: (d) Methyl orange

The correct answer is Methyl orange.

Key Points

• Natural indicator

• A group of natural indicators that can indicate whether a compound is basic or acidic can be found in nature.

• Certain flowers, like hydrangeas, which are natural indicators of acids and bases, can be used to determine the acidity or alkalinity of the soil.

• The blooms turn blue when the soil is acidic; The flowers change color to purple if it is neutral; and the flowers turn pink if it is basic.

• The saturation of the color is influenced by the amount of acid or base in the soil. The soil in which dark blue flowers thrive is extremely acidic, whereas the soil in which dark pink flowers thrive is extremely basic.

Additional Information

• Colored petals of Hydrangea

• The genus Hydrangea, also known as hortensia, is home to more than 75 different species of flowering plants that are native to Asia and the Americas.

• The majority of species have white flowers, but some can be blue, red, pink light purple, or dark purple.

• The presence of aluminum ions, which are either available or tied up depending on the pH of the soil, is what causes the floral color change in these species.

• Colored petals of Petunia

• There are approximately 35 species of petunia, which are native to South America and belong to the nightshade family (Solanaceae).

• The showy trumpet-shaped flowers of the common garden petunia (Petunia atkinsiana), an ornamental plant, make it a popular choice for summer flower beds and window boxes.

• Turmeric Indicator

• One of the best natural indicators is turmeric, which can be found in nature.

• Turmeric is the brilliant yellow powder produced by the turmeric plant. In Hindi, turmeric is referred to as "haldi."

• By nature, turmeric indicators contain yellow pigment.

• However, when combined with a straightforward remedy, it turns red.

• Turmeric-based indicators, such as turmeric paper, are utilized.

Q71. Answer: (c) F

Given → Eight girls, A, B, C, D, E, F, G and H, are seated around a square table, facing the centre.

1) A sits 2nd to the right of B.

2) G sits between A and B.

3) D sits to the immediate left of H, who is to the immediate left of B.

4) F sits 2nd to the right of E, who sits fourth to the left of H.

5) Only one person sits between C and D.

Thus, F sits fourth to the right of G.

Hence, the correct answer is "F".

Q72. Answer: (c) 30 years

Shortcut Trick

Ratio 10 years ago = 5 : 9 (horizontal difference = 4)

Ratio 15 years later = 15 : 17 (horizontal difference = 2)

Multiply 15 : 17 by 2 to balance differences → 30 : 34 (difference = 4)

Increase in A's ratio parts = 30 − 5 = 25 parts.

Total time gap = 10 + 15 = 25 years → 25 parts = 25 years → 1 part = 1 year.

Therefore The correct answer is 30 years.

Alternate Method

10 Yrs Ago

Present

+15 Yrs

5 : 9

15 : 17

25 Years

Given:

Ratio of ages of A and B 10 years ago = 5 : 9

Ratio of their ages 15 years from now = 15 : 17

Calculations:

=> Let the ages of A and B 10 years ago be 5x and 9x respectively.

=> Present age of A = 5x + 10

=> Present age of B = 9x + 10

=> Age of A 15 years from now = (5x + 10) + 15 = 5x + 25

=> Age of B 15 years from now = (9x + 10) + 15 = 9x + 25

=> According to the question, (5x + 25) ÷ (9x + 25) = 15 ÷ 17

=> 17 × (5x + 25) = 15 × (9x + 25)

=> 85x + 425 = 135x + 375

=> 135x − 85x = 425 − 375

=> 50x = 50

=> x = 1

=> A's age 15 years from now = 5x + 25

=> A's age = 5 × 1 + 25 = 30 years

Therefore The correct answer is 30 years.

Additional Information

Ratio Balancing Method

Used when two quantities increase or decrease by the exact same amount. The horizontal difference between the ratio terms is equalized to find the correct unit multiplier efficiently.

Cross-Multiplication

For proportional equations of the form (a + x) ÷ (b + x) = c ÷ d, equating the cross products is the fastest way to solve for the unknown variable.

Present Age Conversion

Always convert past or future age references (e.g., years ago, years hence) back to the present age expressions to maintain equation accuracy and eliminate negative term errors.

Q73. Answer: (b) 9013

Shortcut Trick

The LCM of prime numbers 7, 11, and 13 is their product: 7 × 11 × 13 = 1001.

The largest 4-digit multiple of 1001 is 1001 × 9 = 9009.

As the remainder is 4 in each case, add 4 to the multiple: 9009 + 4 = 9013.

Therefore The correct answer is 9013.

Alternate Method

Given:

Divisors = 7, 11, 13

Remainder in each case = 4

Formula Used:

Required Number = (LCM of Divisors × k) + Remainder

Calculations:

=> LCM(7, 11, 13) = 7 × 11 × 13 = 1001

=> The largest 4-digit number is 9999.

=> Dividing 9999 by the LCM: 9999 ÷ 1001 = 9 (Quotient) and 90 (Remainder).

=> Largest 4-digit multiple of 1001 = 9999 − 90 = 9009.

=> Number satisfying the remainder condition = 9009 + 4 = 9013.

Therefore The correct answer is 9013.

Additional Information

Divisibility by 1001

Any three-digit number repeated twice (e.g., 256256) is always divisible by 7, 11, and 13 because abcabc = abc × 1001.

LCM of Prime Numbers

The Least Common Multiple of a set of prime numbers is always the product of those numbers.

General Remainder Form

If a number N leaves a constant remainder r when divided by x, y, and z, then N = k × LCM(x, y, z) + r.

Q74. Answer: (d) Only conclusions II and III follow.

The least possible Venn diagram for the given statement is shown below:

Conclusions:

I. Some books are pens → Doesn't Follow (Since given all books are copies and no pen is a copy. Thus, some books are pens is not true)

II. No bag is a pen → Follows (Since given all bags are books and all books are copies and no pen is a copy. Thus, no bag is a pen is true)

III. Some copies are bags → Follows (Since given all bags are books and all books are copies. Thus, some copies are bags is true)

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

Q75. Answer: (b) μV > μY > μR

The correct answer is μV > μY > μR.

Key Points

• Refractive index

• The refractive index is the ratio of the speed of light in a medium to the speed of light in a vacuum. The atoms of a medium other than a vacuum continually absorb and re-emit light particles, reducing the speed at which light travels.

• The optical density of the medium determines the speed of electromagnetic waves. The tendency of atoms in a material to restore absorbed electromagnetic energy is known as optical density.

• The speed of light decreases with increasing optical density. The refractive index is one such measure of a medium's optical density.

• The refractive index has the following formula:

• n= c/v

• Where n is the refractive index,

• C is the vacuum light speed (3 × 108 m/s), and

• V is the substance's light speed.

Additional Information

• Dispersion

• Any phenomenon connected to the propagation of individual waves at speeds determined by their wavelengths is known as a dispersion in a wave motion.

• In a transparent medium, the speed of a light wave is inversely proportional to the index of refraction, which is the angle at which a wave changes direction as it moves from one medium to another.

• Any transparent material, such as A glass prism will scatter an incident parallel beam of light in accordance with the glass's refractive index for each wavelength or color. The effect known as angular dispersion is more accurate and is sometimes referred to as dispersion.

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Q76. Answer: (c) small scale industries

The correct answer is small scale industries.

Key Points

• In 1955 Village and Small-Scale Industries Committee likewise called the Karve Committee, noticed the chance of utilizing small-scale businesses for advancing rural development.

• A committee on the village and limited-scope businesses were set up by Planning Commission (presently NITI AYOG) in 1955.

• So, it is additionally called the Village and Small-Scale Industries Committee or Karve Committee after its head Dattatreya Gopal Karve.

• It was set up for the development and advancement of small-scale industries and rural development.

Additional Information

• The Karve Committee is also known as the village and small-scale industries committee was set up in 1955. It was set up to find out the potential of utilizing small-scale industries for promoting rural development.

• Elements of IPR 1956- The main features of this Industrial Policy Resolution of 1956 were as follows:

• New Classification of industries

• Assistance to the Private Sector

• The expanded role of Cottage and Small-Scale Industries.

• Balanced Industrial Growth among Various Regions

• Development of managerial and Technical Cadres

• Explanation: The committee focused on the 'promotion of small-scale industries for rural development. Small-scale industries are a good source of employment for people.

• The Industrial Policy Resolution (IPR) 1956 was adopted in order to achieve the aim of a socialist state with the government controlling the major strategic industries of the economy.

Q77. Answer: (b) IIT-Madras

The correct answer is IIT- Madras.

Key Points

• Aqua MAP Center for Water Management and Policy at IIT Madras aims to create awareness and implement sustainable solutions to impact water management practices on a national scale.

• The problems related to water availability have wide reached implications for residents in arid areas specifically, in rural areas.

• Population growth

• Industrial development

• Encroachment of water bodies such as lakes and ponds

• Misguided policies

• Aim-

• IITM Alumni and IITM Faculty aim to work together and set up.

• IITM Alumni wish to do their best to solve the pressing and impending water crises in our country.

• The Principal Scientific Adviser to the Government of India, inaugurated the new water management and policy Centre, Aqua MAP, at IIT Madras and launched its website – https://aquamap.iitm.ac.in/ on March 19, 2022.

Additional Information

• Prof. Ligy Philip, announcing the first three projects the Centre is supporting, said, "We have a multi-disciplinary faculty team, from Chemistry, Civil, Chemical, and Humanities departments, supporting me at Aqua MAP.

• Dr. Balasubramanian said, "Krishnan and I are thankful to IIT Madras for giving us an opportunity to give back to our alma mater and to the nation through Aqua MAP.

• Water and soil quality analysis: Creation of a digital twin of the Village for environmental management. Waste management for Clean and Healthy Village Automatic Control of Rural Water Supply Schemes.

• "Water consumption in the agriculture sector is the maximum among all the needs, and therefore focus on improving the agricultural water use efficiency is one of the major focuses of Aqua MAP."

Q78. Answer: (c) 24

Shortcut Trick

Work done by (A+B+C) in 2 hours = 2/8 = 1/4 of the tank.

Remaining work = 1 − 1/4 = 3/4, which is filled by (A+B) in 9 hours.

Time taken by (A+B) alone to fill the tank = 9 × (4/3) = 12 hours.

Efficiency of C = (1/8) − (1/12) = (3 − 2) / 24 = 1/24.

Time for C = 24 hours.
Therefore The correct answer is 24 hr.
Alternate Method
Given:
Time taken by (A+B+C) = 8 hr
Time for which they worked together = 2 hr
Remaining time for (A+B) = 9 hr
Formula Used:
Total Work = Efficiency × Time
Calculations:
=> Work done in 2 hr = 2/8 = 1/4 unit
=> Remaining work = 1 − 1/4 = 3/4 unit
=> (A+B) fills 3/4 unit in 9 hr
=> (A+B) fills 1 unit in 9 × (4/3) = 12 hr

Person	Days (hr)	Total Work	Efficiency
(A + B + C)	8	24 (LCM)	24 ÷ 8 = 3
(A + B)	12	24 ÷ 12 = 2	

=> Efficiency of Pipe C = Efficiency of (A+B+C) − Efficiency of (A+B)
=> Efficiency of Pipe C = 3 − 2 = 1 unit/hr
=> Time taken by C alone = Total Work ÷ Efficiency of C
=> Time taken by C alone = 24 ÷ 1 = 24 hr
Therefore The correct answer is 24 hr.
Additional Information
Efficiency and Time Relationship
Efficiency is inversely proportional to the time taken to complete the work (E prop. to 1/T).
LCM Method for Pipes
Total work is assumed as the Least Common Multiple (LCM) of the individual times taken by the pipes.
Inlet and Outlet Pipes
Inlet pipes have positive efficiency while outlet/leak pipes have negative efficiency in calculations.

Q79. Answer: (d) F L X C X D F

Given → N L A _ X N _ B F _ N L _ F _ N L _ _ X
By checking options and substituting accordingly.
1) F L C E X A F → N L A F X - N L B F C - N L E F X - N L A F X => Sequence not followed.
2) F N X C X C F → N L A F X - N N B F X - N L C F X - N L C F X => Sequence not followed.
3) F L X N X D C → N L A F X - N L B F X - N L N F X - N L D C X => Sequence not followed.
4) F L X C X D F → N L A F X - N L B F X - N L C F X - N L D F X => Sequence followed.
Pattern followed here is NLAFX / NLBFX / NLCFX / NLDFX (Third Letter of the series increases +1 simultaneously)
Hence, the correct answer is "F L X C X D F".
Alternate MethodPutting all the letter according to the option we are getting the below result.

1)	N	L	A	F	X	N	L	B	F	C	N	L	E	F	X	N	L	A	F	X
2)	N	L	A	F	X	N	N	B	F	X	N	L	C	F	X	N	L	C	F	X
3)	N	L	A	F	X	N	L	B	F	X	N	L	N	F	X	N	L	D	C	X
4)	N	L	A	F	X	N	L	B	F	X	N	L	C	F	X	N	L	D	F	X

By putting the value of "F L X C X D F" in empty space, then we get the series → NLAFX / NLBFX / NLCFX / NLDFX
Hence, the correct answer is "F L X C X D F".

Q80. Answer: (a) oxidised

The correct answer is oxidised.

Key Points

• A substance that combines with oxygen is said to be "oxidised."

• In order to prevent oxidation, materials can be coated with substances that inhibit oxidation, such as paint or oil.

• This process typically releases energy, in the form of heat and light.

• Oxidation reactions are a crucial part of many natural processes, including respiration and combustion.

• Oxidation can also have negative effects, such as rusting of metal and rotting of organic materials.

Additional Information

• A substance combines with oxygen through a chemical reaction known as combustion.

• This reaction typically releases energy in the form of heat and light.

• The resulting compound is typically a compound containing oxygen, such as water or carbon dioxide.

• Combustion reactions require fuel and an oxidizer, with oxygen being the most common oxidizer.

• Complete combustion results in the production of CO_2 and H_2O, while incomplete combustion can produce harmful by-products such as carbon monoxide.

Q81. Answer: (a) For every protein, there is a specific gene.

The correct answer is for every protein, there is a specific gene.

Key Points

• Genes

• DNA makes up the functional units of heredity known as genes.

• DNA, which is made up of many genes, makes up the chromosome.

• The specific set of instructions for a specific function or protein coding is found in each gene.

• In layman's terms, genes are to blame for heredity.

• The human body has approximately 30000 genes in each cell.

• Only 2% of the genome is made up of the DNA in the gene.

• A particular set of instructions or particular functions make up genes.

• For instance, instructions were given to the globin gene to make hemoglobin.

• A protein called hemoglobin aids in the transport of oxygen throughout the blood.

• The most important substances in the human body are proteins, which not only serve as the building blocks for muscles, connective tissue, and skin but also take care of the enzyme's production.

Additional Information

• RNA

• A ribonucleic acid is known as RNA aids in the body's protein synthesis. The human body's production of new cells is facilitated by this nucleic acid.

• The only difference between RNA and DNA is that it only contains a single ribose sugar molecule and only has one strand, whereas DNA has two strands. Ribonucleic acid is named for this reason.

• Because it aids in the body's chemical reactions, RNA is also referred to as an enzyme.

• Chromosome

• All cells contain chromosomes, which are the genetic material. They can be found in a eukaryotic cell's nucleus. They have a structure like a thread.

• Eukaryotic cells have DNA and proteins that are linked to it, called histone proteins, on each chromosome.

• They are the cause of the traits that are passed down through generations, from parents to children.

• Because they are stained with particular dyes, scientists have given them the name chromosomes; chroma means color and soma means body.

Q82. Answer: (d) Pralhad Venkatesh Joshi

The correct answer is Pralhad Venkatesh Joshi.

Key Points

• A ministry of the Indian government is the Ministry of Parliamentary Affairs. The Union Cabinet Minister for Parliamentary Affairs is in charge of it.

• It manages the parliamentary business and serves as a liaison between the Lok Sabha (the lower house, sometimes known as "House of the People") and the Rajya Sabha ("Council of States," the upper house).

• It started off as a department in 1949 before evolving into a complete ministry.

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• Allotting government time in the legislature for discussion of motions that members have given notice of. Interaction with the Whips and Leaders of the major Parties and Groups in Parliament.

Additional Information

• Making decisions and taking action in response to issues brought up under rule 377 of the rules governing how business is conducted in the Lok Sabha and through special mentions in the Rajya Sabha.

• The Parliamentary Officers' Salaries and Allowances Act of 1953 (20 of 1953). The Members of Parliament Salary, Allowances, and Pensions Act of 1954 (30 of 1954).

• Act of 1977 governing the compensation and benefits of opposition party leaders in parliament (33 of 1977). Act of 1998 Concerning Facilities for the Leader and Chief Whips of Recognized Parties and Groups in Parliament (5 of 1999).

Q83. Answer: (c) 2

Shortcut Trick

Find the smallest difference between any two given numbers: 208 − 180 = 28.

The HCF must be a factor of this difference. The factors of 28 are 28, 14, 7, 4, 2, and 1.

The number 310 is not perfectly divisible by 28, 14, 7, or 4.

Since 310, 208, and 180 are all even numbers, they are all perfectly divisible by 2.

Therefore The correct answer is 2.

Alternate Method

Given:

The numbers are 310, 208, and 180.

Method Used:

Prime Factorization Method: The HCF is the product of the lowest power of all common prime factors.

Calculations:

=> 310 = 2 × 5 × 31

=> 208 = 2 × 2 × 2 × 2 × 13 = 2^4 × 13

=> 180 = 2 × 2 × 3 × 3 × 5 = $2^2 \times 3^2 \times 5$

=> The only common prime factor among all three numbers is 2.

=> The lowest power of 2 present in the factorizations is $2^1 = 2$.

Therefore The correct answer is 2.

Additional Information

Highest Common Factor (HCF)

The HCF of two or more numbers is the largest positive integer that divides each of the numbers without leaving a remainder.

Least Common Multiple (LCM)

The LCM of two or more numbers is the smallest positive integer that is perfectly divisible by each of the given numbers.

Product of Two Numbers Rule

For any two numbers a and b: a × b = HCF(a, b) × LCM(a, b). Note that this property applies only to two numbers, not three.

Co-prime Numbers

Two numbers are considered co-prime (or mutually prime) if their Highest Common Factor (HCF) is exactly 1.

Q84. Answer: (b) Generating electricity

The correct answer is Generating electricity.

Key Points

• The watershed is the area of land that drains or sheds water into a specific receiving water body, such as a lake or a river.

• In the watershed, as rainwater or melted snow flows downward, silt and other elements are picked up, transported, and dumped into the receiving waterbody.

• A comprehensive watershed plan must first identify the characteristics of the watershed and develop the watershed's natural resources.

• To properly plan and actually measure improvements in watershed resources, it is important to establish a baseline for the type and quality of the entire watershed.

Additional Information

• Watershed Management?

• Basin management refers to the improvement of land use practices and water management by managing the use of land and water resources within river basins in a comprehensive manner in order to protect and improve the quality of these resources. A term used to describe the process of enforcing a practice managed.

• Runoff from rainwater and snowmelt can lead to large amounts of pollution in lakes and rivers. Watershed management reduces pollution of watersheds and other natural resources by identifying the different types of pollution present in watersheds and the transport of these pollutants and recommending ways to reduce or eliminate these sources of pollution.

• Water resource management is the activity of planning, developing, distributing, and managing the optimum use of water resources. It is a sub-set of water cycle management.

• Water scarcity can be overcome through proper management of available water, which aids in water conservation and reduces waste.

Q85. Answer: (c) FYUPM

The positional value of alphabet series is;

The pattern followed here is:

'JUPITER' is written as 'KSSEYYY' →

'URANUS' is written as 'VPDJZM' →

Similarly,

'EARTH' is written as 'FYUPM' →

Hence, the correct answer is "FYUPM".

Q86. Answer: (c) −12

Given:

(279 ÷ 31) + (363 ÷ 33) − (512 ÷ 16)

Concept used:

The BODMAS rule should be followed as per the given table:

Calculation:

(279 ÷ 31) + (363 ÷ 33) − (512 ÷ 16)

= 9 + 11 - 32

= 20 - 32

= - 12

Hence, The Required value is - 12.

Q87. Answer: (b) Shape of leaves

The correct answer is Shape of leaves.

Key Points

• Mendel experiments

• Mendel conducted experiments on a pea plant and identified seven primary traits that distinguished the plants. He then carried out the two experiments to ascertain the inheritance rules.

• The two experiments are described in detail below.

• Monohybrid Cross

• Mendel crossed two oppositely shaped pea plants—one short and one tall—in this experiment.

• He named the offspring from the first generation F1 progeny because they were tall.

• After that, he crossed F1 offspring, which resulted in tall and short plants in a 3:1 ratio.

• Dihybrid Cross

• Mendel looked at two traits with two alleles in a dihybrid cross-experiment.

• He noticed that all of the offspring of the first generation, or F1 offspring, were round-yellow after crossing wrinkled-green seeds with round-yellow seeds.

• This indicated that the round shape and yellow color were the dominant characteristics.

• After that, he self-pollinated the F1 offspring, resulting in four distinct traits: in the ratio of 9:3:3:1, the seeds are round-yellow, round-green, wrinkled-yellow, and wrinkled-green.

Additional Information

• Mendel’s laws

• Law of Dominance: Mendel's first law of inheritance is also used to refer to this.

• Hybrid offspring will only inherit the dominant phenotype trait, according to the law of dominance.

• Recessive traits are those in which alleles are suppressed, while dominant traits are those in which alleles are present.

• Law of Segregation: According to the law of segregation, two copies of each hereditary factor segregate during the production of

gametes, giving offspring one factor from each parent.

• To put it another way, allele pairs—the gene's alternative form—segregate during the gamete's formation and randomly reunite during fertilization. Mendel's third law of inheritance is another name for this one.

• Law of Independent Assortment: The law of independent assortment, also known as Mendel's second law of inheritance, states that a pair of traits segregates independently of another pair during gamete formation.

• Different characteristics have equal chances of occurring together because the individual heredity factors assort independently.

Q88. Answer: (b) FONWF

The alphabets and its positional values are:

The logic followed here is shown below:

'BLISS' is written as 'KSNVT'

And

'LIGHT' is written as 'UPLKU'

Similarly,

'WHITE' will be written as 'FONWF'

Hence, the code language for 'WHITE' is 'FONWF'.

Q89. Answer: (d) unsaturated compounds

The correct answer is unsaturated compounds.

Key Points

• Unsaturated compounds

• Organic compounds known as unsaturated hydrocarbons are characterized by the presence of a double or triple bond between two carbon atoms that are adjacent to one another and are entirely composed of hydrogen and carbon.

• The position of the double or triple bond is either described by a number written before the compound's name in the IUPAC nomenclature of unsaturated hydrocarbons (as in 2,4 pentadiene) or by a number written before the suffix, such as "-ene" or "-yne," (as in pent-2-ene).

• Alkenes and olefins are hydrocarbons that have at least one double bond between two adjacent carbon atoms.

• Alkynes are hydrocarbons that have at least one triple bond between two carbon atoms that are right next to each other.

Additional Information

• Saturated compounds

• A saturated hydrocarbon is one in which every single carbon-carbon bond is present.

• Carbon and hydrogen are the only components of an organic compound known as a hydrocarbon.

• Saturated hydrocarbons, as the name suggests, are hydrocarbons in which all of the carbon atoms are bonded to four other atoms and are "saturated," indicating that these organic compounds lack multiple carbon-carbon bonds.

• The carbon chains of alkanes can be either straight or branched.

• These saturated hydrocarbons have sp3 hybridization on every carbon atom.

• Cycloalkanes have sp3 hybridized carbon atoms arranged in a ring. Saturated hydrocarbons, on the other hand, have a ring that can form side chains.

Q90. Answer: (b) 431/990

Shortcut Trick

To convert a mixed recurring decimal to a fraction:

Numerator = (Full number without decimal) − (Non-repeating part)

Denominator = (Write 9 as many times as there are repeating digits) followed by (Write 0 as many times as there are non-repeating digits after decimal)

Fraction = (435 − 4) ÷ 990 = 431/990

Therefore The correct answer is 431/990.

Alternate Method

Given: x = 0.4353535...

Formula Used: Basic algebraic method for recurring decimals.

=> Let x = 0.4353535... —— (i)

=> Multiplying (i) by 10: 10x = 4.353535... —— (ii)

=> Multiplying (i) by 1000: 1000x = 435.353535... —— (iii)

=> Subtracting (ii) from (iii): 1000x − 10x = 435.353535... − 4.353535...

=> 990x = 431

=> x = 431/990

Therefore The correct answer is 431/990.

Additional Information

Pure Recurring Decimal

A decimal in which all the figures after the decimal point are repeated. Example: 0.333... = 3/9 = 1/3.

Mixed Recurring Decimal

A decimal in which at least one figure after the decimal point is not repeated and then some figures are repeated. Example: 0.1222... = (12−1)/90 = 11/90.

Rational Numbers (p/q form)

Any number that can be expressed as a fraction p/q where p and q are integers and q is not zero. All recurring decimals are rational numbers.

Q91. Answer: (b) 85

The logic followed here is:

Sum of previous two terms + positional value = Next term

Hence, '85' can replace the question mark (?) in the given series.

Q92. Answer: (b) Tripura

The correct answer is Tripura.

Key Points

• One of Tripuri's most popular festivals, Karchi Puja involves the worship of Chaturdasa Devata, the dynasty deity of the Tripuri people.

• It is celebrated with Agartala in Chaturdasha Temple. During KharchiPuja, Chaturdasa Devata is taken out, taken to bathe in holy water, and brought back to the temple.

• The celebration lasts seven days and is attended by people from both tribal and non-tribal communities.

• Kharchi Puja is celebrated in Tripura, India on the eighth day of the new moon in July or August each year.

Additional Information

• Kharchi puja lasts for seven consecutive days. The festival is held at the temple of fourteen gods at Old Agartala.

• Every day large numbers of people attend the festival and both Tripuri and Non-Tripuri participants. People offer different types of Parsada i.e., Offerings like Goat, Buffalo, Sweets, etc. Various cultural programmes are performed each evening and a large fair is organised to mark the occasion.

• People look to their own welfare as well as the welfare of society and the state in general. The Last Kharcha Puja was held on 10 July 2019.

• According to Tripuri legends, "Ama Pechi" is the Menstruation of the mother goddess or Earth mother, and the soil is neither ploughed nor dug anywhere during this time. Among Tripuri people menstruation is considered unholy and all significant functions by women are prohibited.

Q93. Answer: (b) Third floor

According to the given statements, we will get the arrangement as:

1) Rohan lives in a seven-storeyed building. The top floor of the building is numbered seven and the lowermost floor is numbered one. Diya who is Rohan's friend lives somewhere above the floor where Rohan lives. There are three floors between Rohan's and Diya's floors.

	C1	C2	C3
7			Diya
6		Diya	
5	Diya		
4			
3			Rohan
2		Rohan	
1	Rohan		

2) Rohan goes two floors below to his colleague Atul's flat to eat and drink together every Sunday.

Then we are left with only case 3 as C1 and C2 are eliminated.

	C1	C2	C3
7			Diya
6		Diya	
5	Diya		
4			
3			Rohan
2		Rohan	
1	Rohan		Atul

Hence, from the above table, we can say that Rohan lives on the "Third floor".

Q94. Answer: (a) 2004

The correct answer is 2004.

Key Points

• Panchayats, or village assemblies, existed in ancient India as self-governing institutions with clear and well-defined functions. Panchayat institutions represented not only the collective will but also the collective wisdom of the entire rural community.

• Bikaner enacted its own Glam Panchayat Act in 1928. Thus, at the time of independence, panchayat functioned in some of the former monarchies, while no such institution existed in other states.

• In 1953, the Rajasthan Panchayat Act was enacted, establishing village panchayats throughout the state.

• The first elections under the Rajasthan Panchayat Samitis and Zilla Parishad Act 1959 were held in September-October 1959. Under the Rajasthan Panchayat Act of 1953, a village-level panchayat had already been set up, so on 2 October 1959, his three-tier system of Panchayathiraj began to function.

Additional Information

• The Panchayati Raj Ministry deals with all matters relating to the Panchayati Raj and Panchayati Raj institutions. Founded in May 2004. The ministry is headed by a cabinet-level minister and subsidizes local governments for civil programs such as maintenance and construction of roads, sidewalks, bridges, drainage systems, parks, water pipes, streetlights, etc.

• The Commonwealth divides government powers and functions between two governments. In India it is then federal government and various state governments. However, with the passage of the 1993nAmendments to Articles 73 and 74 of the Indian Constitution, the division of powers and functions has further shifted to local governments (panchayat at village level, parishes and municipalities at towns and cities). Has been delegated to That is why India's federal structure now has her three tiers of government instead of two.

• Directly elected representatives to constitute the gram panchayat and indirectly elected representatives to constitute the Panchayat Samiti and Zila Parishad.

• The committee was appointed in 1977 to suggest measures to revive and strengthen the declining Panchayati Raj system in India.

Q95. Answer: (d) Rs. 6,250

Shortcut Trick

To find the Selling Price directly, use the multiplier method.

Multiplier for 25% profit = (100 + 25) ÷ 100 = 1.25.

Selling Price (SP) = Cost Price (CP) × 1.25.

SP = 5,000 × 1.25 = 6,250.

Therefore The correct answer is Rs. 6,250.

Alternate Method

Given: Cost Price (CP) = Rs. 5,000, Profit % = 25%.

Formula: SP = CP × (100 + Profit%) ÷ 100

=> Profit Amount = 25% of 5,000

=> Profit Amount = (25 ÷ 100) × 5,000 = 1,250

=> SP = CP + Profit = 5,000 + 1,250

=> SP = 6,250

Therefore The correct answer is Rs. 6,250.

Additional Information

Profit and Loss Basic Concepts

Profit occurs when SP > CP. Profit = SP − CP. Profit Percentage is always calculated on the Cost Price unless stated otherwise.

Fractional Representation

25% can be written as 1/4. This means for every 4 units of CP, there is 1 unit of profit, making the SP equal to 5 units.

Q96. Answer: (b) lighter elements only

The correct answer is lighter elements only.

Key Points

• Newlands' Law of Octaves

• British chemist John Newlands attempted the 62 elements that were known at the time in 1864.

• Based on their atomic masses, he arranged them in ascending order and discovered that each eighth element shared similar properties. Newland's law of octaves was developed based on this observation.

• The law of octaves states that every eighth element has similar properties when the elements are arranged in the increasing order of their atomic masses.

• The octaves of music, in which every eighth note is comparable to the first, was used by Newlands to illustrate the similarity between the elements.

Additional Information

• Limitations of Newland’s Law of Octaves

• In Newland's periodic classification, a number of elements shared the same slots.

• Nickel and cobalt, for instance, were inserted into the same slot.

• Some metals, like cobalt, nickel, and platinum, were included in the group that included the halogens.

• Only elements up to calcium were subject to Newland's law of octaves.

• Octaves were unable to accommodate elements with higher atomic masses.

• The octave pattern could not accommodate the subsequent discoveries of elements.

Q97. Answer: (d) 72 cm2

Shortcut Trick

Area of a triangle = (1/2) × base × height

Area = 0.5 × 9 × 16

Area = 9 × 8 = 72 cm²

Therefore The correct answer is 72 cm².

Alternate Method

Given:

Base of the triangle (b) = 9 cm

Height of the triangle (h) = 16 cm

Formula Used:

Area of Triangle = (1/2) × b × h

Calculations:

=> Area = (1/2) × 9 × 16

=> Area = 9 × (16/2)

=> Area = 9 × 8

=> Area = 72 cm²

Therefore The correct answer is 72 cm².

Additional Information

Heron's Formula

Used when all three sides (a, b, c) are known: Area = √[s(s−a)(s−b)(s−c)], where s = (a+b+c)/2.

Equilateral Triangle Area

For a triangle with side 'a', Area = (√3/4) × a².

Right-Angled Triangle

Area = (1/2) × Product of legs containing the right angle.

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Q98. Answer: (b) 50

Shortcut Trick

Let Assumed Mean (A) = 50.

Calculate Net Deviation (Σfd): [17 × (−40)] + [28 × (−20)] + [32 × 0] + [24 × 20] + [19 × 40]

=> −680 − 560 + 0 + 480 + 760 = 0.

Since the net deviation is 0, the Actual Mean = Assumed Mean = 50.

Therefore The correct answer is 50.

Alternate Method

Given: Marks (x_i) and frequency (f_i).

Formula Used: Mean (μ) = $\Sigma f_i x_i \div \Sigma f_i$

Calculations:

=> Total Students (Σf_i) = 17 + 28 + 32 + 24 + 19 = 120

=> $\Sigma f_i x_i$ = (10 × 17) + (30 × 28) + (50 × 32) + (70 × 24) + (90 × 19)

=> $\Sigma f_i x_i$ = 170 + 840 + 1600 + 1680 + 1710 = 6000

=> Mean = 6000 ÷ 120 = 50

Therefore The correct answer is 50.

Additional Information

Arithmetic Mean Properties

The sum of deviations of all observations from their arithmetic mean is always zero, i.e., $\Sigma(x_i - \mu) = 0$.

Assumed Mean Method

Used to simplify calculations: Mean = A + (Σfd ÷ Σf), where d = x − A and A is the assumed mean.

Effect of Changes

If every observation is increased/decreased by a constant k, the mean also increases/decreases by k.

Q99. Answer: (c) 3 years

Shortcut Trick

Calculate the ratio of Amount (A) to Principal (P): A/P = 26620/20000 = 1331/1000.

Express the ratio as a power of the Rate factor: (1 + 10/100) = 11/10.

Since 1331/1000 = $(11/10)^3$, the power represents the time period.

Therefore n = 3 years.

Therefore The correct answer is 3 years.

Alternate Method

Given:

Principal (P) = Rs. 20,000

Amount (A) = Rs. 26,620

Rate of Interest (R) = 10% per annum

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

=> $26620 = 20000(1 + 10/100)^n$

=> $26620 / 20000 = (11/10)^n$

=> $2662 / 2000 = (1.1)^n$

=> $1331 / 1000 = (1.1)^n$

=> $1.331 = (1.1)^n$

=> $(1.1)^3 = (1.1)^n$

=> n = 3

Therefore The correct answer is 3 years.

Additional Information

Compound Interest vs Simple Interest Difference

For 2 years, Difference (D2) = $P(R/100)^2$. For 3 years, Difference (D3) = $P(R/100)^2 \times (3 + R/100)$.

Effective Rate of Interest

The effective rate for 10% compounded annually for 3 years is 33.1%, calculated as $[(1.1)^3 - 1] \times 100$.

Compounding Periods

If compounded half-yearly, Rate becomes R/2 and Time becomes 2n. If quarterly, Rate becomes R/4 and Time becomes 4n.

Q100. Answer: (d) Konkani

The correct answer is Konkani.

Key Points

• Konkani language, Indo-Aryan language of the Indo-European language family. Konkani is spoken by some 2.5 million people, mainly on the central west coast of India, where it is the official language of Goa state.

• It is also associated particularly with the city of Mangalore (Mangaluru) in southwestern Karnataka and is spoken especially along the west coast of Maharashtra state.

• It is one of the 22 Scheduled languages mentioned in the 8th schedule of the Indian Constitution.

• The Konkani people kept the language alive as a dialect in their homes and social gatherings in this area. Konkani is an Indo-Aryan language derived from the mother of all Indian languages, Sanskrit and Prakrit language.

Additional Information

• The substratum of the Konkani language lies in the speech of Austroasiatic tribes called Kurukh, Oraon, and Kukni, whose modern representatives are languages like Kurukh and its dialects including Kurux, Kunrukh, Kunna, and Malto.

• According to the Indian Anthropological Society, these Australoid tribes speaking Austro-Asiatic or Munda languages who once inhabited Konkan migrated to Northern India (Chota Nagpur Plateau, Mirzapur) and are not found in Konkan anymore.

• The grammatical impact of the Dravidian languages on the structure and syntax of Indo-Aryan languages is difficult to fathom. Some linguists explain this anomaly by arguing that Middle Indo-Aryan and New Indo-Aryan were built on a Dravidian substratum.

• Some examples of Konkani words of Dravidian origin are: naall (coconut), madval (washerman), choru (cooked rice), and mulo (radish).

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