RRB Group D Previous Year Paper (Held on: 25 Aug 2022 Shift 2)

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

Take this paper as a timed mock test

Practise under exam conditions, then review your answers after you submit.

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CBT

Q1. Simplify:

$(1.5a^2 - 2.5b^2)(1.5a^2 + 2.5b^2) + 6.25ab$

(a) 2.5a4 - 6.25b4 + 6.25ab
(b) 2.25a4 - 6.25b4 + 6.25ab
(c) 2.25a4 - 6.25b4
(d) 2.25 a4 - 6.5b4 + 6.25ab

Q2. In Munnar, a travel company has three 4-seater cars and two 8-seater maxi cabs. The rate of each passenger for a round trip in a car is Rs. 25 and for a round trip in a maxi cab is Rs. 20. The average occupancy of the seats is 100%. What is the average earning of each vehicle for one round trip?

(a) Rs. 125
(b) Rs. 127
(c) Rs. 124
(d) Rs. 126

Q3. The Modern Periodic Table has _____ groups and _____ periods.

(a) 18, 6
(b) 18, 7
(c) 17, 8
(d) 18, 5

Q4. Refer to the following letter and number series and answer the question.

(Left) G C 6 8 T 7 D 4 6 K 2 R Y 3 5 E S A 4 T Y 7 8 G T (Right)

If all the numbers are dropped from the series, how many letters are there in the English alphabetical order between the letter that is fourth from the right end and the letter that is sixth from the left end of the given series?

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

Q5. Consider the below statements and identify the correct answer

Statement-I: The chemical formula for baking soda is CasO4 1/2 H2O.

Statement-II: Baking soda is used for making toys, materials for decoration and for making surfaces smooth

(a) Both the statements are true.
(b) Statement-II is true, and Statement-I is false.
(c) Both the statements are false.
(d) Statement-I is true, and Statement-II is false.

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Q6. An object, 3.0 cm in height, is placed at a distance of 20.0 cm in front of a convex mirror of focal length 6.0 cm, on its principal axis. Its image has a height of _____ and is _____.

(a) less than 1.0 cm, erect
(b) more than 3.0 cm, inverted
(c) more than 3.0 cm, erect
(d) less than 3.0 cm, inverted

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 the numbers into its constituent

digits. E. g. 13- Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on I and 3 is not allowed.)

(5, 21, 2)

(7, 33, 4)

(a) (6, 40, 8)
(b) (10, 93, 3)
(c) (8, 51, 9)
(d) (11, 24, 3)

Q8. Identify the INCORRECT statement from among the following.

(a) A freely suspended bar magnet points in north-south direction.
(b) Outside a bar magnet, the magnetic field lines are directed from north to south pole.
(c) A number of field lines intersect at a given point inside a magnetic field.
(d) Repulsion is a sure test of magnetism.

Q9. Sujlam started from a point facing towards the west, turned left and walked for 10 m, then turned right and walked for 12 m, then turned left and walked for 11 m, and then turned left again at point P and walked for 17 m. Prior to turning left at point P, he was facing in which direction?

(All turns are 90 degree turns only)

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

Q10. The following table shows the break-up of the costs (in 3) incurred by a company in the production of five products, A to E. Study the table and answer the question.

Product	A	B	C	D	E
Raw material	400	200	700	300	400
Manufacturing	80	40	150	80	100
Advertisement	180	70	200	170	200
Labour	200	180	400	140	250
Miscellaneous	40	10	50	10	50
Total cost	900	500	1500	700	1000

Which of the following products has the maximum manufacturing cost in comparison to its total cost of production?

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

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Q11. If '+' means, '-', '-'means '×', '×' means '÷' ,and '÷'means '+', what will come in place of the question mark (?) in the
24 + 16 ÷ 132 × 11 – 3 = ?

(a) 42
(b) 40
(c) 46
(d) 44

Q12. Which of the following excretory products is stored in the old xylem of the plants?

(a) Carbon dioxide
(b) Resin
(c) Citric acid
(d) Morphin

Q13. As per Article 243B of the Indian Constitution, Panchayats at the intermediate level may NOT be constituted in a State having a population not exceeding _____.

(a) 25 lakhs
(b) 5 lakhs
(c) 20 lakhs
(d) 10 lakhs

Q14. If the selling price of an almirah is doubled, profit is tripled. Find the profit percentage.

(a) 25%
(b) 10%
(c) 100%
(d) 50%

Q15. Who was the founder of the social reform movement for Sikhism - the Nirankari movement?

(a) Baba Gurmeet Dev
(b) Shri Sohan Singh
(c) Baba Balak Singh
(d) Baba Dyal Das

Q16. The S.I unit of resistivity is:

(a) ohm m
(b) ohm
(c) ohm/m
(d) mho

Q17. In a certain code language, MUTINY is written as 25149202113 and MAGIC is written as 397113. How will NECTAR be written in the same language?

(a) 181203514
(b) 182203614
(c) 191253014
(d) 182103513

Q18. The Longest Moustache competition is held at which of the following festivals/fairs?

(a) Kila Raipur Sports Festival
(b) Hornbill Festival
(c) Pushkar Fair
(d) Thrissur Pooram Festival

Q19. Which of the following numbers will replace the question mark (?) in the given series?
23, 31, 95, 311,?

(a) 818
(b) 876

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(c) 832
(d) 823

Q20. How many such pairs of letters are there in the word 'DEVELOP (in both forward and backward directions) each of which have as many letters between them in the word as there are in the English alphabetical order?
(a) 3
(b) 2
(c) 1
(d) 4

Q21. According to Dobereiner, _____.
(a) the sum of atomic masses of the first and the third elements of the triad is equal to that of the second element
(b) the sum of atomic masses of the first and the second elements of the triad is equal to that of the third element
(c) the arithmetical mean of the atomic masses of the first and the third elements of the triad is equal to that of the second one
(d) the arithmetical mean of the atomic masses of the second and the third elements of the triad is equal to that of the first One

Q22. National Women's Day is celebrated on which date in India?
(a) 23 January
(b) 13 January
(c) 23 February
(d) 13 February

Q23. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster
FINE : GKQI : : MOST : NQVX : : SEAL : ?
(a) PGTD
(b) TGPD
(c) TPGD
(d) TGDP

Q24. Identify the sportsperson who received the Major Dhyan Chand Khel Ratna Award 2021 in the wrestling discipline from the following options.
(a) Nishad Kumar
(b) Sharad Kumar
(c) Ravi Kumar
(d) Suhash Yathiraj

Q25. In which of the following period do the monsoon winds tentatively reach Punjab, Westerm Uttar Pradesh and Haryana during a normal monsoon year?
(a) First week of May
(b) First week of June
(c) First week of August
(d) First week of July

Q26. The angles of a quadrilateral are in the ratio 2 : 5 : 7 : 10. Find the difference between the greatest and the smallest angles of the quadrilateral.
(a) 50°
(b) 120°
(c) 180°
(d) 60°

Q27. The headquarters of Central Institute of Indian Languages (CIL) is situated in _____.
(a) Chennai
(b) Pondicherry
(c) Bengaluu

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(d) Mysuru

Q28. In how much time will a sum of money double itself at 10 per cent per annum rate of simple interest?

(a) 12 years
(b) 8 years
(c) 5 years
(d) 10 years

Q29. Sardar Sarovar Dam was constructed in Gujarat over the _____.

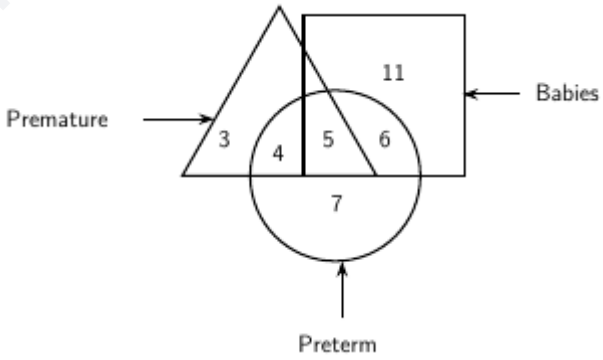
(a) Sutlej River
(b) Ganga River
(c) Narmada River
(d) Mahanadi River

Q30. Which of the following numbers will replace the question mark (?) in the given series?

8, 17, 33, 63, 114, 193, ?

(a) 307
(b) 370
(c) 377
(d) 347

Q31. Study the given diagram carefully and answer the question The numbers in different sections indicate the number of persons.



How many such babies are there who are NEITHER premature NOR preterm?

(a) 5
(b) 4
(c) 6
(d) 11

Q32. Which of the following method(s) can be used to change the direction of force on a current carying conductor?

(i) Changing the magnitude of current
(ii) Changing the strength of magnetic field
(iii) Changing the direction of current

(a) Only (i)
(b) Both (ii) and (iii)
(c) Both (i) and (iii)
(d) Only (iii)

Q33. The average age of Raj and his sister is 8 years. If Raj's age is 10 years, then find the age of his sister.

(a) 7 years
(b) 6 years
(c) 9 years
(d) 8 years

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Q34. In January 2022, with which university did Jio sign a pact for undertaking research and standardization related activities in 6G technology?

(a) Barcelona Institute of Science and Technology
(b) University of Oulu, Finland
(c) Indian Institute of Science Bengaluru
(d) Canadian Institute of Health Research

Q35. A decision is given followed by two statements I and II. Read all the information carefully and select the correct option.

Decision:

In order to promote tourism, country W is declaring 20 of its cities as Heritage Sites.

Statements:

I. 4 of the 20 cities are located in hilly areas and have limited access to transport.

II. In the past whenever a city in Country W has been promoted for tourism, it has led to increased employment opportunities in that city.

(a) Both statements I and II weaken the decision
(b) Statement I weakens the decision and statement II strengthens the decision
(c) Statement I is a neutral statement and statement II strengthens the decision
(d) Both statements I and II strengthen the decision

Q36. In this question, a group of letters is coded using numbers as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Letter / Symbol	I	L	M	H	Y	O	C	E	R
Code	4	5	9	1	2	3	6	7	8

Conditions

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

(ii) If the first element is a consonant and the last, a vowel, the first and last elements are to be coded as 0.

(iii) If both the second and the fifth elements are vowels, the fifth element is to be coded as the code for the second element and vice-versa.

Question: EICHER

(a) 814767
(b) 876417
(c) 877416
(d) 876147

Q37. How many such pairs of letters are there in the word 'ABILITY' (in both forward and backward directions) each of which have as many letters between them in the word as there are in the English alphabetical order?

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

Q38. There are four prime numbers taken in ascending order. The product of the first three prime numbers is 1771 and the sum of the last two prime numbers is 82. What is the product of the last two prime numbers?

(a) 1357
(b) 1127
(c) 1537
(d) 1387

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Q39. Convert 0.23636... into a vulgar fraction.

(a) 7/33
(b) 9/44
(c) 13/55
(d) 17/66

Q40. Which of the following is the quadratic equation whose roots are -2 and 4?

(a) 3x2 - 5x - 24 = 0
(b) 2x2 - 6x - 24 = 0
(c) 3x2 - 6x - 24 = 0
(d) 3x2 - 6x - 20 = 0

Q41. Which structure is responsible for maintaining the amount of water in amoeba?

(a) Contractile vacuole
(b) Food vacuole
(c) Cytoplasm
(d) Plasma membrane

Q42. Where did the first Green Hydrogen Microgrid Project start in 2021?

(a) Maharashtra
(b) Kerala
(c) Tamil Nadu
(d) Andhra Pradesh

Q43. Select the option that represents the letters that, when placed from left to right in the blanks below, will complete the letter series.

P_T P_S_C T_R S P C_P R_P_T_R S

(a) CRPCSPPT
(b) CSPCRPTP
(c) CRPPTSCP
(d) CCPPPRST

Q44. How many times has The Factory Act been amended as on June 2022?

(a) 8
(b) 5
(c) 4
(d) 9

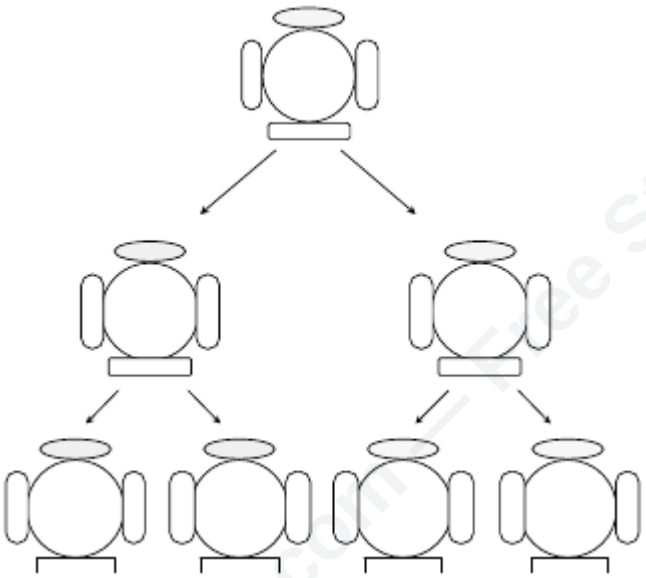
Q45. If '+' means '-', '-' means '×', '×' means '÷' and '÷' means '+', what will come in place of the question mark (?) in the following equation?

28 – 2 + 80 × 5 ÷ 14 = ?

(a) 45
(b) 25
(c) 52
(d) 54

Q46. The figure below shows a single organism undergoing reproduction and the progeny with minor differences. What could be the reason for the variation?

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(a) Errors in RNA formation
(b) Errors in DNA copying
(c) Errors in protein formation
(d) Gene being non-functional

Q47. The value of -48 ÷ [4 × (6 - 5 + 1)] ÷ 24 =
(a) 12
(b) -7/4
(c) -1/4
(d) –9

Q48. Which form of carbon is used as a dry lubricant?
(a) Graphite
(b) Diamond
(c) Coke
(d) Coal

Q49. Which of the following pairs of numbers is co-prime?
(a) (17, 23)
(b) (14, 21)
(c) (12, 24)
(d) (15, 25)

Q50. According to the Constitution of India, in which of the following matters can only Union Legislature make laws?
(a) Post and Telegram
(b) Prison
(c) Trade and Commerce
(d) Agriculture

Q51. The difference between two numbers is 42 and they are in the ratio 5 : 3. Find the smaller number.
(a) 36
(b) 63
(c) 105
(d) 21

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Q52. In this question, a statement is followed by four conclusions. Find out which conclusion is true based on the given statement.

Statement:

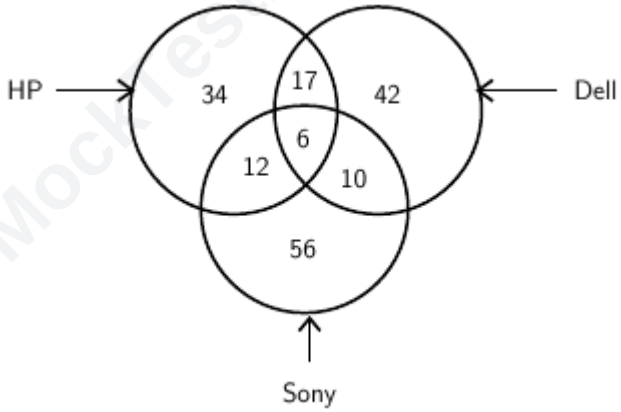
Q = R > S ≤ T < U > V = Z

Conclusions:

1. U > S
2. Q < T
3. S < V
4. Z > U

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

Q53. Study the given diagram carefully and answer the following question. The numbers in different sections indicate the number of persons using different brands of laptop in an IT office.



How many people use both Sony and Dell laptops?

(a) 6
(b) 16
(c) 20
(d) 10

Q54. Every year, which day is observed as the 'Minorities Rights Day' to uphold the right to freedom and equal opportunities for the ethnic minorities in India and create awareness about the respect and dignity of the minorities?

(a) 25 December
(b) 29 August
(c) 18 December
(d) 27 February

Q55. What is the theme selected by RBI as the 2022 theme for Financial Literacy week?

(a) Credit Discipline and Credit from Formal Institutions
(b) Farmers
(c) Micro, Small and Medium Enterprises
(d) Go Digital, Go Secure

Q56. The Central Bank of Zimbabwe has been lowering rate of interests of the economy to boost growth. The bank is being _____ in its monetary policy stance.

(a) Neutral
(b) dovish
(c) Accommodative
(d) hawkish

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Q57. Babu took some quantity of dilute nitric acid in a test tube and heated the test tube at 70°C for about 10 minutes. What was its effect on the pH of nitric acid?

(a) It decreased
(b) It rose up
(c) It first increased and then decreased
(d) It remained constant

Q58. Four different experiments were conducted by students of Class X.

I. Navin took a beaker containing some aqueous solution of CusO4 and added a piece of magnesium strip in it.

II. Ayush took a beaker containing some aqueous solution of CusO4 and added some platinum pieces in it.

III. Sneha took a beaker containing some aqueous solution CusO4 and added some copper turnings in it.

IV. Akriti took a beaker containing some aqueous solution CusO4 and added a piece of silver wire in it.

Who among them was able to perform a displacement reaction?

(a) Sneha
(b) Akriti
(c) Ayush
(d) Navin

Q59. As per the Ministry of New And Renewable Energy. which state has the highest wind power potential as on March 2021?

(a) Rajasthan
(b) Karnataka
(c) Tamil Nadu
(d) Gujarat

Q60. Crop production does NOT involve considerable costs on which of the following?

(a) Costs on seeds
(b) Costs on fertilizers
(c) Costs on pesticides
(d) Costs on animal food

Q61. Five students- 1, 2, 3 ,4 and 5- are sitting around a circular table facing the centre. 4 is sitting to the immediate right of 1 and immediate left of 2. 5 is sitting second to the left of 1. Which of the following statements is true?

(a) 5 is sitting third to the right of 3.
(b) 1 is the immediate neighbour of 5.
(c) 2 is sitting between 4 and 1.
(d) 3 is sitting between 5 and 1.

Q62. Pole E is to the north of pole U and east of pole R. Pole N is to the west of pole U and east of pole I. Pole J is to the south of the pole I. What is the position of pole R with respect to pole U?

(a) South
(b) South-west
(c) North
(d) North-west

Q63. The ratio of the sum of all the interior angles to an exterior angle of a regular polygon is 24 : 1. Find the number of sides of the polygon.

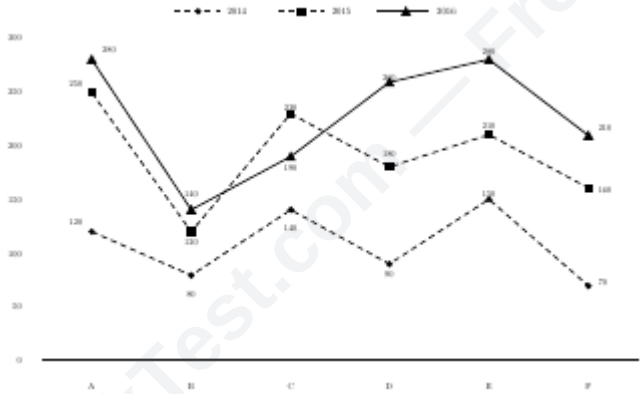
(a) 80
(b) 78
(c) 10
(d) 8

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Q64. Chlorine gas reacts with potassium iodide solution to form potassium chloride and iodine. This reaction is an example of a:

(a) combination reaction
(b) double displacement reaction
(c) displacement reaction
(d) decomposition reaction

Q65. The following line graph shows the number of admissions of students (in thousands) in six different districts, A, B, C, D, E and F, in three consecutive years, 2014, 2015 and 2016. Study the graph and answer the question.



What is the difference between the total number of admissions in district B for the given three years and the total number of admissions in district E for the first two consecutive years (2014 and 2015)?

(a) 25
(b) 20
(c) 40
(d) 80

Q66. Simplify: $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta)$.

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

Q67. Find the fourth proportional of 4a + 7,11a +3 and 6a, if a = 2.

(a) 25
(b) 15
(c) 30
(d) 20

Q68. A, B, C, D, E, F and G want to play a video game they purchased together. Each will get it on one day of the same week starting from Monday and ending on Sunday. No one gets it on the same day of the week. A will play on Sunday. D will play immediately before A. B will play immediately after E. E will play on Wednesday. C will not get it on Monday. F gets it on a day between B and D. On which day will G get to play?

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

Q69. Find the double of the lower limit of the modal class of the given data:

CI	100-110	110-120	120-130	130-140	140-150
F	12	15	32	34	22

(a) 68
(b) 280

(c) 260
(d) 540

Q70. Find the third proportional of 18 and 54.
(a) 172
(b) 121
(c) 162
(d) 144

Q71. The sex of a person is determined by _____.
(a) the chromosomes present in sperm
(b) the chromosomes present in both sperm and ovum and dietary habits of parents
(c) the chromosomes present in ovum
(d) the chromosomes present in both sperm and ovum

Q72. What type of political party system does India have?
(a) Three-party system
(b) Multi-party system
(c) Two-party system
(d) One-party system

Q73. If aman bought 6 pencils for Rs. 5, and sold them at 5 pencils for Rs. 6, then the gain percentage is _____.
(a) 43%
(b) 44%
(c) 42%
(d) 41%

Q74. Find the approximate angle between the minute hand and the hour hand of a 12-hour clock when the time is 9 : 25.
(a) 150 degrees
(b) 100 degrees
(c) 190 degrees
(d) 130 degrees

Q75. A ray of light bends towards the normal while travelling from medium A to medium B. Which of the following statements is/ are correct:
(A) Medium A is optically denser than medium B.
(B) Speed of light is more in medium A than medium B.
(C) Refractive index of medium B is more than refractive index of medium A.
(a) Both B and C
(b) Both A and C
(c) A, B and C
(d) Both A and B

Q76. How many hydrogen atoms will be added along with one carbon atom in the next member of a homologous series?
(a) 1
(b) 3
(c) 2
(d) 4

Q77. Five persons, A, B, C, D and E, are sitting in a straight line. All are facing the north direction. D sits to the immediate left of A. Only two persons are sitting between D and B. C sits second from the extreme right end of the line. Only two persons are sitting between C and E. Who is sitting to the immediate right of E?
(a) B
(b) A
(c) D

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(d) C

Q78. Select the option that is related to the fifth umber in the same way as the second number is related to the first number and the fourth umber is related to the third number.

13 : 96 : : 18 : 131 : : 14 : ?

(a) 100
(b) 104
(c) 103
(d) 102

Q79. The radius and height of a cylinder are in the ratio 2: 1 Find its total surface area if curved surface area is 616 m².

(a) 908 m2
(b) 1512 m2
(c) 1848 m2
(d) 1232 m2

Q80. A 250-metre long train running at a speed of 100 km/h crosses another train coming from the opposite direction at a speed of 62 km/h in 10 seconds. What is the length of the second train?

(a) 240 metres
(b) 200 metres
(c) 230 metres
(d) 270 metres

Q81. In amoeba, the food is taken by the _____.

(a) mouth
(b) movement of cilia
(c) entire body surface area
(d) movement of flagella

Q82. Based on the given statement, four conclusions are drawn. Find out which conclusion is NOT true based on the statement.

Statement: B > F ≥ P > L = K ≤ W < M

(a) F > K
(b) L < M
(c) P = K
(d) B > L

Q83. What is the similarity between fermentation in yeast and anaerobic respiration taking place in muscle cells of humans?

(a) Take place in mitochondria
(b) Lactic acid is formed
(c) Ethanol is formed
(d) Take place in Cytoplasm

Q84. An object is placed on the principal axis of a convex lens of focal length 12 cm, at a distance of 18 cm. The magnification produced by the lens is____ and the image is _____.

(a) more than 1, inverted
(b) less than 1, inverted
(c) more than 1, erect
(d) less than 1, erect

Q85. What will come in the place of the question mark (?) in the following equation if '+' and '-' are interchanged '×' and '÷' also are interchanged?

12 - 104 × 8 + 5 ÷ 4 = ?

(a) 5

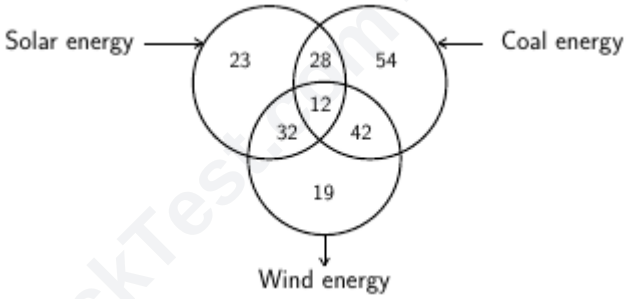
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(b) 7
(c) 9
(d) 11

Q86. Two resistors A and B have resistances 5 ohm and 10 ohm, respectively. If they are connected in series to a voltage source of 5 V. The ratio of power developed in resistor A to that of power developed in resistor B will be:

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

Q87. Study the given diagram carefully and answer the following question. The umbers in different sections indicate the number of persons in a small village relying on different sources of energy for their daily needs.



How many people rely on both Solar energy and Coal energy?

(a) 28
(b) 77
(c) 40
(d) 12

Q88. With which sport is the Rovers Cup associated?

(a) Rowing
(b) Hockey
(c) Football
(d) Cricket

Q89. In a queue of boys, there are exactly 8 boys standing between Suraj and Bheem. Suraj is 21^(st) from the front, while Bheem is at the first position from the back. How many total boys are there in the queue?

(a) 30
(b) 32
(c) 31
(d) 29

Q90. An amount is divided between two friends in the ratio 2 : 5. If the second part is Rs. 6 more than the first, then the initial amount is:

(a) Rs. 23
(b) Rs. 14
(c) Rs. 12
(d) Rs. 13

Q91. How many cylinders of radius 10 cm and height 20 cm can be filled with water from a cylinder of radius 20 cm and height 100 cm full of water?

(a) 30
(b) 60
(c) 20
(d) 40

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Q92. Which of the following parallels of latitude is INCORRECTLY matched with its location?

(a) Tropic of Capricorn - Eastern Hemisphere
(b) Arctic Circle - North of the Equator
(c) Antarctic Circle - South of the Equator
(d) Tropic of Cancer - North Hemisphere

Q93. _____ played a major role in the revival of Hinduism and the spread of his interpretation of Advaita Vedanta known as "Neo-Vedanta" in the West.

(a) Sri Ramkrishna Paramhansa
(b) Swami Vivekananda
(c) Samrat Ashoka
(d) Swami Dayanand

Q94. Two metallic wires A and B are made of the same material. Wire A has length I and radius r while wire B has length 2l and radius 2r. The ratio of the resistance of wire A to that of wire B is:

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

Q95. If a and b are the roots of $x^2 - x - 12 = 0$, and a > b, then the quadratic equation in x whose roots are (2a- 1) and (2b + 1) is:

(a) x2- 2x + 35 = 0
(b) x2 - 2x - 35 = 0
(c) x2- 4x - 45 = 0
(d) x2 - 4x + 45 = 0

Q96. An object is placed at a distance of 30 cm in front of a concave mirror of focal length 15 cm. The image formed is:

(a) real and inverted
(b) real and erect
(c) virtual and inverted
(d) virtual and erect

Q97. Simplify √729-√400

(a) 8
(b) 5
(c) 6
(d) 7

Q98. Pesticides, though non-biodegradable, are both beneficial and harmful for agriculture. Select the INCORRECT option regarding pesticides.

(a) They reduce plant growth
(b) They reduce chlorophyll content of the plant and hence affect photosynthesis
(c) They are used to control weeds, pests and plant diseases
(d) They alter nitrogen metabolism, so less protein content in plants

Q99. A train is moving in from north to south direction. It overtakes Raj and Madhur who are walking in the same direction at the rate of 2 km/h and 4 km/h in 9 sec and 10 sec, respectively. If the train is x metres long, find the value of x.

(a) 50
(b) 30
(c) 70
(d) 90

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Q100. In a class of 11 students, each scored differently. V's rank from the bottom is 6th, while D's rank from the top is 4th. T's rank from the top is exactly between the ranks of V and D. What is T's rank from the bottom?

(a) 5th
(b) 7th
(c) 8th
(d) 9th

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) 2.25a4 - 6.25b4 + 6.25ab

Given: (1.5a2 - 2.5b2)(1.5a2 + 2.5b2) + 6.25ab
Formula used:
$(A-B)(A+B)=(A^2-B^2)$
Calculation:
=> (1.5a2 - 2.5b2)(1.5a2 + 2.5b2) + 6.25ab
=> $((1.5a^2)^2- (2.5b^2)^2) + 6.25ab$
=> 2.25a4 - 6.25b4 + 6.25ab
Thus, '2.25a4 - 6.25b4 + 6.25ab' is the correct answer.

Q2. Answer: (c) Rs. 124

Shortcut Trick
Individual vehicle earnings: Car = 4 × Rs. 25 = Rs. 100; Maxi Cab = 8 × Rs. 20 = Rs. 160.
Total vehicles = 3 + 2 = 5.
Weighted average = [(3 × 100) + (2 × 160)] ÷ 5
Average = (300 + 320) ÷ 5 = 620 ÷ 5 = Rs. 124.
Therefore The correct answer is Rs. 124.
Alternate Method
Given:
Number of Cars = 3 (Capacity = 4, Rate = Rs. 25)
Number of Maxi Cabs = 2 (Capacity = 8, Rate = Rs. 20)
Formula: Average earning = Total Earning ÷ Total number of vehicles
=> Earning from one car per trip = 4 × 25 = Rs. 100
=> Total earning from 3 cars = 3 × 100 = Rs. 300
=> Earning from one maxi cab per trip = 8 × 20 = Rs. 160
=> Total earning from 2 maxi cabs = 2 × 160 = Rs. 320
=> Total vehicles = 3 + 2 = 5
=> Total earnings = 300 + 320 = Rs. 620

=> Average earning per vehicle = 620 ÷ 5 = Rs. 124

Therefore The correct answer is Rs. 124.

Additional Information

Weighted Average

It is used when different groups have different sizes or weights. Formula: (n1x1 + n2x2) ÷ (n1 + n2).

Total Revenue Calculation

Total Revenue = (Number of units × Capacity per unit × Rate per seat × Occupancy %).

Average Concept

The average value represents the central value that would be earned if every vehicle generated the same amount of revenue.

Q3. Answer: (b) 18, 7

The correct answer is 18,7.

Key Points

• Modern periodic table: It is defined as the table in which the elements are arranged in groups and periods.

• In the modern periodic table, the elements are arranged according to their increasing atomic number.

• There are 18 groups and 7 periods in this periodic table.

• The periods are arranged in horizontal rows and groups are present in verticle rows.

Additional Information

• Mendeleev is the father of the Modern Periodic Table.

• The atomic number is equal to the number of electrons or protons in a neutral atom.

• Previously the groups of the periodic table were named as IA,…VIIIA, VIII, IB…VIIB and 0. But now they are named as 1, 2, 3…18. In the modern periodic table, periods are the seven horizontal rows.

• Elements of group 18 of the modern periodic table are considered a noble gas.

Q4. Answer: (a) One

The pattern followed here is the number of letters in the alphabetic series in the given series under the condition that the letters should be between the letter that is fourth from the right end and the letter that is sixth from the left end of the given series.

So,

The sixth from the left end is R and the fourth from the right end is T.

The number of letters between R and T = R S T.

Here only one letter between R and T which is S.

Therefore, the correct answer is "one".

Q5. Answer: (c) Both the statements are false.

The correct answer is Both statements are false.

Key Points

• The chemical formula for baking soda is NaHCO3.

• Baking soda is a versatile ingredient whose uses extend far beyond cooking.

• This household staple shines when it comes to neutralizing odors and cleaning,

• Because it helps remove tough stains, eliminate foul odors, and clean difficult areas like the oven, microwave, and tile grout.

Important Points

• People who start to consume baking soda for health purposes should speak to a doctor first.

• The person who have kidney disease or high blood pressure should avoid sodium bicarbonate because it may increase sodium levels in the blood.

• Another side effects of sodium bicarbonate is headaches.

Q6. Answer: (a) less than 1.0 cm, erect

The correct answer is "less than 1.0 cm, erect".

Key Points

• In a convex mirror, there are only two cases for image formation which are given below,

• When an object is kept at infinity, the image is formed at focus and highly diminished.

• When an object is kept between infinity and pole, the image is formed between focus and pole and is smaller than an object.

• As in the given situation, we have a finite distance at which the object is kept so the second case is followed.

• Also, the image is smaller than the object, followed by option 1 only.

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• And in all two cases, an image formed will be erect.

• So, the image formed is less than 1 cm and erect.

Q7. Answer: (c) (8, 51, 9)

The logic followed here is:

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

Now,

(5, 21, 2)

→ (5 + 2) × 3

→ 7 × 3 = 21.

(7, 33, 4)

→ (7 + 4) × 3

→ 11 × 3 = 33.

Similarly, for (8, 51, 9)

→ (8 + 9) × 3

→ 17 × 3 = 51.

Hence, the correct answer is "Option 3".

Q8. Answer: (c) A number of field lines intersect at a given point inside a magnetic field.

The correct answer is A number of field lines intersect at a given point inside a magnetic field.

Key Points

• A freely suspended magnet always rests in a north-south direction because the north pole of the magnet lies in the geographic north direction and the south pole of the magnet lies in the geographic south direction. So it aligns itself in the N-S direction. As unlike poles attract and as poles repel.

• Magnetic field lines flow from the North pole to the South pole outside the magnet, while they flow from the South pole to the North pole inside the magnet.

• If magnetic field lines intersect each other, then at the intersection point there will be two directions of the same field which is not possible. Hence the field lines do not cross or intersect each other.

• Repulsion is a sure test for magnetism because to identify whether the rod or material is an iron rod, a magnet repulsion is the only way. This is because a magnet attracts an iron object and unlike poles repel each other.

Q9. Answer: (c) South

Drawing a diagram according to the given information,

• Sujlam started from a point facing towards the west, turned left and walked for 10 m.

• Then turned right and walked for 12 m.

• Then turned left and walked for 11 m.

• Then turned left again at point P and walked for 17 m.

So, he is facing south at point P.

Therefore, the correct answer is option 3.

Q10. Answer: (c) D

Given :

Product	A	B	C	D	E
Raw material	400	200	700	300	400
Manufacturing	80	40	150	80	100
Advertisement	180	70	200	170	200
Labour	200	180	400	140	250
Miscellaneous	40	10	50	10	50
Total cost	900	500	1500	700	1000

Concept used:

Ratio of X product=(Total cost)/Manufacturing

The Product has the least Ratio and also has the maximum manufacturing cost in comparison to its total cost of production.

Calculation:

=> Ratio of A product=900/80=11.25

=> Ratio of B product=500/40=12.5

=> Ratio of C product=1500/150=10

=> Ratio of D product=700/80=8.75

=> Ratio of E product=1000/100=10

Here, Ratio of D is least.

Hence, product 'D' has the maximum manufacturing cost in comparison to its total cost of production.

Q11. Answer: (d) 44

Decoding the information,

Sign	•	•	×	÷
Means	•	×	÷	•

Given:

24 + 16 ÷ 132 × 11 – 3

After replacing the signs and applying the BODMAS rule,

= 24 - 16 + 132 ÷ 11 × 3

= 24 - 16 + 12 × 3

= 24 - 16 + 36

= 24 + 20

= 44

So, the correct answer is option 4.

Q12. Answer: (b) Resin

The correct answer is Resin.

Key Points

• Xylem is a plant vascular tissue which carries water and dissolved minerals from the roots of the plants

• And also provides physical support to the plant.

• Xylem tissue dies after one year and then develops a new one.

• In plants, excretory products are stored in cellular vacuoles, in leaves that fall off, and in the old xylem as resins and gums.

• The main functions of the resin are to transfer stress between the reinforcing fibers, act as a glue to hold the fibers together, and protect the fibers from mechanical and environmental damage.

Additional Information

• Resin

• Resins can be produced through the bark of a tree.

• Resin are solid, semisolid ,water insoluble substance, Organic Substance.

• Resins are widely used in building as adhesives, coatings or as a construction material when a strong bond is required.

Q13. Answer: (c) 20 lakhs

The correct answer is 20 lakhs.

Key Points

• A constitutional status was given to the Panchayati Raj institutions in India throug the 73rd Constitutional Amendment Act in 1992.

• Article 243B was inserted into the Part IX of the Indian Constitution and deals with the Panchayati Raj institutions in every village, district, and state.

• As per Article 243B of the Indian Constitution, Panchayats at the intermediate level may NOT be constituted in a State having a population not exceeding 20 lakhs.

Q14. Answer: (c) 100%

Shortcut Trick

Let CP be x and SP be y.

Initial Profit = y − x. New SP = 2y.

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New Profit = 2y − x. Given: 2y − x = 3(y − x).

2y − x = 3y − 3x => 2x = y.

Profit % = [(SP − CP) ÷ CP] × 100 = [(2x − x) ÷ x] × 100 = 100%.

Therefore The correct answer is 100%.

Alternate Method

Given → Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100.

=> Let initial Cost Price (CP) = 100 and initial Profit = P.

=> Initial Selling Price (SP) = 100 + P.

=> New Selling Price = 2(100 + P) = 200 + 2P.

=> New Profit = (New SP − CP) = (200 + 2P) − 100 = 100 + 2P.

=> According to question, New Profit = 3 × P => 100 + 2P = 3P => P = 100.

=> Profit Percentage = (100 ÷ 100) × 100 = 100%.

Therefore The correct answer is 100%.

Additional Information

Profit and Loss Relationship

Profit occurs when Selling Price (SP) is greater than Cost Price (CP). Profit = SP − CP.

Percentage Calculation

Profit percentage is always calculated on the Cost Price unless stated otherwise. Profit% = (Profit ÷ CP) × 100.

Q15. Answer: (d) Baba Dyal Das

The correct answer is " Baba Dyal Das ".

Key Points

• Baba Dyal Das was the founder of the social reform movement for sikhism- the Nirankari movement.

• The motive of this movement was purification and return.

• He called for the return of Sikhism to its origin and emphasized the worship of one god.

• This approach means rejecting idolatry and prohibiting eating meat, drinking liquor, cheating, etc.

Q16. Answer: (a) ohm m

The correct answer is ohm m.

Key Points

• The ability of a material to resist the flow of electricity is measured by its resistivity.

• Resistivity is the reciprocal of conductivity and is also known as specific electrical resistance and volume resistivity.

• The formula for electrical resistivity is given as, ρ = RA/l where R, l, and A, are the resistance, length, and area of the cross-section of the material.

• The SI unit of resistivity is ohm m and can be expressed as ohm-cm in the CGS unit.

Additional Information

• A measure of resistance is any object's obstruction to the flow of electric current. The unit of resistance is the ohm.

• A resistor is an electrical component that is utilised in the circuit to provide that particular level of resistance.

• The electrical equipment used to measure electrical resistance is called an ohmmeter. When in resistance-measuring mode, multimeters also serve as ohmmeters.

• A substance's capacity to carry electricity is referred to as conductance or electrical conductance.

• Conductance is the reciprocal of resistance and has the unit, mho.

Q17. Answer: (a) 181203514

The position of letters according to alphabetic series is,

The logic followed here is,

• MUTINY is coded as 25149202113,

• MAGIC is coded as 397113,

• NECTAR is coded as,

Hence, the correct answer is option 1 i.e. 181203514".

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Q18. Answer: (c) Pushkar Fair

The correct answer is " Pushkar fair ".

Key Points

• Pushkar is one of the world's largest camel fair.

• It has become an important tourist attraction.

• Competitions such as matka phod, bridal competition, and longest moustache attract thousands of tourists.

• It is a 9 day long fair that takes place in Rajasthan.

Additional Information

• Kila Raipur sports festival is also known as the rural Olympics that takes place annually at Kila Raipur near Ludhiana Punjab.

• Hornbill festival is an annual festival celebrated in Nagaland.

• Thrissur Pooram festival is an annual Hindu temple festival held in Thrissur, Kerala.

Q19. Answer: (d) 823

The logic followed here is,

Thus, 823 will replace the question mark in the series.

Hence, the correct answer is Option (4).

Q20. Answer: (b) 2

The position value table is,

Forward pair : OP, DE

Backward pair : No pair found

There are two pairs: DE and OP

Thus, the correct answer is option 2 i.e. 2.

Q21. Answer: (c) the arithmetical mean of the atomic masses of the first and the third elements of the triad is equal to tha...

The correct answer is " the arithmetical mean of the atomic masses of the first and the third elements of the triad is equal to that of the second one ".

Key Points

• Dobereiner arranged the elements in increasing order of atomic masses.

• He found out that in a triad the atomic mass of the middle element is equal to the arithmetical mean of the first and third elements of the triad.

• eg:- Li, Na, K. The atomic mass of Li is 9 and K is 39. the average of the two numbers is 23 which is the atomic mass of Na.

Q22. Answer: (d) 13 February

The correct answer is " 13 February ".

Key Points

• Every year on 13 February, national women's day is celebrated in India.

• On this day, a celebrated revolutionary, politician, and poet Sarojini Naidu was born.

• This day is celebrated to honor every women who are making a contribution to nation-building.

Q23. Answer: (d) TGDP

The position of letters according to alphabetic series is,

The pattern followed here is,

• FINE : GKQI

• MOST : NQVX

• SEAL : TGDP

Hence, the correct answer is option 4.

Q24. Answer: (c) Ravi Kumar

The correct answer is " Ravi Kumar ".

Key Points

• Ravi Kumar received the Major Dhyan Chand Khel Ratna Award 2021 in the wrestling discipline.

• He also won a silver medal in the 2020 Tokyo Olympics.

• He is also a three times Asian champion in wrestling.

Additional Information

• Nishad Kumar is an Indian Paralympian and high jumper.

• Sharad Kumar is an Indian para high jumper.

• Suhash Yathiraj is an Indian para badminton player.

Q25. Answer: (d) First week of July

The correct answer is " First week of July ".

Key Points

• During a normal monsoon year, the monsoon winds reach Punjab, western Uttar Pradesh, and Haryana in the first week of July.

• The monsoon winds are pulsating in nature and are affected by several atmospheric conditions.

• The duration of monsoon is usually between 100- 120 days.

• It starts from early June to mid-September.

Q26. Answer: (b) 120°

Shortcut Trick

Sum of ratio parts = 2 + 5 + 7 + 10 = 24 units.

Total sum of angles in a quadrilateral = 360°.

Value of 1 unit = 360° ÷ 24 = 15°.

Difference between greatest (10) and smallest (2) ratio parts = 10 − 2 = 8 units.

Required difference = 8 × 15° = 120°.

Therefore The correct answer is 120°.

Alternate Method

Given:

Ratio of angles of the quadrilateral = 2 : 5 : 7 : 10

Formula Used:

Sum of all interior angles of a quadrilateral = 360°

Calculations:

Let the angles of the quadrilateral be 2x, 5x, 7x, and 10x.

=> 2x + 5x + 7x + 10x = 360°

=> 24x = 360°

=> x = 360° ÷ 24

=> x = 15°

=> Smallest angle = 2x = 2 × 15° = 30°

=> Greatest angle = 10x = 10 × 15° = 150°

=> Difference = 150° − 30° = 120°

Therefore The correct answer is 120°.

Additional Information

Angle Sum Property of Polygons

The sum of interior angles of any n-sided polygon is given by the formula (n − 2) × 180°.

Cyclic Quadrilateral

In a cyclic quadrilateral, the sum of opposite angles is always 180° (supplementary).

Parallelogram Properties

In a parallelogram, opposite angles are equal and adjacent angles are supplementary (sum to 180°).

Q27. Answer: (d) Mysuru

The correct answer is " Mysuru ".

Key Points

• The Central Institute of Indian Languages is an Indian research and teaching Institute situated in Mysuru.

• It was founded on 17 July 1969.

• It is the part of language bureau of the Ministry of Human Resource development.

• The aim of the institute is to protect and document minor, minority and tribal languages.

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Q28. Answer: (d) 10 years

Shortcut Trick

For a sum of money to double itself, the Simple Interest earned must be equal to the Principal (100%).

Shortcut Formula: Time (T) = 100 ÷ Rate (R)

=> Time = 100 ÷ 10

=> Time = 10 years

Therefore The correct answer is 10 years.

Alternate Method

Given:

Let the Principal (P) = Rs. 100

Since the sum doubles itself, the Amount (A) = Rs. 200

Rate (R) = 10% per annum

Formula Used:

Simple Interest (SI) = Amount − Principal

Simple Interest (SI) = (P × R × T) ÷ 100

Calculations:

=> Simple Interest (SI) = 200 − 100 = Rs. 100

=> 100 = (100 × 10 × T) ÷ 100

=> 100 = 10 × T

=> T = 100 ÷ 10

=> T = 10 years

Therefore The correct answer is 10 years.

Additional Information

Sum n-times itself (Simple Interest)

If a sum becomes n times itself in T years at R%, then: R × T = (n − 1) × 100.

Compound Interest Doubling (Rule of 72)

For Compound Interest, a sum doubles approximately in T ≈ 72 ÷ R years.

Amount Formula

Amount (A) = Principal (P) × [1 + (R × T) ÷ 100] for Simple Interest.

Q29. Answer: (c) Narmada River

The correct answer is " Narmada river ".

Key Points

• Sardar Sarovar Dam was constructed in the village of Kevadiya in Gujarat.

• It was developed over the Narmada river.

• The dam was inaugurated in 2017 by the prime minister of India.

• The dam was constructed to provide water and electricity to four Indian states: Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan.

Additional Information

• The Bhakra Nangal dam is built across the Sutlej river in Punjab.

• There are approx. 24 dams and projects built on river Ganga.

• The Hirakund dam is built across the Mahanadi river.

Q30. Answer: (a) 307

The logic followed here is,

Hence, "307" is the correct answer.

Q31. Answer: (d) 11

Given that:

From the diagram, we can conclude, No. of babies who are neither premature nor preterm =11.

Hence, the correct answer is "Option 4".

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Q32. Answer: (d) Only (iii)

The correct answer is Only (iii).

Key Points

• A current-carrying conductor encounters a force that is perpendicular to both the field and the direction of the current flow when it is exposed to an external magnetic field.

• When a current-carrying conductor is placed in a magnetic field, the direction of the force acting on it can be determined using Fleming's Left Hand Rule.

• The method of changing the direction of the current can be used to change the direction of the force on a current carrying conductor.

• The direction of force on a current carrying conductor can be reversed by reversing the direction of the current.

Q33. Answer: (b) 6 years

Shortcut Trick

Total age of 2 people = Average × 2 = 8 × 2 = 16 years.

Sister's age = Total age − Raj's age = 16 − 10 = 6 years.

Therefore The correct answer is 6 years.

Alternate Method

Given: Average age of Raj and Sister = 8 years; Raj's age = 10 years.

Formula Used: Average = Sum of observations ÷ Number of observations

=> (Raj's Age + Sister's Age) ÷ 2 = 8

=> 10 + Sister's Age = 8 × 2

=> 10 + Sister's Age = 16

=> Sister's Age = 16 − 10

=> Sister's Age = 6 years

Therefore The correct answer is 6 years.

Additional Information

Sum of Observations

The total sum can always be calculated as Sum = Average × Number of terms.

Average Age Property

If every person's age increases by 'n' years, the average also increases by exactly 'n' years.

Weighted Average

Used when two groups with different averages are combined: (n1A1 + n2A2) ÷ (n1 + n2).

Q34. Answer: (b) University of Oulu, Finland

The correct answer is University of Oulu, Finland.

Key Points

• In January 2022, Jio Platforms (JPL) signed a pact with the University of Oulu, Finland undertaking research and standardization related activities in 6G technology.

• JPL and the University of Oulu will work together on research and development projects in the fields of holographic beamforming, aerial and space communication, and 3D-connected intelligence in cybersecurity, microelectronics, and photonics.

• Together, JPL and the Oulu University will be better able to compete with 6G enabled items in the military, automotive, white goods, industrial machinery, consumer goods, efficient manufacturing, innovative surroundings for personal smart devices, and experiences like urban computing and autonomous traffic situations.

Additional Information

• The Indian Institute of Science (IISc) is a public, deemed, research university providing higher education and research in science, engineering, design, and management.

• IISc is situated in Bangalore, in the state of Karnataka in India. Jamsetji Tata actively encouraged the establishment of the institution, which is why it is also known locally as the "Tata Institute" and it was founded in 1909. In 1958, it received the designation as a deemed university, and in 2018, it received the designation as an Institute of Eminence status.

• Built on the abilities and objectives of seven Catalan research centres of excellence, the Barcelona Institute of Science and Technology (BIST) is a preeminent institution of multidisciplinary research and was established in 2015.

• BIST plays a key role in advancing the boundaries of science by encouraging collaboration among the members of its broad scientific community. It has also established itself as a global leader in developing top-notch research talent.

• The federal organisation in charge of supporting health and medical research in Canada is known as the Canadian Institutes of Health Research (CIHR) and it was established in 2000. It is the successor to the Canadian Medical Research Council and

consists of 13 institutes.

• As part of the federal government's engagement in health research, CIHR provides grants, fellowships, scholarships, and other financial aid to more than 13,000 researchers and trainees.

Q35. Answer: (b) Statement I weakens the decision and statement II strengthens the decision

Decision:

• In order to promote tourism, country W is declaring 20 of its cities as Heritage Sites.

Statements:

1. 4 of the 20 cities are located in hilly areas and have limited access to transport. → Weakens the decision.

• As there is limited access to transport so it becomes difficult for tourists to reach there. Therefore this statement weakens the decision.

2. In the past whenever a city in Country W has been promoted for tourism, it has led to increased employment opportunities in that city. → Strengthens the decision.

• As employment is provided, people earn more money, which will increase countries' economies.

Therefore, the correct answer is option 2.

Q36. Answer: (d) 876147

Given →Letter/Symbol and their codes:-

Letter / Symbol	I	L	M	H	Y	O	C	E	R
Code	4	5	9	1	2	3	6	7	8

Conditions for coding the group elements,

S.no.	Condition	Result
1	If the first element is a vowel and the last, is a consonant.	The code for the first and last element are to be interchanged.
2	If the first element is a consonant and the last, a vowel.	The first and last elements are to be coded as 0.
3	If both the second and the fifth elements are vowels.	The fifth element is to be coded as the code for the second element and vice-versa.

In EICHER :-

Condition 1: Follow → First element is a vowel and the last, is a consonant. Therefore, the code for the first and last elements are to be interchanged.

Condition 2: Doesn't follow → the First element is not consonant and the last is not a vowel.

Condition 3: Follows → Second element is a vowel and the fifth element is also a vowel.

Thus, the code for EICHER after condition 1 is : 846177.

The code for EICHER after condition 3 is 876147.

Hence, the correct answer is " Option 4".

Q37. Answer: (a) 1

The position value table is,

Thus, there is one pair i.e. "AB".

Hence, the correct answer is option 1.

Q38. Answer: (a) 1357

Shortcut Trick

Find prime factors of 1771 by dividing by primes (7, 11, 13...): 1771 = 7 × 11 × 23.

Identify the third prime in ascending order: P3 = 23.

Find the fourth prime using the sum condition: P4 = 82 − 23 = 59.

Calculate the final product: 23 × 59 = 1357.

Therefore The correct answer is 1357.

Alternate Method

Given:

Product of first three prime numbers (P1 × P2 × P3) = 1771

Sum of last two prime numbers (P3 + P4) = 82

Calculations:

=> Step 1: Factorize 1771 into prime factors.

=> 1771 ÷ 7 = 253

=> 253 ÷ 11 = 23

=> 23 ÷ 23 = 1

=> Prime factors in ascending order are 7, 11, and 23. Thus, P1 = 7, P2 = 11, P3 = 23.

=> Step 2: Find the fourth prime number P4.

=> P3 + P4 = 82

=> 23 + P4 = 82

=> P4 = 82 − 23 = 59 (which is a prime number).

=> Step 3: Calculate the product of the last two prime numbers.

=> Product = P3 × P4 = 23 × 59

=> 23 × 59 = 23 × (60 − 1) = 1380 − 23 = 1357

Therefore The correct answer is 1357.

Additional Information

Prime Numbers and Factorization

A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself. Every composite number can be uniquely represented as a product of primes.

Divisibility Rule for 11

A number is divisible by 11 if the difference between the sum of digits at odd positions and the sum of digits at even positions is either 0 or a multiple of 11.

Ascending Prime Sequences

In problems involving consecutive or ascending primes, always start by testing the smallest odd primes (3, 5, 7, 11...) to factorize large products.

Q39. Answer: (c) 13/55

Given : 0.23636...

Calculation:

Let's write the recurring decimal in fraction form

X = Multiply X by 10

10X = 2.3636... ..... (1)

1000x = 236.3636... .....(2)

Subtract (2) from (1)

=> 1000X - 10X =236.3636...-2.3636...

=> 990X=234

=> X =234/990

=> X=13/55

Hence, the answer is ' 13over 55 '.

Q40. Answer: (c) 3x2 - 6x - 24 = 0

Shortcut Trick

The sum of roots is −2 + 4 = 2 and the product of roots is −2 × 4 = −8.

Check options for −b/a = 2 and c/a = −8.

For the given correct option: −(−6)/3 = 2 and −24/3 = −8.

Therefore The correct answer is 3x2 − 6x − 24 = 0.

Alternate Method

Given: Roots of the quadratic equation are α = −2 and β = 4.

Formula Used: A quadratic equation with roots α and β is given by x2 − (α + β)x + αβ = 0.

=> Sum of roots (α + β) = −2 + 4 = 2

=> Product of roots (αβ) = −2 × 4 = −8

=> Substituting these values in the formula: x2 − (2)x + (−8) = 0

=> x2 − 2x − 8 = 0

=> To match the given options, multiply the entire equation by 3:

=> 3(x2 − 2x − 8) = 3(0)

=> 3x2 − 6x − 24 = 0

Therefore The correct answer is 3x2 − 6x − 24 = 0.

Additional Information

Standard Form 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

The nature is determined by the 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.

Equation Formation

Any quadratic equation can be represented as k[x2 − (Sum)x + (Product)] = 0, where k is a non-zero constant.

Q41. Answer: (a) Contractile vacuole

The correct answer is Contractile vacuole.

Key Points

• An amoeba, also known as an amoeboid, is a unicellular organism having the capacity to change its shape, typically through extending and retracting pseudopods.

• Osmoregulation in protists and unicellular algae is carried out by an organelle known as a contractile vacuole, sometimes referred to as a pulsatile or pulsating vacuole.

• Amoeba has contractile vacuoles that aid in osmoregulation by regulating water balance and controlling how much water a cell contains.

• The contractile vacuole functions as a component of a defence mechanism that stops the cell from absorbing an excessive amount of water and enables lysing due to an excessive amount of internal pressure.

Additional Information

• Having a digestive role, the food vacuole is a membrane-enclosed sac. Unicellular protozoans including amoebas, plasmodium, and others contain it.

• By digesting the food that has been consumed, food vacuoles function as an intracellular stomach. Digestive enzymes in it help break down the meal so that it can be used by the body and then released into the cytoplasm.

• Cytoplasm is the name given to the substance that fills up the cells. It includes additional organelles suspended in the cytosol as well as filaments, ions, proteins, and macromolecular structures in the cytosol of the cell.

• Cells' ability to maintain their turgidity, which allows them to hold their shape, is one of the fundamental roles played by cytoplasm.

• A flexible, lipid bilayer called the plasma membrane encloses and shields the cell's cytoplasm.

• Between the interior organelles of the cell and the external environment, the plasma membrane serves as a physical barrier. It is a selectively permeable membrane, allowing only a limited number of molecules to enter and exit the cell.

Q42. Answer: (d) Andhra Pradesh

The correct answer is " Andhra Pradesh ".

Key Points

• The first Green Hydrogen Microgrid Project was started in NTPC Simhadri, Andhra Pradesh.

• This is India's first green hydrogen-based energy storage project.

• The hydrogen will be produced using advanced 240 kW solid oxide electrolyser by taking input power from the nearby floating solar project.

• The hydrogen will be produced during day and stored at high pressure for its use by a 50 kW solid oxide fuel cell.

• The system will work from 5 pm to 7 am.

Q43. Answer: (c) CRPPTSCP

Given : P_T P_S_C T_R S P C_P R_P_T_R S

By checking options :

1. CRPCSPPT → PCTPRS/ PC TCRS /P CSP RP/ PPTTR S → (It doesn't Follows the pattern)

2. CSPCRPTP → PCTPSS/ PC TCRS /P CRP RP/ PTTPR S → (It doesn't Follows the pattern)

3. CRPPTSCP → PCTPRS/ PC TPRS /P CTPRS/ PCTPR S → ((It follows the pattern of : PCTPRS - PCTPRS - PCTPRS - PCTPRS)

4. CCPPPRST → PCTPCS/ PCTPRS /P CPP RR/ PSTTR S → (It doesn't Follows the pattern)

Hence, "CRPPTSCP" is the correct answer.

Q44. Answer: (a) 8

The correct answer is " 8 ".

Key Points

• The factory act was for improving the conditions of the children working in the factories.

• The factory act was applied in 1948.

• The factory act has been amended 8 times:- 1949, 1950, 1951, 1954, 1970, 1976, 1987 and 2022.

Q45. Answer: (d) 54

Decoding the information,

Sign	•	•	×	÷
Mean	•	×	÷	•

Given:

28 – 2 + 80 × 5 ÷ 14

After replacing the signs and applying the BODMAS rule,

28 × 2 - 80 ÷ 5 + 14

= 28 × 2 - 16 + 14

= 56 - 16 + 14

= 56 - 2

= 54

Hence, "54" is the correct answer.

Q46. Answer: (b) Errors in DNA copying

The correct answer is Errors in DNA copying.

Key Points

• DNA is the molecule that contains the genetic information necessary for an organism to develop and function.

• A single original DNA molecule is split into two identical copies through a biological process known as DNA copying or DNA replication.

• By creating variations during sexual reproduction, DNA copying contributes to evolution.

• There are chances of making errors in DNA copying during sexual reproduction, and these errors during DNA replication lead to variations that encourages diversity during evolution and aids in species survival.

Q47. Answer: (c) -1/4

Given:

-48 ÷ [4 × (6 - 5 + 1)] ÷ 24

using the BODMAS rule,

= -48 ÷ [4 × (6 - 5 + 1)] ÷ 24

= -48 ÷ [4 × 2] ÷ 24

= -48 ÷ 8 ÷ 24

= -6 ÷ 24

= -textbf1/4

Hence, “ -textbf1/4 ” is the correct answer.

Q48. Answer: (a) Graphite

The correct answer is Graphite.

Key Points

• The allotrope of carbon, graphite is used as a dry lubricant.

• Graphite is slippery in nature and offers lubrication at high temperatures. It is, thus, used as a dry lubricant and is mostly preferred better than liquid and oil lubricants.

• Graphite as a dry lubricant has applications in the food industry, air compressors, machine shop works, lubricating locks, piano actions, ball bearings, open gears, brass instrument valves, etc.

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Additional Information

• The atoms of diamond are grouped in a crystal structure known as diamond cubic, and it is a solid form of the element carbon. Because of its superior hardness and thermal conductivity compared to other natural materials, diamond is frequently employed in high-tech industrial products like cutting and polishing equipment.

• Coke is produced through the destructive distillation process of heating coal or oil without the presence of air, resulting in a grey, hard, and porous fuel with a high carbon content and minimal impurities. When air pollution is a concern, it is also utilised as a fuel in stoves and forges and is a significant industrial product.

• The brownish black sedimentary rock known as coal is combustible and is formed in rock strata known as coal seams. Coal is created when decomposing plant matter turns into peat and is then transformed into coal by the heat and pressure of deep burial over the course of millions of years.

Q49. Answer: (a) (17, 23)

Shortcut Trick

Co-prime numbers are pairs of numbers whose HCF is 1.

Check the options: (14, 21) are div. by 7; (12, 24) are div. by 12; (15, 25) are div. by 5.

In pair (17, 23), both are prime numbers, so their only common factor is 1.

Therefore The correct answer is (17, 23).

Alternate Method

Given: Pairs of numbers to identify co-primality.

Formula Used: Two numbers a and b are co-prime if HCF(a, b) = 1.

=> Case 1: Factors of 17 = 1, 17; Factors of 23 = 1, 23. Common factor = 1. (Co-prime)

=> Case 2: Factors of 14 = 1, 2, 7, 14; Factors of 21 = 1, 3, 7, 21. Common factors = 1, 7. (Not co-prime)

=> Case 3: Factors of 12 = 1, 2, 3, 4, 6, 12; Factors of 24 = 1, 2... 12, 24. Common factors include 12. (Not co-prime)

=> Case 4: Factors of 15 = 1, 3, 5, 15; Factors of 25 = 1, 5, 25. Common factors = 1, 5. (Not co-prime)

Therefore The correct answer is (17, 23).

Additional Information

Prime Numbers Property

Any two distinct prime numbers are always co-prime to each other because they only have 1 as a common factor.

Consecutive Numbers

Any two consecutive natural numbers (e.g., 8 and 9) are always co-prime.

HCF of Co-prime Numbers

The Highest Common Factor (HCF) of two co-prime numbers is always 1, and their LCM is always their product (a × b).

Q50. Answer: (a) Post and Telegram

The correct answer is " Post and Telegram ".

Key Points

• The function of the legislative is to form policies and laws that will govern the nation.

• The Union Parliament is chiefly concerned with this function.

• To ensure that these functions are duly followed, Constitution of India provides for two houses, Lok Sabha or the Lower House and Rajya Sabha or the Upper House.

• The union legislature can make laws for railways, post and telegrams.

Additional Information

• The laws for prison are made by the state government.

• The laws for agriculture are made and maintained by the central government.

Q51. Answer: (b) 63

Shortcut Trick

Ratio difference = 5 − 3 = 2 units.

Given difference 2 units = 42 → 1 unit = 21.

Smaller number = 3 units = 3 × 21 = 63.

Therefore The correct answer is 63.

Alternate Method

Given:

Ratio of numbers = 5 : 3

Difference between numbers = 42

Calculation:

=> Let the numbers be 5x and 3x.

=> 5x − 3x = 42

=> 2x = 42

=> x = 42 ÷ 2 = 21

=> Smaller number = 3x = 3 × 21

=> Smaller number = 63

Therefore The correct answer is 63.

Additional Information

Ratio and Proportion

If two numbers are in the ratio a : b, they can be represented as ax and bx, where x is the highest common factor (HCF).

Difference Rule

The difference between the numbers is |a − b| × x. In this case, (5 − 3) × 21 = 42.

Sum of Numbers

The sum of the numbers can be calculated as (a + b) × x. Here, (5 + 3) × 21 = 168.

Q52. Answer: (a) 1

According to the given information,

Statement: Q = R > S ≤ T < U > V = Z

Conclusions:

1. U > S → True (As Q = R > S ≤ T < U > V = Z → U > S satisfy the given equation).
2. Q < T → False (As Q = R > S ≤ T < U > V = Z → There is no direct relationship between Q and T).
3. S < V → False (As Q = R > S ≤ T < U > V = Z → There is no direct relationship between S and V).
4. Z > U → False (As Q = R > S ≤ T < U > V = Z → There is no direct relationship between Z and U).

Hence, conclusion "1" only follows.

Therefore, the correct answer is option 1.

Q53. Answer: (b) 16

Given that:

From the diagram, we can conclude, No. of people using both Sony and Dell laptops = 10 + 6 = 16.

Hence, the correct answer is "16".

Q54. Answer: (c) 18 December

The correct answer is " 18 December ".

Key Points

• National Minorities Rights Day is commemorated on December 18 every year in India.

• Its aim is to safeguard the individual rights of the religious, ethnic, racial, or linguistic minorities in the country.

• This day is a reminder about the rights of minorities and to raise awareness about it.

• Minority Rights Day in India is commemorated by conducting debates and seminars on topic related to minority communities.

Additional Information

• The National Commission for Minorities celebrated the Minorities Rights Day.

• The United Nations on December 18, 1992 adopted and broadcast the Statement on the individual's Rights belonging to Religious or Linguistic National or Ethnic Minorities.

• National Commission on Minorities Act 1992 has recognized 6 minority communities that is Muslims, Christians, Sikhs, Buddhists, Parsis, and Jains.

Q55. Answer: (d) Go Digital, Go Secure

The correct answer is " Go Digital, Go Secure".

Key Points

• RBI selected the theme " Go Digital, Go Secure" for Financial Literacy week of 2022.

• Reserve Bank of India (RBI) has been conducting Financial Literacy Week (FLW) every year since 2016 to propagate financial education messages on a particular theme across the country.

Additional Information

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• The FLW 2019 was focused on “Farmers”.

• The FLW 2020 was focused on “MSMEs”.

• The FLW 2021 was focused on “Credit Discipline and Credit from Formal Institutions”.

Q56. Answer: (b) dovish

The correct answer is " Dovish ".

Key Points

• Doves tend to support low-interest rates and an expansionary monetary policy because they value indicators like low unemployment over keeping inflation low.

• If an economist suggests that inflation has few negative effects or calls for quantitative easing, then they are called a dove or labeled as dovish.

Additional Information

• Accommodative monetary policy is a strategy used by central banks that is aimed at keeping interest rates low in order to infuse more cash into the economy to boost growth and maintain or reduce unemployment.

• neutral is the federal funds rate that neither stimulates nor restrains economic growth.

• A hawkish Fed will assume an aggressive stance that prioritizes keeping inflation low or getting it lower. It’s likely to raise interest rates even if that causes job losses. Hawks are focused on inflation. They favor raising interest rates to restrict the supply of money.

Q57. Answer: (a) It decreased

The correct answer is It decreased.

Key Points

• The pH scale measures how acidic or alkaline a substance is.

• A pH scale has a range of 0 to 14. An acidic solution has a pH less than 7 while an alkaline solution has a pH more than 7. The solution with pH 7 is neutral, that is, its neither acidic or basic.

• When the temperature is increased, the degree of decomposition in acidic solution increases, this eventually lowers or decreases the pH of the solution

• Thus, when Babu took some quantity of dilute nitric acid in a test tube and heated the test tube at 70°C for about 10 minutes, the pH of nitric acid decreases with increase in temperature.

Q58. Answer: (d) Navin

The correct answer is Navin.

Key Points

• An element that is more reactive displaces an element that is less reactive from its compound in a chemical reaction is known as a displacement reaction.

• A list of metals arranged in descending order of reactivity is called the reactivity series. The metals that are most reactive are at the top, while the least reactive are at the bottom.

• When two metals are arranged in a series, the metal at the top of the reactivity series has the ability to remove the lower metals from their salt solution.

• Magnesium is at the top of the reactive series and is more reactive compared to platinum, copper, and silver.

• Also, copper is more reactive when compared to platinum and silver, and less reactive elements cannot displace a more reactive element like copper.

• Thus, when Navin took a beaker containing some aqueous solution of CusO4 and added a piece of magnesium strip in it, the more reactive element, magnesium will displace the less reactive element, copper, forming magnesium sulfate.

Q59. Answer: (c) Tamil Nadu

The correct answer is " Tamil Nadu ".

Key Points

• Tamil Nadu tops the list of states with the largest installed wind power generation capacity in the country.

• Share of wind power in electricity generation was around 28% in 2018.

• Total wind capacity at the end of 2018 stood at 8,631 MW while its total installed electricity generation capacity stood at 30,447 MW at the end of 2018.

Q60. Answer: (d) Costs on animal food

The correct answer is " Costs on animal food ".

Key Points

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• Cost generally refers to the expenses incurred on inputs required for production of commodities- crops, live-stock etc.

• Inputs required are labour, seeds, manures and fertilizers, land, pesticides, diesel, electricity, irrigation water, feeds, fodders, medicines etc.

• Crop production is the process of growing crops for domestic and commercial purposes.

• cost in the crop production can include that cost of the seeds, fertilizers, pesticides and various other farming tools.

Q61. Answer: (d) 3 is sitting between 5 and 1.

Given:

1) Five students- 1, 2, 3 ,4 and 5- are sitting around a circular table facing the centre.

2) 4 is sitting to the immediate right of 1 and immediate left of 2.

3) 5 is sitting second to the left of 1.

So, only 3 is sitting between 1 and 5.

Therefore, the correct answer is option 4.

Q62. Answer: (d) North-west

Drawing diagram according to the given information,

1) Pole E is to the north of pole U and east of pole R.

2) Pole N is to the west of pole U and east of pole I. Pole J is to the south of pole I.

So, the position of pole R with respect to pole U is North-west.

Therefore, the correct answer is option 4.

Q63. Answer: (d) 8

Shortcut Trick

The ratio of the sum of interior angles to an exterior angle of a regular polygon is given by the formula: n(n − 2) / 2.

Given ratio = 24 : 1

=> n(n − 2) / 2 = 24

=> n(n − 2) = 48

By testing factors: 8 × (8 − 2) = 8 × 6 = 48.

The number of sides n = 8.

Therefore The correct answer is 8.

Alternate Method

Given:

Ratio of Sum of Interior Angles to Exterior Angle = 24 : 1

Formula Used:

Sum of all interior angles = (n − 2) × 180°

Each exterior angle of a regular polygon = 360° / n

Calculations:

=> [(n − 2) × 180°] / [360° / n] = 24 /

Q64. Answer: (c) displacement reaction

The correct answer is displacement reaction.

Key Points

• A displacement reaction occurs when an atom or group of atoms in a molecule are replaced by another atom.

• Metals are arranged in descending order of their reactivities to form a series known as the activity series or reactivity series.

• There are two types of displacement reaction: single displacement reaction and double displacement reaction.

• One element is replaced by another in a compound in a single displacement reaction while double displacement reactions happen when a portion of two ionic compounds is transferred, resulting in the creation of two new compounds.

• When chlorine gas reacts with a potassium iodide solution, chlorine displaces iodine to form potassium chloride and iodine.

Additional Information

• Any reaction in which two or more chemicals combine to create a single new substance is referred to as a combination reaction.

• The chemical reaction in which one reactant splits into two or more products is called a decomposition reaction.

• When reactant ions switch positions to create new products, the reaction is referred to as a double displacement reaction.

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Q65. Answer: (b) 20

Given:

Here given the number of admissions for districts A,B,C,D,E,F in the given interval (2014-2016)

Calculation:

Total number of admissions in the district of B for the three year (2014-2016) = (80+120+140) = 340.

Total number of admissions in district E for the year (2014 and 2015) = (150+210) = 360.

Therefore the difference of admission is (360 - 340)=20.

Hence the correct answer is 20.

Q66. Answer: (b) 1

Shortcut Trick

Substitute a convenient value for θ.

Let θ = 0°.

Value = $(1 + \tan^2 0°) \times (1 - \sin 0°) \times (1 + \sin 0°)$

=> $(1 + 0) \times (1 - 0) \times (1 + 0) = 1 \times 1 \times 1 = 1$

Therefore The correct answer is 1.

Alternate Method

Given:

Expression: $(1 + \tan^2 \theta)(1 - \sin \theta)(1 + \sin \theta)$

Formula Used:

1) $\sec^2 \theta - \tan^2 \theta = 1 \Rightarrow 1 + \tan^2 \theta = \sec^2 \theta$

2) $(a - b)(a + b) = a^2 - b^2$

3) $\sin^2 \theta + \cos^2 \theta = 1 \Rightarrow 1 - \sin^2 \theta = \cos^2 \theta$

4) $\sec \theta \times \cos \theta = 1$

Calculations:

=> $(1 + \tan^2 \theta) \times [(1 - \sin \theta)(1 + \sin \theta)]$

=> $\sec^2 \theta \times (1 - \sin^2 \theta)$

=> $\sec^2 \theta \times \cos^2 \theta$

=> $(\sec \theta \times \cos \theta)^2$

=> $(1)^2 = 1$

Therefore The correct answer is 1.

Additional Information

Trigonometric Identities

The three fundamental Pythagorean identities are $\sin^2 \theta + \cos^2 \theta = 1$, $1 + \tan^2 \theta = \sec^2 \theta$, and $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$.

Reciprocal Relations

Reciprocal pairs of trigonometric functions are (sin θ, cosec θ), (cos θ, sec θ), and (tan θ, cot θ), whose products always equal 1.

Q67. Answer: (d) 20

Shortcut Trick

Substitute a = 2 directly into the expressions to find the first three terms.

First term = 4(2) + 7 = 15; Second term = 11(2) + 3 = 25; Third term = 6(2) = 12.

Fourth proportional x = (Second × Third) ÷ First.

x = (25 × 12) ÷ 15 = 300 ÷ 15 = 20.

Therefore The correct answer is 20.

Alternate Method

Given: a = 2. Terms are 4a + 7, 11a + 3, and 6a.

Formula: If A, B, C, D are in proportion, then A/B = C/D or D = (B × C) / A.

=> First proportional (A) = 4(2) + 7 = 8 + 7 = 15

=> Second proportional (B) = 11(2) + 3 = 22 + 3 = 25

=> Third proportional (C) = 6(2) = 12

=> Let the fourth proportional be x.

=> 15/25 = 12/x

=> 3/5 = 12/x

=> 3x = 12 × 5

=> x = 60 ÷ 3 = 20

Therefore The correct answer is 20.

Additional Information

Third Proportional

If A, B, C are in continued proportion, then A:B = B:C. The third proportional C = $B^2 \div A$.

Mean Proportional

The mean proportional between two numbers A and B is given by $\sqrt{(A \times B)}$.

Product Rule of Proportion

In a proportion A:B :: C:D, the product of extremes (A × D) is always equal to the product of means (B × C).

Q68. Answer: (d) Monday

Drawing the diagram according to the given information,

1) A, B, C, D, E, F, and G want to play a video game they purchased together. Each will get it on one day of the same week starting from Monday and ending on Sunday. No one gets it on same day of the week.

2) A will play on Sunday.

Days	Persons
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	
Sunday	A

3) D will play immediately before A.

Days	Persons
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	D
Sunday	A

4) B will play immediately after E. E will play on Wednesday.

Days	Persons
Monday	
Tuesday	
Wednesday	E
Thursday	B
Friday	
Saturday	D
Sunday	A

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5) C will not get it on Monday. F gets it on a day between B and D.

Days	Persons
Monday	G
Tuesday	C
Wednesday	E
Thursday	B
Friday	F
Saturday	D
Sunday	A

So, on Monday G will get to play.

Therefore, the correct answer is option 4.

Q69. Answer: (c) 260

Shortcut Trick

Identify the highest frequency from the data: 34.

The class interval with the highest frequency is the Modal Class: 130 − 140.

The Lower Limit (L) of this modal class is 130.

Calculate the double of the lower limit: 2 × 130 = 260.

Therefore The correct answer is 260.

Alternate Method

Given: Frequency distribution with Class Intervals (CI) and Frequencies (F).

=> Compare the frequencies: 12, 15, 32, 34, and 22.

=> The maximum frequency is 34.

=> Therefore, the modal class is the interval corresponding to 34, which is 130 − 140.

=> In the class interval 130 − 140, the lower limit (L) = 130 and the upper limit (U) = 140.

=> Double of the lower limit = 2 × L

=> Required Value = 2 × 130 = 260.

Therefore The correct answer is 260.

Additional Information

Modal Class

It is the class interval in a frequency distribution that contains the highest frequency.

Mode of Grouped Data

The mode is calculated using the formula: Mode = L + [(f1 − f0) / (2f1 − f0 − f2)] × h, where L is the lower limit of the modal class and h is the class width.

Class Limits

For a class interval a − b, a is called the lower limit and b is called the upper limit.

Q70. Answer: (c) 162

Shortcut Trick

For two numbers a and b, the third proportional is calculated as $b^2 \div a$.

Given: a = 18 and b = 54.

Third Proportional = (54 × 54) ÷ 18

=> 3 × 54 = 162.

Therefore The correct answer is 162.

Alternate Method

Given:

First number (a) = 18

Second number (b) = 54

Formula Used:

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

Calculations:

=> 18/54 = 54/x

=> 1/3 = 54/x

=> x = 54 × 3

=> x = 162

Therefore The correct answer is 162.

Additional Information

Mean Proportional

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

Fourth Proportional

For three numbers a, b, and c, the fourth proportional d is such that a : b = c : d, which means d = (b × c) ÷ a.

Continued Proportion

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

Q71. Answer: (a) the chromosomes present in sperm

The correct answer is the chromosomes present in sperm.

Key Points

• Chromosomes in humans come in 23 pairs. Out of these 23 pairs, 22 pairs are autosomes, and the only pair that actively participates in determining sex is the sex chromosome.

• There are two sets of sex chromosomes in both males and females. There are one X and one Y (XY) sex chromosome, both of which are active, present in males while in females one of the two active X (XX) sex chromosomes is present.

• The sex of a person is determined by the chromosomes present in the sperm of father.

• If the female's ovum having X chromosome receives a sperm carrying Y chromosome from the, then the offspring will be male while if the female's ovum having X chromosome receives a sperm carrying Y chromosome, then the offspring will be female.

Q72. Answer: (b) Multi-party system

The correct answer is "Multi-party system".

Key Points

• India is a democratic country and every person has an equal right to express themselves.

• India have a multi-party system.

• More than two parties have a reasonable chance of coming to power either on their own strength or in alliance with others.

• People can elect their representative according to their choice.

Additional Information

• In one-party system, only one party is allowed to control and run the government. for eg- China

• In second-party system, only two main parties are allowed to run the government. for eg- United States of America

Q73. Answer: (b) 44%

Shortcut Trick

Cross-multiplication method: Quantity × Price.

CP side: 5 (Price) × 5 (Quantity) = 25.

SP side: 6 (Price) × 6 (Quantity) = 36.

Profit = 36 − 25 = 11.

Profit% = (11 ÷ 25) × 100 = 44%.

Therefore The correct answer is 44%.

Alternate Method

Given → CP of 6 pencils = Rs. 5 | SP of 5 pencils = Rs. 6.

Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100.

=> To compare, make the quantity of pencils the same (LCM of 5 and 6 = 30).

=> Cost Price (CP) of 30 pencils = 5 × 5 = Rs. 25.

=> Selling Price (SP) of 30 pencils = 6 × 6 = Rs. 36.

=> Profit = 36 − 25 = Rs. 11.

=> Profit percentage = (11 ÷ 25) × 100 = 44%.

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Therefore The correct answer is 44%.

Additional Information

Unitary Method

Calculate the price of a single unit: CP of 1 pencil = 5/6 and SP of 1 pencil = 6/5.

Profit and Loss calculation

Profit occurs when SP > CP. Percentage is always calculated on the base of Cost Price unless stated otherwise.

Q74. Answer: (d) 130 degrees

Given: a 12-hour clock when the time is 9 : 25.

Formula used:

Angle between the minute hand and the hour hand=(60 H - 11 M)/2

where H represents hour and M represents minutes.

Calculation:

Angle between the minute hand and the hour hand=(60 ×9 - 11×25)/2

Angle between the minute hand and the hour hand=265/2 = 132.5°

Thus, the approximate angle between the minute hand and the hour hand is ' 130° '.

Q75. Answer: (a) Both B and C

The correct answer is Both B and C.

Key Points

• When a wave travels from one medium to another, it bends, which is known as refraction.

• If the light is travelling from a rarer medium to a denser medium, the light will get refracted towards the normal while if the light is travelling from a denser medium to a rarer medium, the light will get refracted away from the normal.

• When a ray of light bends towards the normal while travelling from a rarer to a denser medium, the speed of light is more in a rarer medium than a denser medium and the refractive index of a denser medium is more than the refractive index of a rarer medium.

Additional Information

• Dispersion is the process by which white light separates into the colours that make up its spectrum (in order VIBGYOR) when it passes through a glass prism.

• When light travels through one medium, such as air or a glass of water, it is partially absorbed by the medium's particles before radiating in a certain direction afterwards. This is called the scattering of light. The light's wavelength and the size of the scattered particles both affect the scattered light intensity.

• When light beams move from a denser medium to one that is considerably less dense, total internal reflection occur.

• Total internal reflections occur when the angle of incidence is greater than the critical angle.

Q76. Answer: (c) 2

The correct answer is 2.

Key Points

• A group of compounds with the same general formula but have differences in the length of the carbon chain are referred to as homologous series.

• A homologous series of compounds usually have similar chemical and physical properties because they share a fixed set of functional groups.

• The next member of a homologous series by a molecular formula of CH_4, containing one carbon atom and two hydrogen atoms, constituting a molecular mass of 14u.

Additional Information

• As alkanes, alkenes, and alkynes only have carbon and hydrogen atoms, they are also known as hydrocarbyl groups.

• The kinds of bonds between the two carbon atoms, such as double or triple bonds, in alkanes, alkenes, and alkynes are the difference between them.

• The substituent atoms or groups of atoms that are joined to particular molecules to form functional groups..

• A molecule's behaviour and chemical reactions can be predicted in a systematic manner if it has a functional group.

Q77. Answer: (c) D

Given :

• Five persons, A, B, C, D and E, are sitting in a straight line.

• All are facing the north direction.

Solution step by step:

(1.) Only two persons are sitting between D and B.

(2.) D sits to the immediate left of A.

(3.) C sits second from the extreme right end of the line.

There is only Case 1 is qualified because case 2's second position is occupied by D. whereas in case 1 if second right position is unoccupied.

(4.) Only two persons are sitting between C and E.

Hence, 'D' is sitting to the immediate right of E.

Hence, the correct answer is 'option 3'.

Q78. Answer: (c) 103

The logic is followed here:

Second number = (First number × 7) + 5

Hence, Require number = (14 × 7) + 5 = 103

Thus, '103' is the missing number.

Hence, the correct answer is 'Option (3)'.

Q79. Answer: (c) 1848 m2

Shortcut Trick

Ratio of Radius (r) to Height (h) = 2 : 1

Ratio of TSA to CSA = $(2\pi r(r + h)) / (2\pi rh) = (r + h) / h$

TSA / 616 = (2 + 1) / 1 = 3 / 1

TSA = 616 × 3 = 1848 m^2

Therefore The correct answer is 1848 m^2.

Alternate Method

Given:

Ratio r : h = 2 : 1 => Let r = 2x and h = x

Curved Surface Area (CSA) = 616 m^2

Formula Used:

CSA of cylinder = $2\pi rh$

Total Surface Area (TSA) = $2\pi r(r + h)$

Calculations:

=> $2 \times (22/7) \times (2x) \times (x) = 616$

=> $(88/7) \times x^2 = 616$

=> $x^2 = (616 \times 7) / 88$

=> $x^2 = 7 \times 7$ => $x = 7$

=> Radius (r) = 2 × 7 = 14 m

=> Height (h) = 7 m

=> TSA = $2 \times (22/7) \times 14 \times (14 + 7)$

=> TSA = 2 × 22 × 2 × 21

=> TSA = 88 × 21 = 1848 m^2

Therefore The correct answer is 1848 m^2.

Additional Information

Volume of Cylinder

The amount of space inside the cylinder is given by $V = \pi r^2 h$.

Surface Area Components

Total Surface Area is the sum of Curved Surface Area ($2\pi rh$) and the area of two circular bases ($2\pi r^2$).

Hollow Cylinder

For a cylinder with internal radius r and external radius R, the Volume = $\pi(R^2 - r^2)h$.

Q80. Answer: (b) 200 metres

Shortcut Trick

Relative Speed in opposite direction = 100 + 62 = 162 km/h.

Convert to m/s: 162 × (5/18) = 45 m/s.

Total Distance (L1 + L2) = Relative Speed × Time = 45 × 10 = 450 m.

Length of second train (L2) = 450 − 250 = 200 m.

Therefore The correct answer is 200 metres.

Alternate Method

Given:

Length of first train (L1) = 250 m

Speed of first train (S1) = 100 km/h

Speed of second train (S2) = 62 km/h

Time taken (t) = 10 seconds

Formula Used:

Relative Speed (Opposite) = S1 + S2

Distance = Speed × Time

Calculations:

=> Relative Speed = 100 + 62 = 162 km/h

=> Speed in m/s = 162 × (5/18) = 9 × 5 = 45 m/s

=> Total Distance = L1 + L2

=> 250 + L2 = 45 × 10

=> 250 + L2 = 450

=> L2 = 450 − 250

=> L2 = 200 m

Therefore The correct answer is 200 metres.

Additional Information

Relative Speed Concept

When two objects move in opposite directions, relative speed is the sum of their speeds (S1 + S2). When moving in the same direction, it is the difference (|S1 − S2|).

Unit Conversion

To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Total Distance for Trains

When a train crosses another train or a platform, the total distance covered is always the sum of the lengths of the two objects.

Q81. Answer: (c) entire body surface area

The correct answer is entire body surface area.

Key Points

• Amoeba is a single-celled organism with the capacity to alter their form.

• Ponds, lakes, and slow-moving rivers are their typical habitats for them.

• In amoeba, the food is taken by the entire body's surface area.

• The amoeba lacks a mouth and anus and its endoplasm contains a granular nucleus, food vacuoles, and contractile vacuoles.

• Amoeba consumes food by creating a vacuole around the food particle using their cytoplasmic extensions. To digest the food particles, enzymes are then secreted.

Additional Information

• An organism that only has one cell is referred to as a unicellular organism, or single-celled organism, as opposed to a multicellular organism, which has numerous cells.

• Prokaryotic and eukaryotic organisms are the two broad classifications of creatures.

• Bacteria and archaea are two groups that make up the majority of prokaryotes.

• While most eukaryotes have several cells, some, like protozoa, single-celled algae, and single-celled fungi, have only one cell.

• Flagella, cilia, and pseudopodia are only a few of the mechanisms used by protozoa to move about.

Q82. Answer: (c) P = K

According to given information:

Statements: B > F ≥ P > L = K ≤ W < M

Options or Conclusions:

I. F > K → True (As F ≥ P > L = K → there is a direct relation between F and K. So, conclusion I is true)

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II. L < M → True (As L = K ≤ W < M → there is a direct relation between L and M. So, conclusion II is true)

III. P = K → False (As P > L = K → Here P is always greater than K. So, conclusion II is false)

IV. B > L → True (As B > F ≥ P > L → there is a direct relation between B and L. So, conclusion IV is true)

Hence, the 'P = K' only conclusion is False.

Hence, "Option 3 "is the correct answer.

Q83. Answer: (d) Take place in Cytoplasm

The correct answer is Take place in Cytoplasm.

Key Points

• During fermentation in yeast, glycolysis happens first, followed by the conversion of pyruvate to ethanol and carbon dioxide, which regenerates the electron carrier NAD+ for use in more glycolysis.

• While doing extreme hard work or exercises, the muscle cells in humans lacks oxygen and under anaerobic conditions, produces lactic acid as the final byproduct of respiration rather than carbon dioxide.

• Both the fermentation in yeast and anaerobic respiration occuring in muscle cells of humans take place in the cytoplasm.

Additional Information

• There are two types of respiration: aerobic respiration and anaerobic respiration.

• The process of cellular respiration known as aerobic respiration occurs in the presence of oxygen gas and is used to create energy from food. Most plants, animals, birds, humans, and other mammals use this sort of respiration often. The final products of aerobic respiration process are water and carbon dioxide.

• Anaerobic respiration is a process of respiration that occurs without oxygen gas. In this procedure, glucose is broken down while lacking oxygen to provide energy. The fermentation process in yeast is one of the most effective example of anaerobic respiration.

Q84. Answer: (a) more than 1, inverted

The correct answer is more than 1, inverted.

Key Points

• The ratio of the height of the image to the height of the object is used to define the magnification a lens produces.

• The magnification may be positive, negative, or equal to one depending on the position and image produced by the lens.

• If the magnification of the lens is more than one, the image produced will be magnified and if the magnification of the lens is less than one, the image produced will be diminished. The size of the image will be same as that of the object when the magnification produced by the lens is equal to one.

• When an object is placed on the principal axis of a convex lens of focal length 12 cm, at a distance of 18 cm, the object is lying between the focus and the centre of curvature, and the image produced by lens will be real, inverted, and larger than object size. Since, the image is magnified, the magnification produced by the lens is more than one.

Q85. Answer: (a) 5

Decoding the information,

Sign	•	×	÷	•
Means	•	÷	×	•

Given:

12 - 104 × 8 + 5 ÷ 4 = ?

After replacing the signs from left to right and using the BODMAS rule,

=> 12 + 104 ÷ 8 - 5 × 4

=> 12 + 13 - 5 × 4

=> 12 + 13 - 20

=> 25 - 20

=> 5

Hence, the correct answer is Option (1).

Q86. Answer: (c) 1 : 2

Given:

• Two resistors, A and B are connected in series to a voltage source of 5V.

• Resistance of resistor A, R= 5 ohm

• Resistance of resistor B, R'= 10 ohm

Formula Used:

Power in Watt (W), $P=(V^2)/R$, where V is the voltage in Volt (V) and R is the Resistance in ohm.

Solution:

When two resistors, A and B, with resistances of 5 ohms and 10 ohms respectively, are connected in series, the total resistance of the circuit is the sum of the individual resistances:

$R_{(total)} = R_A + R_B = 5 \text{ ohm} + 10 \text{ ohm} = 15 \text{ ohm}$

The total current I flowing through the circuit when connected to a 5 V source is given by Ohm's Law:

$I = V/R_{(total)} = 5 \text{ V}/15 \text{ ohm} = 1/3 \text{ A}$

Now, we can calculate the power P dissipated in each resistor using the formula:

$P = I^2R$

For resistor A (5 ohms):

$P_A = I_A^2R_A = (1/3)^2 * 5 = 5/9 \text{ W}$

For resistor B (10 ohms):

$P_B = I_B^2R_B = (1/3)^2 * 10 = 10/9 \text{ W}$

The ratio of power developed in resistor A to that developed in resistor B is:

$\text{Ratio} = P_A/P_B = 5/10 = 1/2$

Therefore, the ratio of the power developed in resistor A to that in resistor B is 1:2.

Q87. Answer: (c) 40

• The shaded part represents both Solar energy and Coal energy.

• The number of people who rely on both Solar energy and Coal energy = 28 + 12 = 40

Hence, the correct answer is Option (3).

Q88. Answer: (c) Football

The correct answer is " Football ".

Key Points

• The Rovers Cup was an annual football tournament held in India, organized by the Western India Football Association.

• It was the second oldest tournament in India after Durand Cup.

• Rovers Cup was incorporated by some British football enthusiasts in Bombay, Bombay Presidency, in 1890, as a form of amusement.

• After the foundation of Bombay Football Association (BFA) in 1902, the tournament became well organized.

• Patronized by Justice Russell, the tournament was firstly opened to British teams.

• Later in 1911, Western India Football Association was founded as a result of merger between BFA and Rovers Cup Committee.

Q89. Answer: (a) 30

Given :

• there are exactly 8 boys standing between Suraj and Bheem.

• Suraj is 21st from the front.

• Bheem is at the first position from the back.

Formula used:

Total boys in queue = Position of Bheem from back + Position of Suraj from front + number of boys between Suraj and Bheem.

Calculation:

According to the question,

Total boys in queue = 1 + 21 + 8 = 30

Hence, total '30' boys are there in the queue.

Q90. Answer: (b) Rs. 14

Shortcut Trick

Ratio of parts = 2 : 5

Difference between parts in units = 5 − 2 = 3 units

Given, 3 units = Rs. 6 => 1 unit = Rs. 2

Total amount = (2 + 5) units = 7 units = 7 × Rs. 2 = Rs. 14

Therefore The correct answer is Rs. 14.

Alternate Method

Given:
Ratio of two parts = 2 : 5
Difference between parts = Rs. 6
Calculations:
=> Let the first part be 2x and the second part be 5x.
=> According to the question, 5x − 2x = 6
=> 3x = 6
=> x = 2
=> Initial amount = 2x + 5x = 7x
=> Initial amount = 7 × 2 = 14
Therefore The correct answer is Rs. 14.
Additional Information
Ratio and Proportion
A ratio compares two quantities. If a total amount T is divided in the ratio a : b, the parts are (a/(a+b)) × T and (b/(a+b)) × T.
Difference between parts
The difference between parts is proportional to the difference between the ratio units. Difference = |a − b| units.

Q91. Answer: (c) 20

Shortcut Trick
Ratio of Volumes = $(R1/R2)^2 \times (H1/H2)$
Number of cylinders = $(20/10)^2 \times (100/20)$
Number of cylinders = $2^2 \times 5 = 4 \times 5 = 20$
Therefore The correct answer is 20 cylinders.
Alternate Method
Given:
Large Cylinder: Radius (R) = 20 cm, Height (H) = 100 cm
Small Cylinder: Radius (r) = 10 cm, Height (h) = 20 cm
Formula Used: Volume of a cylinder = $\pi r^2 h$
Calculations:
=> Volume of large cylinder (V_L) = $\pi \times (20)^2 \times 100$
=> Volume of small cylinder (V_S) = $\pi \times (10)^2 \times 20$
=> Number of cylinders (n) = $V_L \div V_S$
=> n = $(\pi \times 400 \times 100) \div (\pi \times 100 \times 20)$
=> n = 40000 ÷ 2000
=> n = 20
Therefore The correct answer is 20 cylinders.
Additional Information
Cylinder Surface Area
Curved Surface Area (CSA) = $2\pi rh$ and Total Surface Area (TSA) = $2\pi r(h + r)$.
Hollow Cylinder Volume
Volume of material in a hollow cylinder = $\pi(R^2 - r^2)h$, where R is outer and r is inner radius.
Volume Conservation
When one solid is melted and recast or filled into another, the total Volume remains constant.

Q92. Answer: (a) Tropic of Capricorn - Eastern Hemisphere

The correct answer is " Tropic of Capricorn - Eastern Hemisphere ".
Key Points
• The Tropic of Capricorn lies in the Southern Hemisphere.
• The Tropic of Capricorn is the circle of latitude that contains the subsolar point at the December solstice.
• It is thus the southernmost latitude where the Sun can be seen directly overhead.
• It also reaches 90 degrees below the horizon at solar midnight on the June Solstice.
• Its northern equivalent is the Tropic of Cancer.

Q93. Answer: (b) Swami Vivekananda

The correct answer is " Swami Vivekananda ".

Key Points

• A major proponent in the popularisation of this Universalist and Perennialist interpretation of Advaita Vedānta was Swami Vivekananda, who played a major role in the revival of Hinduism, and the spread of Advaita Vedānta to the west via the Ramakrishna Mission.

• His interpretation of Advaita Vedānta has been called "Neo-Vedānta". Vivekananda discerned a universal religion, regarding all the apparent differences between various traditions as various manifestations of one truth.

• He presented karma, bhakti, jnana and raja yoga as equal means to attain moksha, to present Vedānta as a liberal and universal religion, in contrast to the exclusivism of other religions.

Q94. Answer: (a) 2 : 1

Given:

• Two metallic wires A and B are made of the same material.

• Wire A has length I and radius r while wire B has length 2l and radius 2r.

Concepts Used:

Resistance, $R = (\rho l)/A = (\rho l)/(\pi r^2)$, where ρ, l, A, and r are the resistivity, length, area of cross-section, amd radius of the material.

Solution:

Since, the wires A and B are made of same material, the resistivity of A and B are equal.

Resistance of wire A is given as,

$R=(\rho l)/(\pi r^2)$

Resistance of wire B is given as,

$R' = (\rho (2l))/(\pi (2r)^2)$; => $R'=(2 \rho l)/(4 \pi r^2)$; => $R'=(\rho l)/(2 \pi r^2)$

Now, calculating the ratio of the resistance of wire A to that of wire B, we get

$R : R'=(\rho l)/(\pi r^2) : (\rho l)/(2\pi r^2)$; => R : R' = 1: 1/2; => R: R' = 2:1

Therefore, the correct answer is 2 : 1.

Q95. Answer: (b) x2 - 2x - 35 = 0

Shortcut Trick

Find the roots of x2 − x − 12 = 0 by factoring: (x − 4)(x + 3) = 0 => x = 4, −3.

Given a > b, assign a = 4 and b = −3.

The new roots are (2 × 4 − 1) = 7 and (2 × −3 + 1) = −5.

Sum of new roots = 7 + (−5) = 2; Product of new roots = 7 × (−5) = −35.

The required quadratic equation is x2 − (Sum)x + (Product) = 0 => x2 − 2x − 35 = 0.

Therefore The correct answer is x2 − 2x − 35 = 0.

Alternate Method

Given:

Original equation: x2 − x − 12 = 0

Roots: a and b where a > b

New roots to find: (2a − 1) and (2b + 1)

Method Used:

Factorization of the quadratic expression and the Sum-Product form of a quadratic equation.

Calculations:

=> x2 − 4x + 3x − 12 = 0

=> x(x − 4) + 3(x − 4) = 0

=> (x − 4)(x + 3) = 0

=> x = 4 or x = −3

=> Since a > b, a = 4 and b = −3

=> First new root (α) = 2(4) − 1 = 8 − 1 = 7

=> Second new root (β) = 2(−3) + 1 = −6 + 1 = −5

=> Sum of roots (α + β) = 7 + (−5) = 2

=> Product of roots (α × β) = 7 × (−5) = −35

=> Required equation: x2 − (α + β)x + (αβ) = 0

=> x2 − 2x + (−35) = 0

=> x2 − 2x − 35 = 0

Therefore The correct answer is x2 − 2x − 35 = 0.

Additional Information

Nature of Roots

For a quadratic equation ax2 + bx + c = 0, the discriminant D = b2 − 4ac determines if roots are real (D ≥ 0) or imaginary (D < 0).

Sum and Product of Roots

If α and β are roots, then Sum (α + β) = −b/a and Product (α × β) = c/a.

Formation of Quadratic Equation

An equation can be formed using roots as x2 − (Sum of Roots)x + (Product of Roots) = 0.

Symmetric Functions of Roots

Expressions like α2 + β2 can be written as (α + β)2 − 2αβ to solve for new equations without finding individual roots.

Q96. Answer: (a) real and inverted

The correct answer is real and inverted.

Key Points

• When a hollow sphere's inside surface serves as the reflecting surface and the cut part's outside is painted, it forms a concave mirror.

• Concave mirror is sometimes referred to as a converging mirror because light converges at a point as it hits and reflects off of the concave mirror's reflecting surface.

• When an object is placed at the centre of curvature (C) of a concave mirror, then the image is formed at the centre of curvature itself. The image formed is real, inverted, and is of the same size as that of the object.

• Here, an object is placed at a distance of 30 cm in front of a concave mirror of focal length (F)15 cm. The centre of curvature of the concave mirror is at 30cm (2F), and a real and inverted image of the same size as that of the object is formed at the centre of curvature itself.

Q97. Answer: (d) 7

Given:

√729-√400

Formula used:

Prime factorization method.

Calculation:

√729-√400; =√(3×3×3×3×3×3)-√(2×2×2×2×5×5); =27-20; =7

Hence, the value after simplification is 7.

Q98. Answer: (d) They alter nitrogen metabolism, so less protein content in plants

Key Point

• Pesticides are compounds used to prevent, destroy, and control pests.

• Pesticides, though non-biodegradable, are both beneficial and harmful to agriculture. They alter nitrogen metabolism, so less protein content in plants

• Pesticides reduce the chlorophyll content of the plant and hence affect photosynthesis. They reduce plant growth.

• In some cases, the soil, water, turf, and other vegetation could all become contaminated by pesticides and the pesticides can be toxic to some non-target plants and animals.

Additional Information

• The first stage of the nitrogen cycle and a vital biological activity is nitrogen fixation. A number of bacterial species, including Rhizobium, Azotobacter, and others, as well as other natural phenomena, participate in this process, which turns atmospheric nitrogen into ammonia.

• The primary mechanism of nitrogen metabolism is the recycling of ammonia into the neutral or charged form of ammonium ion. The nitrogen cycle is the fundamental process involved in nitrogen metabolism.

• By converting light energy into chemical energy through a process called photosynthesis, plants can subsequently release that chemical energy to power their activities. Solar energy, water, and carbon dioxide are needed for the photosynthetic process, which yields oxygen as a byproduct.

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Q99. Answer: (a) 50

Shortcut Trick

Let Train Speed be S km/h. Distance (Length x) is constant.

Relative speed 1 × Time 1 = Relative speed 2 × Time 2

=> (S − 2) × 9 = (S − 4) × 10

=> 9S − 18 = 10S − 40 => S = 22 km/h

Length x = (22 − 2) × (5/18) × 9 = 20 × (5/2) = 50 m

Therefore The correct answer is 50 m.

Alternate Method

Given: Speed of Raj = 2 km/h, Speed of Madhur = 4 km/h, Time 1 = 9 sec, Time 2 = 10 sec.

Formula: Distance = Relative Speed × Time

=> Convert speeds to m/s: 2 km/h = 2 × (5/18) m/s; 4 km/h = 4 × (5/18) m/s

=> x = (V − 2 × 5/18) × 9 --- (i)

=> x = (V − 4 × 5/18) × 10 --- (ii)

=> Equating (i) and (ii): 9V − 5 = 10V − 400/36 × 2 (Wait, simpler calculation:)

=> (S − 2) × 5/18 × 9 = (S − 4) × 5/18 × 10

=> 9S − 18 = 10S − 40 => S = 22 km/h

=> x = (22 − 2) × 5/18 × 9 = 20 × 5/2 = 50 m

Therefore The correct answer is 50 m.

Additional Information

Relative Speed

When two objects move in the same direction, relative speed is (u − v). In the opposite direction, it is (u + v).

Unit Conversion

To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Train Overtaking a Moving Object

Distance covered is always equal to the length of the train when it crosses a point object like a person or a pole.

Q100. Answer: (b) 7th

Given:

• 11 students in a class.

• V's rank from the bottom is 6th.

• D's rank from the top is 4th.

• T's rank from the top is exactly between the ranks of V and D.

Calculation:

according to the question,

Thus, clearly visible that T's rank from the bottom is 7th.

Hence, 'option 2' is the correct answer.

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