RRB Group D Previous Year Paper (Held on: 6 Sept 2022 Shift 1)

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

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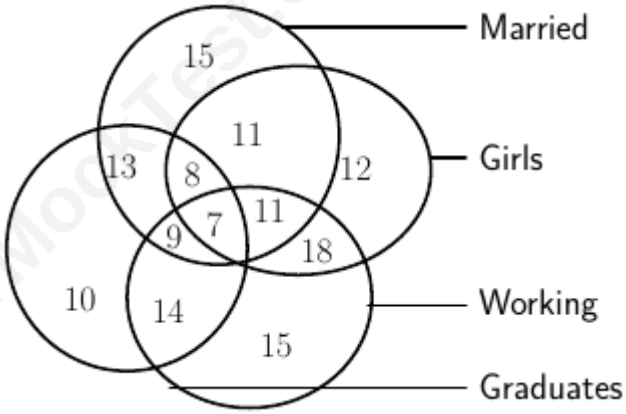
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CBT

Q1. Study the given Venn diagram and answer the question that follows.



How many married girls are graduates but NOT working?

(a) 11
(b) 8
(c) 7
(d) 9

Q2. ZnO + C → Zn + CO

In the given reaction, which statement is INCORRECT?

(a) C is oxidised to CO
(b) ZnO is oxidised to Zn
(c) ZnO acts as an oxidising agent
(d) C acts as a reducing agent

Q3. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 – Operations on 13 such as adding / deleting / multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

17 : 26 :: 5 : 14 :: 22 : ?

(a) 35
(b) 33
(c) 31
(d) 37

Q4. Refer to the following number - symbol series and answer the question that follows.

3 ^ 1 3 & > 9 3 8 4 ! ^ 3 5 4 1 * 2 9 8 > * # 9 ! 9 6

How many such numbers are there that are immediately preceded by a symbol and immediately followed by a symbol?

(a) 6
(b) 2
(c) 5
(d) 3

Q5. The position of how many letters will remain unchanged if each of the letters in the word BACKFIRE is arranged in the reverse alphabetical order?

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

Q6. Complete the given reaction.

2AgBr(s) → (sumlight) 2Ag(s) + ?

(a) Cl2 (g)
(b) Br2 (g)
(c) H2 (g)
(d) CO2 (g)

Q7. Sampark Kranti Express left Delhi for Chennai at 14:30 hours, travelling at a speed of 75 km/h, while Rajdhani Express left Delhi for Chennai on the same day at 16:30 hours, travelling at a speed of 90 km/h, travelling on the same route. How far away from Delhi will the two trains meet?

(a) 820 km
(b) 950 km
(c) 900 km
(d) 860 km

Q8. Select the number from among the given options that can replace the question mark (?) in the following series.

53, 58, 51, 56, 49, 54, 47, 52, 45, 50, 43, 48, ?

(a) 43
(b) 55
(c) 41
(d) 53

Q9. During a sale 662/3 % of the goods are sold at 26% profit, 25% of the remaining goods are sold at 20% profit and the still remaining goods are sold at a loss of 40%. If there is an overall profit of x%, then what is the value of x?

(a) 8
(b) 8.5
(c) 9.5
(d) 9

Q10. The Central Institute of Indian Languages (CIIL) was set up at _____ in 1969.

(a) Trichur (Thrissur)
(b) Mysore (Mysuru)
(c) Mangalore (Mangaluru)
(d) Cochin (Kochi)

Q11. A man covers a certain distance at a speed of 75 km/h in 8 hours. To cover the same distance in 6 hours, his speed needs to be:

(a) 100 km/h
(b) 300 km/h

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(c) 150 km/h
(d) 200 km/h

Q12. The Criminal Procedure (Identification) Bill, 2022, that was passed by the Parliament was placed by which of the following ministries?

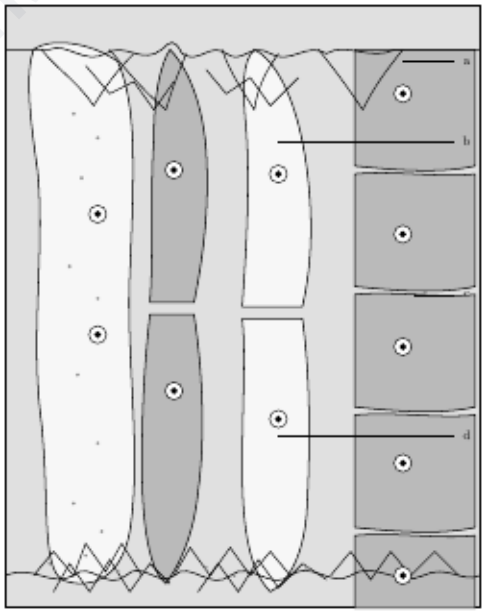
(a) Ministry of Social Justice and Empowerment
(b) Ministry of Home Affairs
(c) Ministry of Education
(d) Ministry of Defence

Q13. Match the following:

Natural source	Acid		
i.	Lemon	a.	Methanoic acid
ii.	Nettle sting	b.	Citric acid
iii.	Tomato	c.	Oxalic acid

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

Q14. The diagram below shows a section of phloem tissue in plants. Which labelling shows the part with perforated walls that helps in transportation?



(a) a
(b) b
(c) d
(d) c

Q15. How many Fundamental Duties were added to the Indian Constitution through the 42nd Amendment Act of 1976?

(a) 10
(b) 11
(c) 3
(d) 5

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Q16. Which of the following is NOT true about indifference curves between two goods?

(a) They are downward sloping.
(b) They may intersect each other.
(c) Higher IC means higher satisfaction levels.
(d) They are convex to the origin.

Q17. A solid metallic sphere of radius 12 cm is melted and recast into 27 identical spheres. What is the ratio of the surface area of the original sphere to the total surface area of 6 smaller spheres so formed?

(a) 9 : 4
(b) 9 : 8
(c) 3 : 2
(d) 3 : 1

Q18. If we add 5 to each of the following numbers and then write the digits in each number in reverse order and then arrange the numbers in ascending order, the position of how many numbers will NOT change?

224, 637, 816, 471, 303

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

Q19. The value of $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2$ is:

(a) $5 - \text{cosec}^2 A + \sec^2 A$
(b) $5 + \sec A + \text{cosec } A$
(c) $5 + \text{cosec}^2 A + \sec^2 A$
(d) $5 + \text{cosec}^2 A - \sec^2 A$

Q20. Hymns of Rig Veda are also known as _____.

(a) Janas
(b) Suktas
(c) Rudras
(d) Rituals

Q21. The refractive indices of mediums 1, 2 and 3 are 1.31, 1.36 and 1.44, respectively. If the speed of light in the mediums are v1, v2 and v3, respectively, which of the following relations between them is correct?

(a) v3 > v1 > v2
(b) v1 > v2 > v3
(c) v2 > v3 > v1
(d) v1 = v2 = v3

Q22. Penkuni Festival is celebrated in which of the following states?

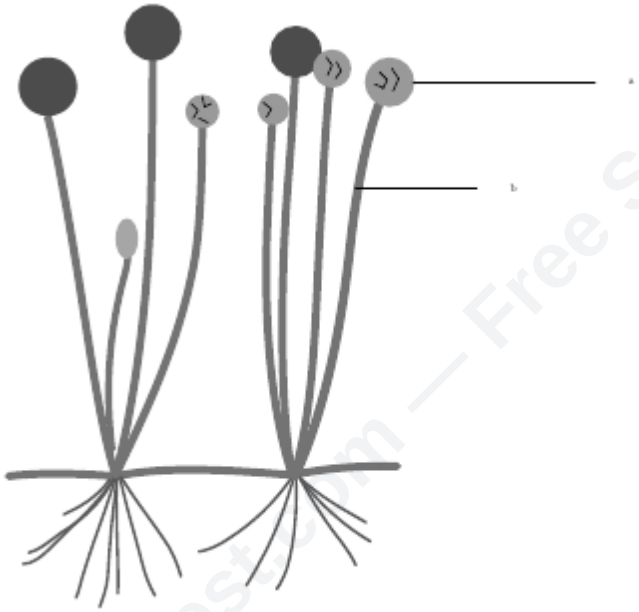
(a) Kerala
(b) Assam
(c) West Bengal
(d) Odisha

Q23. If $P = (x^4 - 8x)/(2x^2 + 5x - 3) \times (2x - 1)/(x^2 + 2x + 4) \times (x^2 - 9)/(x^2 - 2x)$, then $(P^2 - 1)$ is equal to:

(a) $x^2 + 6x + 8$
(b) $x^2 - 6x + 8$
(c) $x^2 - 6x + 10$
(d) $x^2 + 6x + 10$

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Q24. Identify the vegetative part and the reproductive part in the following diagram of Rhizopus.



(a) Both a and b are vegetative parts
(b) a is the reproductive part, whereas b is the vegetative part
(c) Both a and b are reproductive parts
(d) a is the vegetative part, whereas b is the reproductive part

Q25. The Ballary - Chitradurga - Chikmagalur - Tumkur belt located in Karnataka is a rich source of which ore?
(a) Manganese ore
(b) Copper ore
(c) Iron ore
(d) Titanium ore

Q26. A ray of light is incident on a concave mirror of radius of curvature 10 cm, parallel to its principal axis. After reflection, it passes through a point on the axis at a distance of _____ from the mirror.
(a) 12.5 cm
(b) 10 cm
(c) 7.5 cm
(d) 5 cm

Q27. Which of the following is a disadvantage of water shed management?
(a) Maintenance cost is very high
(b) Mitigates droughts and floods
(c) Increases the life of downstream dams and reservoirs
(d) Increases the income of water shed community

Q28. A certain number of people are sitting in a row, facing north. S is seventh to the right of L. K is third to the right of J. L is third to the right of K. If no other person is sitting in the row, what is the total number of persons seated?
(a) 16
(b) 15
(c) 14
(d) 17

Q29. National Backward Classes Finance & Development Corporation (NBCFDC) is a Government of India undertaking under the aegis of Ministry of _____.
(a) Social Justice and Empowerment
(b) Micro, Small and Medium Enterprises
(c) Tribal Affairs

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(d) Rural Development

Q30. In 1928, Vallabhbhai Patel led the peasant movement in _____, a taluka in Gujarat, against enhancement of land revenue.

(a) Bardoli
(b) Palsana
(c) Chorasi
(d) Kamrej

Q31. Convert 25 grams to kilograms, expressing the answer as a fraction.

(a) 1/4 kg
(b) 1/4000 kg
(c) 1/400 kg
(d) 1/40 kg

Q32. World TB Day is celebrated on which date?

(a) 2^(nd) March
(b) 24^(th) March
(c) 12^(th) March
(d) 28^(th) March

Q33. Refer to the following letter, number, symbol series and answer the question.

(Left) S $ 3 & H P W 8 # J * M 2 F A 2 $ Y 1 V (Right)

How many such symbols are there which are immediately preceded by a letter and also immediately followed by a number?

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

Q34. Express 4.56767... in the form p/q, where p and q are integers and q ≠ 0.

(a) 463/110
(b) 494/165
(c) 4281/495
(d) 4283/495

Q35. Which of the following numbers will replace the question mark (?) in the given series?

30, 35, 40, 43, 46, 51, ?

(a) 57
(b) 56
(c) 55
(d) 58

Q36. In the given letter-cluster pairs, the first letter-cluster is related to the second letter-cluster following a certain logic. Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

UPR : YTV

LZB : PDF

(a) TGH : XII
(b) BHU : CJS
(c) MSO : NPA
(d) MKN : QOR

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Q37. Cigarette smoking is harmful to our health because _____.

(a) it reduces the oxygen - carrying capacity of RBCs
(b) causes oedema in lungs
(c) it weakens the chest muscles
(d) it damages the cilia in the upper respiratory tract

Q38. Let x be the greatest number which, when divides 7072, 8505 and 9925, the remainders are 22, 45 and 55, respectively. What is the sum of the digits of x?

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

Q39. Which of the following plants does not reproduce by vegetative propagation?

(a) Mango
(b) Grape
(c) Sugarcane
(d) Rose

Q40. A shopkeeper offers the following schemes on toys of the same marked price. (A) Successive discounts of 12% and 15% on any number of toys bought. (B) Successive discounts of 15%, 10% and 2% on any number of toys bought. (C) 40% discount on the first 3 toys and 15% discount on each toy thereon. (D) 2 toys free of cost on buying 10 toys. A customer wants to buy 10 toys. Which of the above schemes is most beneficial to her?

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

Q41. What will be the increase in consumption if income increases by Rs. 500 (assume MPC = 0.5)?

(a) Rs. 250
(b) Rs. 750
(c) Rs. 500
(d) Rs. 50

Q42. Who is regarded as the father of local self - government in India?

(a) Lord Warren Hasting
(b) Lord Robert Clive
(c) Lord Wellesley
(d) Lord Rippon

Q43. The sides of a rectangular field are 77 m and 50 m long. Its area is equal to the area of a circular field. What is the perimeter (in m) of the circular field? (Take $\pi = 22/7$)

(a) 220
(b) 330
(c) 165
(d) 110

Q44. Dobereiner arranged the three elements in a triad in order of:

(a) increase in their atomic masses
(b) decrease in their atomic numbers
(c) increase in their atomic numbers
(d) decrease in their atomic masses

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Q45. An object of size 4.0 cm is placed in front of a convex mirror of focal length 8 cm, at a distance of 24 cm. The image formed is ____ and its height is ____.

(a) erect, 1.0 cm
(b) erect, 2.0 cm
(c) inverted, 2.0 cm
(d) inverted, 1.0 cm

Q46. The 15^(th) edition of the Indian Premier League (IPL) was / will be played in the year _____.

(a) 2021
(b) 2023
(c) 2022
(d) 2020

Q47. In a science book, two solenoids, P and Q, of the same average radius and the same length are shown. The number of field lines drawn inside P is thrice of that drawn inside Q. If the current in the two solenoids is the same, the number of turns in solenoid P is _____ times the number of turns in solenoid Q.

(a) 1/9
(b) 1/3
(c) 9
(d) 3

Q48. At what rate per annum of simple interest will a sum of Rs. 7,500 become Rs. 9,250 in 7 years?

(a) 4(1)/(3)%
(b) 5(1)/(3)%
(c) 6(1)/(3)%
(d) 3(1)/(3)%

Q49. Which of the following group of organisms are involved in the breakdown of dead and decaying organisms?

(a) Consumers
(b) Decomposers
(c) Producers
(d) Scavengers

Q50. The third proportional to 18 and 72 is:

(a) 288
(b) 488
(c) 388
(d) 588

Q51. As on March 2022, Pradhan Mantri Jan Dhan Account holder gets an accidental insurance cover of _____.

(a) Rs. 25,000 to Rs. 50,000
(b) Rs. 5 lakh
(c) Rs. 50,000 to Rs. 1 lakh
(d) Rs. 1 lakh to Rs. 2 lakh

Q52. A train crosses a pole in 80 seconds. If the speed of the train is 36 km/h, then the length of the train is:

(a) 1000 metres
(b) 1200 metres
(c) 600 metres
(d) 800 metres

Q53. A straight angle is equal to

(a) 100º
(b) 0º
(c) 90º

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(d) 180º

Q54. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

11 : 132 :: 12 : 156 :: 13 : ?

(a) 182
(b) 196
(c) 190
(d) 180

Q55. The ratio of incomes of Seema and Darshan is 7 : 5. They save Rs. 12,000 and Rs. 9,000, respectively. If the ratio of their expenditures is 17 : 12, then what is the total expenditure (in Rs.) of Seema and Darshan?

(a) 93,000
(b) 75,000
(c) 81,000
(d) 87,000

Q56. Which of the following is INCORRECTLY paired?

(a) Bituminous coal - Most popular coal in commercial use
(b) Metallurgical coal - Used for smelting iron in blast furnaces
(c) Anthracite - Lowest grade of hard coal
(d) Lignite - Low grade brown coal

Q57. A, B, C, D, E, F, G and H were sitting around a square table, facing the centre. Some of them were sitting at the corners, while some were sitting at the exact centre of the sides. Only A was sitting between G and D. C was sitting fourth to the left of G. Only E was sitting between B and C. H was sitting to the immediate left of D. B was sitting second to the right of G. D is sitting at one of the corners. Who was sitting third to the right of D?

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

Q58. A ray of white light is incident on a refracting surface AB of a glass prism and emerges out of the other refracting surface AC. Consider the following statements:

(a) The angle of refraction at surface AB is the same for different colours of white light.

(b) The angle of refraction at the surface AC is different for different colours.

Which of the above statements is / are correct?

(a) Only (a)
(b) Neither (a) nor (b)
(c) Only (b)
(d) Both (a) and (b)

Q59. What was the role of Sreejesh PR in Indian men's hockey team during the Tokyo Olympics held in the year 2021?

(a) Defender
(b) Forward
(c) Midfielder
(d) Goalkeeper

Q60. If '+' means '÷', '-' means '+', '×' means '-' and '÷' means '×', then what will be the value of the following expression?

[{(19 × 12) - (2 ÷ 4))} + (2 - 3)] ÷ 2

(a) 6
(b) 4
(c) 8
(d) 12

Q61. The sum of the ages of 6 children born at intervals of 2 years each is 42 years. What is the age of the eldest child?

(a) 19 years
(b) 12 years
(c) 15 years
(d) 16 years

Q62. Three statements are followed by three conclusions numbered I, II and III. You have to consider these statements to be true, even if they seem to be at variance with commonly known facts. Decide which of the given conclusions logically follow(s) from the given statement.

Statements:

All paintings are arts

Some walls are doors

Some paintings are windows

Conclusions:

(I) Some arts are walls

(II) Some arts are windows

(III) Some paintings are doors

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

Q63. Seven people, A, B, C, D, E, F and G, are sitting in a straight row, facing north. Only three people sit between G and F. Only two people sit to the left of G. B is not an immediate neighbour of F. B sits second to the right of D. C sits to the immediate right of E. Who sits at the extreme left end of the row?

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

Q64. Match the following:

Functional Group	Name of group		
i.	COOH	a.	ester
ii.	R - CO - R	b.	keytone
iii.	COOR	c.	carboxylic acid

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

Q65. Select the combination of letters that when sequentially placed from left to right in the same sequence in the blanks of the given series, will complete the series.

S L _ _ G S _ _ N G _ _ A N G

(a) L A N A L S
(b) A N L A S L
(c) A L N A S L
(d) A L A N L S

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Q66. In the reference of local winds in India, the 'Loo' can be best described as _____.

(a) cool and humid winds
(b) humid and hot winds
(c) moist and cool winds
(d) dry and hot winds

Q67. Match the following:

1.	**Total number of elements found**	**a.**	**94**
2.	Naturally available elements	b.	24
3.	Elements found through laboratory processes	c.	118

(a) 1 - c, 2 - b, 3 - a
(b) 1 - a, 2 - c, 3 - b
(c) 1 - c, 2 - a, 3 - b
(d) 1 - a, 2 - b, 3 - c

Q68. Nandan had some marbles. When he distributed the marbles equally among 15 children, he found that 2 marbles were left. Had he distributed the marbles equally among 24 children and 32 children, he still would have had 11 and 19 marbles, respectively, left with him. But when he distributed them equally among 31 children, no marble was left. The number of marbles that Nandan initially had may lie between:

(a) 2360 and 2370
(b) 2370 and 2380
(c) 2350 and 2360
(d) 2380 and 2390

Q69. If a = 50, b = 20, find the value of a3 + b3.

(a) 2,03,000
(b) 1,56,000
(c) 1,75,000
(d) 1,33,000

Q70. The value of [89 - (336/301) × {68 - (50 ÷ 3 + 7/6)} + 67] is:

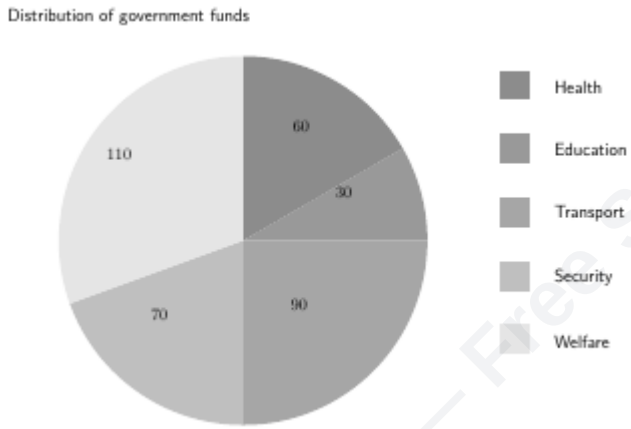
(a) 90
(b) 100
(c) 120
(d) 110

Q71. A wire of length L and resistance R is reformed so that its length increases by 50% with no change in its volume. The resistance of the new wire is:

(a) (4/9) R
(b) (9/4) R
(c) (3/2) R
(d) (2/3) R

Q72. The following pie chart shows funds spent by the government on various public activities. All the values are given in crores. Study the pie chart and answer the question.

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What is the sum of the 'difference between the funds spent on security and education' and the 'funds spent on health' (in crores)?

(a) 80
(b) 90
(c) 100
(d) 120

Q73. A, B, C, D, E and F live on six different floors of the same building. The lowermost floor in the building is numbered 6, the floor above it is numbered 5, and so on till the topmost floor is numbered 1.

B lives on an odd numbered floor but not an floor number 3. Neither D nor E lives on the lowermost floor. A lives on an odd numbered floor and is immediately above D. C lives on floor number 5. Who lives on floor number 2?

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

Q74. Magnetic field inside a solenoid is:

(a) uniform
(b) weaker at the middle
(c) stronger at the middle
(d) zero

Q75. The average marks of three batches of 25, 31 and 41 students is 20, 26 and 56, respectively. Find the average marks of all the students (rounded off to two places of decimal).

(a) 37.13
(b) 35.78
(c) 36.92
(d) 35.45

Q76. Which of the following is the correct statement for the parallel combination of 3 Ω, 2 Ω and 6 Ω resistors?

(a) Value of resistance increases.
(b) Potential difference across each resistor is equal.
(c) Current passing through 6 Ω resistor is maximum
(d) Current passing through each resistor is equal.

Q77. Which of the following is NOT a component of xylem?

(a) Companion cell
(b) Vessel
(c) Tracheid
(d) Parenchyma

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Q78. The mode and median of a data is 23.6 and 24, respectively. What is the mean of the data? (Use empirical formula.)

(a) 23.6
(b) 24.8
(c) 24.2
(d) 23.2

Q79. The presence of which of the following does NOT let the air passage in the respiratory system of humans collapse when there is less air in it?

(a) Tendons
(b) Ligaments
(c) Rings of cartilage
(d) Muscles

Q80. The roots of the quadratic equation $x^2 - 11x/2 + 6 = 0$ are

(a) 2 and 3/2
(b) 4/3 and 3/2
(c) 4 and 3/2
(d) 2 and 4/3

Q81. In a certain code language, 'COUNT' is written as 'ESAVD' and 'FIBRE' is written as 'HMHZO'. How will 'GIANT' be written in that language?

(a) KMRPD
(b) IDGBY
(c) PMJKR
(d) IMGVD

Q82. Given below is a statement followed by two possible conclusions I and II. Read the information carefully and select the correct option.

Statement:

The most popular OTT platform (providing TV and film content over the internet) in country C - 'StreamOn' has recently signed a contract with five of the major film producers to release their movies in theatres and on 'StreamOn' together and on the same date from January 2023 onwards.

Which of the following can be concluded from the given information?

I. The number of tickets sold by theatres will decrease to some extent in 2023.

II. Each of the five film producers release at least one movie each year.

(a) Only II can be concluded from the given information.
(b) Only I can be concluded from the given information.
(c) Both I and II can be concluded from the given information.
(d) Neither I nor II can be concluded from the given information.

Q83. What is the chemical name of Plaster of Paris?

(a) Calcium sulphate hemihydrate
(b) Calcium acetate
(c) Calcium carbonate
(d) Calcium sulphate dihydrate

Q84. Sheetal steps out of her house and walks 160 m towards the north. She takes a left turn and walks 60 m. She takes a left turn again and walks 120 m. She takes another left turn and walks 130 m. Finally, she takes right turn and walks 40 m to reach a café. How far and in which direction is the café from Sheetal's house? (All turns are 90 degree turns only)

(a) 70 m, West
(b) 60 m, West
(c) 70 m, East
(d) 60 m, East

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Q85. The angles opposite to equal sides of a triangle are:

(a) complementary
(b) unequal
(c) supplementary
(d) equal

Q86. Which committee proposed that the local government be granted constitutional recognition in 1989?

(a) P K Thungon Committee
(b) L M Singhvi Committee
(c) Ashok Mehta Committee
(d) G V K Rao Committee

Q87. Amongst six friends A, B, C, D, E and F, each has a different height. B is taller than only two other friends. C is shorter than only one friend. E is shorter than B but taller than F. A is shorter than D. Who is the second shortest among all the friends?

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

Q88. If

× means 'division'
• means 'addition'
÷ means 'subtraction' and
• means 'multiplication',

then what will be the value of the expression 17 ÷ 17 + 21 × 7 - 13 = ?

(a) -21
(b) 23
(c) 21
(d) -23

Q89. Three resistors of 10 Ω, 15 Ω and 30 Ω are connected in series. The resistance of the combination is:

(a) 25 Ω
(b) 45 Ω
(c) 55 Ω
(d) 5 Ω

Q90. Pole P is to the north of pole R. Pole Q is to the east of pole R and north of pole S. What is the position of pole R with respect to pole S?

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

Q91. If α and β, where β > α, are the roots of the equation $8x^2 + 22x - 21 = 0$, then what is the value of (2α + 3β)?

(a) • 19/4
(b) 37/2
(c) • 21/2
(d) 21/4

Q92. Which Indian physicist shared the Boltzmann Medal for the year 2022 with American scientist John Hopfield?

(a) Archana Bhattacharyya
(b) Deepak Dhar
(c) Dhiraj Bora

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(d) Radha Balakrishnan

Q93. A statement is given below, followed by four conclusions given in the options. Find out which conclusion is true based on the given statement.

Statement: Q ≤ S ≤ C < F > T ≥ H > M

(a) S ≥ F
(b) Q > H
(c) C = H
(d) T > M

Q94. When magnesium is burnt in the presence of air, the product formed is:

(a) magnesium carbonate
(b) magnesium chloride
(c) magnesium sulphate
(d) magnesium oxide

Q95. The Industrial Revolution in Britain gave a stiff competition to the handicraft industries in India due to _____.

(a) lack of skills of handicraft industry
(b) low cost and better quality product produced by machines
(c) no raw material available for handicraft
(d) expensive factors of production

Q96. Three statements are followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they do not confirm to real world knowledge, decide which of the given conclusions / possibilities can be true on the basis of the statements.

Statements:

1. All greens are reds.
2. Some reds are browns.
3. All greys are browns.

Conclusions:

I. Some greys are greens.

II. All browns are reds is a possibility.

III. Some browns are greens.

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

Q97. In a certain code language, ‘CLIMATE’ is written as ‘DUZNHMD’ and ‘COMPLEX’ is written as ‘YDMQNND’. How will ‘DISPLAY’ be written in that language?

(a) ZZMOTHE
(b) EJTQMBZ
(c) ZZMQTHE
(d) ZMBQTJE

Q98. The following table shows the marks scored by A, B, C and D in four subjects i. e., Mathematics, Hindi, English and Science. Marks given are out of 100. Study the table and answer the question.

Subject / Student ↓ →	A	B	C	D
Mathematics	90	85	83	78
Hindi	86	78	74	82
English	75	74	70	74
Science	92	88	64	70

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What is the ratio of 'the sum of the marks scored by A in Hindi and B in English' to 'the sum of the marks scored by C in English and D in Science'?

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

Q99. Refer to the following letter, symbol series and answer the question.

D & C N E ^ & G ^ Y % % @ G Y & I & * H K Z

How many vowels are there that are immediately followed by a symbol?

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

Q100. Seven friends Rekha, Bharti, Shilpi, Jai, Tarun, Ravi, and Nausheen have their houses on seven different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is number 7. Five people live between the floors where Jai and Rekha live. There are two floors between Tarun's and Ravi's house. Tarun lives on one of the floors below Ravi's floor. Ravi's house is not at the top floor. Nausheen's house is just above Tarun's house. Only two people live between Nausheen's and Jai's house. Only two people are above Bharti's house. Who among the following lives on floor number 4?

(a) Jai
(b) Nausheen
(c) Tarun
(d) Bharti

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) 8

According to the given diagram:

There are 8 married girls are graduates but NOT working.

Hence, the correct answer is "Option 2".

Q2. Answer: (b) ZnO is oxidised to Zn

The correct answer is ZnO is oxidised to Zn

Key Points

• ZnO acts as an oxidising agent:

• An oxidising agent is a substance that gets reduced and, in the process, causes another substance to be oxidized.

• Since ZnO is reduced to Zn in this reaction, it acts as an oxidizing agent.
• C acts as a reducing agent:
• A reducing agent is a substance that gets oxidized while causing another substance to be reduced.
• Since C is oxidized to CO, it acts as a reducing agent.
• Carbon is oxidised from an oxidation state of 0 in elemental form to +2 in CO.
• ZnO is reduced to Zn as its oxidation state decreases from +2 (in ZnO) to 0 (in elemental Zn).
• Therefore the statement ZnO is oxidised to Zn is incorrect

Additional Information

• Oxidation ReactionAn oxidation reaction is a chemical process where a substance loses electrons, leading to an increase in its oxidation state. This process is often accompanied by the gain of oxygen or the loss of hydrogen in a chemical reaction.

Q3. Answer: (c) 31

The logic followed here is:

Logic: 1st number + 9 = 2nd number.

Now,

For, 17 : 26

=> 17 + 9 = 26

For, 5 : 14

=> 5 + 9 = 14

Similarly, for 22 : ?

=> 22 + 9 = 31.

Hence, the correct answer is "Option 3".

Q4. Answer: (b) 2

Given: > 3 ^ 1 3 & > 9 3 8 4 ! ^ 3 5 4 1 * 2 9 8 > * # 9 ! 9 6

• Numbers are there that are immediately preceded by a symbol and immediately followed by a symbol:
• So, Needed pattern is: Symbol - Number - Symbol.

3 ^ 1 3 & > 9 3 8 4 ! ^ 3 5 4 1 * 2 9 8 > * # 9 ! 9 6

Clearly, there is only 'two' pairs numbers are there that are immediately preceded by a symbol and immediately followed by a symbol.

Hence, the correct answer is "2".

Q5. Answer: (a) Zero

Given word: 'BACKFIRE'

After arranged in reverse alphabetical order:

Alphabets	B	A	C	K	F	I	R	E
Reverse alphabetical order	R	K	I	F	E	C	B	A

Now,

there is no alphabet that will remain unchanged if each of the letters in the word 'BACKFIRE' is arranged in reverse alphabetical order.

Hence, the correct answer is "Option 1".

Q6. Answer: (b) Br2 (g)

The correct answer is Br2 (g)

Key Points

• The given reaction is
• 2AgBr(s) → (sumlight) 2Ag(s) + ?
• When silver bromide (AgBr) is exposed to light, it undergoes photodissociation.
• The light energy causes AgBr to break down into silver (Ag) and bromine gas (Br _22).
• Thus the complete reaction is
• 2AgBr(s) → (sumlight) 2Ag(s) + br2 (g)

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• Silver bromide is an ionic compound made up of silver ions (Ag +) and bromide ions (Br −).
• It is a light-sensitive material, commonly used in photographic films.
Additional Information
• Here is the full form of the Options
• Cl (g) - Chlorine gas
• Br (g) - Bromine gas
• H (g) - Hydrogen gas
• CO (g) - Carbon dioxide gas

Q7. Answer: (c) 900 km

Shortcut Trick
Direct formula for meeting distance: D = [S1 × S2 × Time Difference] ÷ (S2 − S1)
Here, S1 = 75 km/h, S2 = 90 km/h, and Time Difference = 16:30 − 14:30 = 2 hours.
D = [75 × 90 × 2] ÷ (90 − 75)
D = 13500 ÷ 15
D = 900 km
Therefore The correct answer is 900 km.
Alternate Method
Given:
Speed of Sampark Kranti Express = 75 km/h
Departure time of Sampark Kranti = 14:30 hours
Speed of Rajdhani Express = 90 km/h
Departure time of Rajdhani = 16:30 hours
Formula Used:
Distance = Speed × Time
Relative Speed (same direction) = S1 − S2
Calculations:
=> Time difference between the departures = 16:30 − 14:30 = 2 hours.
=> Distance covered by Sampark Kranti Express in these 2 hours = 75 × 2 = 150 km.
=> This 150 km is the head start distance between the two trains.
=> Relative speed of Rajdhani Express with respect to Sampark Kranti = 90 − 75 = 15 km/h.
=> Time taken by Rajdhani Express to catch up = Distance ÷ Relative speed.
=> Catch up time = 150 ÷ 15 = 10 hours.
=> The meeting distance from Delhi = Speed of Rajdhani × Time taken.
=> Distance = 90 × 10 = 900 km.
Therefore The correct answer is 900 km.
Additional Information
Relative Speed
When two objects move in the same direction, their relative speed is the difference of their individual speeds (S1 − S2). When they move in opposite directions, it is the sum of their speeds (S1 + S2).
Catch-up Time Formula
Time to meet = Head start distance ÷ Relative speed. This determines the duration required for the faster object to overtake the slower one.
Average Speed
When a journey covers two equal halves at different speeds S1 and S2, Average Speed = (2 × S1 × S2) ÷ (S1 + S2).

Q8. Answer: (c) 41

The logic followed here is:
Hence, the correct answer is "Option 3".

Q9. Answer: (d) 9

Shortcut Trick
Assume total goods = 12 units (common multiple of 3 and 4).

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66(2/3)% of 12 = 8 units at +26% profit.

Remaining = 4 units. 25% of 4 = 1 unit at +20% profit.

Balance = 3 units at −40% loss.

Net Profit % = [(8 × 26) + (1 × 20) + (3 × −40)] ÷ 12 = [208 + 20 − 120] ÷ 12 = 108 ÷ 12 = 9%.

Therefore The correct answer is 9.

Alternate Method

Given:

Part 1: 66(2/3)% = 2/3 of total goods sold at 26% profit.

Remaining = 1 − 2/3 = 1/3.

Part 2: 25% of remaining = 1/4 × 1/3 = 1/12 of total goods sold at 20% profit.

Part 3: Still remaining = 1/3 − 1/12 = 3/12 = 1/4 of total goods sold at 40% loss.

Calculations:

=> x = (2/3 × 26) + (1/12 × 20) + (1/4 × −40)

=> x = 52/3 + 5/3 − 10

=> x = (52 + 5)/3 − 10

=> x = 57/3 − 10

=> x = 19 − 10

=> x = 9

Therefore The correct answer is 9.

Additional Information

Weighted Average Method

When parts of a whole are sold at different profit/loss percentages, the overall profit/loss is the weighted average: Overall % = (n1p1 + n2p2 + ...) / (n1 + n2 + ...).

Successive Discounts vs Partial Sales

Partial sales involve dividing the quantity, whereas successive discounts involve reducing the price repeatedly. Do not confuse weighted average with the formula a + b + ab/100.

Percentage to Fraction Conversion

Always use 66(2/3)% = 2/3 and 25% = 1/4 to simplify ratio-based calculations in profit and loss problems.

Q10. Answer: (b) Mysore (Mysuru)

The correct answer is Mysore(Mysuru)

Key Points

• The Central Institute of Indian Languages (CIIL) is an Indian research and teaching institute based in Mysuru, part of the Language Bureau of the Ministry of Education.

• It was founded on 17 July 1969.

• The institution advises and Assists Central as well as State Governments in the matters of language.

• It contributes to the development of all Indian Languages by creating content and corpus.

• It protects and Documents Minor, Minority and Tribal Languages and Promotes Linguistic harmony by teaching 20 Indian languages to non-native learner

Additional Information

Institute	Place
All India Institute of Speech and Hearing	Mysore
Oriental Research Institute	Mysore
Central Silk Board	Bengaluru
Coffee Board	Bengaluru
Rubber Board	Manjeri, Kerala
Tea Board	Kolkata
Wine Board	Bengaluru

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Q11. Answer: (a) 100 km/h

Shortcut Trick

Since Distance is constant, Speed is inversely proportional to Time (S prop. to 1/T).

Ratio of Time = 8 : 6 = 4 : 3

Therefore Ratio of Speed = 3 : 4

Given, 3 units = 75 km/h → 1 unit = 25 km/h

New speed = 4 units = 4 × 25 = 100 km/h

Therefore The correct answer is 100 km/h.

Alternate Method

Given: Initial speed (S1) = 75 km/h, Initial time (T1) = 8 hours, New time (T2) = 6 hours.

Formula Used: Distance = Speed × Time

=> Distance = 75 × 8

=> Distance = 600 km

=> New Speed = Distance ÷ New Time

=> New Speed = 600 ÷ 6

=> New Speed = 100 km/h

Therefore The correct answer is 100 km/h.

Additional Information

Speed-Time Inverse Relation

When distance is constant, the product of speed and time remains the same (S1T1 = S2T2). This is useful for solving comparison problems without finding distance.

Average Speed

For two equal distances covered at speeds a and b, the average speed is given by (2ab) ÷ (a + b).

Relative Speed

If two objects move in the same direction, relative speed is |S1 − S2|. In opposite directions, it is (S1 + S2).

Q12. Answer: (b) Ministry of Home Affairs

The correct answer is the Ministry of Home Affairs

Key Points

• The Criminal Procedure (Identification) Bill 2022 was introduced in Lok Sabha on March 28, 2022 by Shri Ajay Kumar,, in the Ministry of Home Affairs.

• It was introduced in the Indian Parliament to address certain deficiencies in the existing laws related to the identification of individuals involved in criminal activities.

• The bill expands the methods of identification beyond traditional fingerprinting. It allows the collection of biometric data, including:

• Fingerprints

• Photographs

• Iris scans

• Other biological samples or measurements

• The bill seeks to amend the Identification of Prisoners Act, of 1920, which primarily dealt with the identification of convicted individuals.

• The Ministry of Home Affairs is responsible for implementing this bill, coordinating with state and union territory governments to ensure that the necessary infrastructure is in place for the collection and management of biometric data.

Q13. Answer: (d) i - b, ii - a, iii - c

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

Key Points

• Lemon:

• Contains citric acid.

• Nettle sting:

• Contains methanoic acid (also known as formic acid), which is responsible for the stinging sensation.

• Tomato:

• Contains oxalic acid in smaller amounts.

• So the correct matching is

Natural source	Acid		
i.	Lemon	b.	Citric acid
ii.	Nettle sting	a.	Methanoic acid
iii.	Tomato	c.	Oxalic acid

• Thus, the correct matches are: i - b, ii - a, iii - c

Q14. Answer: (b) b

The correct answer is b.

Key Points

• The part labeled 'b' in the phloem tissue is known as the sieve tube element.

• Sieve tube elements are characterized by their perforated walls, known as sieve plates, which facilitate the transport of nutrients.

• The main function of sieve tube elements is to transport organic substances, such as sugars, throughout the plant.

• Sieve plates are crucial for maintaining the flow of phloem sap between adjacent sieve tube elements.

Additional Information

• Phloem Tissue:

• Phloem is one of the two types of vascular tissue in plants, the other being xylem.

• It is responsible for the transport of organic nutrients, particularly sucrose, from the leaves to other parts of the plant.

• Sieve Tube Elements:

• Sieve tube elements are specialized cells that form long tubes for the transportation of phloem sap.

• They lack a nucleus and have fewer organelles to facilitate the easy flow of sap.

• Sieve Plates:

• Sieve plates are the end walls of sieve tube elements that are perforated to allow the flow of sap between cells.

• They play a critical role in maintaining the continuity of the phloem transport system.

• Companion Cells:

• Companion cells are closely associated with sieve tube elements and aid in their function.

• They provide metabolic support and help in the loading and unloading of sugars into the sieve tubes.

Q15. Answer: (a) 10

The correct answer is 10

Key Points

• The 42nd Amendment Act of 1976 added 10 Fundamental Duties to the Indian Constitution.

• The duties were added to promote a sense of patriotism and responsibility among citizens

• They are listed in Article 51A of Part IV-A of the Constitution

• They are non-justiciable, meaning they cannot be enforced by law.

• The amendment was brought in during the emergency period and was a response to the perceived breakdown of civic sense and morality in the country.

• The Fundamental Duties are a set of moral obligations that are expected of every citizen of India, and they were added to the Constitution to promote national unity and a sense of responsibility among citizens.

Q16. Answer: (b) They may intersect each other.

The correct answer is that They may intersect each other.

Key Points

• The statement "They may intersect each other" is not true about indifference curves between two goods.

• Indifference curves cannot intersect each other because it would break down the indifference curve analysis

• Indifference curves graphically represent the different levels of consumer satisfaction at each commodity bundle.

• The slope of Indifference curves is downward sloping.

• Higher indifference curves (IC) mean higher satisfaction levels.

Q17. Answer: (c) 3 : 2

Shortcut Trick

Volume ratio of Original to Smaller sphere is 27 : 1.

Radius ratio R : r = $\sqrt[3]{27} : \sqrt[3]{1} = 3 : 1$.

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Surface Area ratio of Original to 6 Smaller spheres = $R^2 : 6 \times r^2$.
Ratio = $3^2 : 6 \times 1^2 = 9 : 6 = 3 : 2$.
Therefore The correct answer is 3 : 2.
Alternate Method
Given:
Radius of original sphere (R) = 12 cm
Number of identical smaller spheres (n) = 27
Formula Used:
Volume of sphere = $(4/3) \times \pi \times \text{radius}^3$
Surface Area of sphere = $4 \times \pi \times \text{radius}^2$
Calculations:
=> Volume of Original Sphere = 27 × Volume of Smaller Sphere
=> $(4/3) \times \pi \times (12)^3 = 27 \times (4/3) \times \pi \times r^3$
=> $1728 = 27 \times r^3$
=> $r^3 = 1728 \div 27 = 64$
=> r = 4 cm
=> Surface Area of Original Sphere (S1) = $4 \times \pi \times (12)^2 = 576\pi$
=> Surface Area of 6 Smaller Spheres (S2) = $6 \times (4 \times \pi \times 4^2) = 6 \times 64\pi = 384\pi$
=> Required Ratio = S1 : S2 = $576\pi : 384\pi$
=> Ratio = 576 : 384 = 3 : 2
Therefore The correct answer is 3 : 2.
Additional Information
Volume and Surface Area Relationship
When a solid is melted and recast, the Total Volume remains constant. Volume = $(4/3)\pi r^3$.
Radius and Area Ratio Rule
If the ratio of radii of two spheres is a : b, then the ratio of their surface areas is $a^2 : b^2$.
Hemisphere Properties
For a hemisphere of radius r, Curved Surface Area = $2\pi r^2$ and Total Surface Area = $3\pi r^2$.

Q18. Answer: (b) One

Given numbers: 224, 637, 816, 471, 303
If we add 5 to each of the following numbers, we get
229, 642, 821, 476, 308
Then write the digits in each number in reverse order:
922, 246, 128, 674, 803
Then arrange the numbers in ascending order:
128, 246, 674, 803, 922
The position of One numbers will NOT change that number is 246.
Hence, 'One' is the correct answer.

Q19. Answer: (c) 5 + cosec^2 A + $\sec^2$ A

Shortcut Trick
Put A = 45° in the given expression.
$(\sin 45° + \text{cosec } 45°)^2 + (\cos 45° + \sec 45°)^2 = (1/\sqrt{2} + \sqrt{2})^2 + (1/\sqrt{2} + \sqrt{2})^2$
=> $(3/\sqrt{2})^2 + (3/\sqrt{2})^2 = 9/2 + 9/2 = 9$.
Check options at A = 45°: Option (3) is $5 + \text{cosec}^2 45° + \sec^2 45° = 5 + 2 + 2 = 9$.
Therefore The correct answer is 5 + cosec^2 A + $\sec^2$ A.
Alternate Method
Given: $(\sin A + \text{cosec } A)^2 + (\cos A + \sec A)^2$
Formula Used: $(a + b)^2 = a^2 + b^2 + 2ab$; $\sin A \times \text{cosec } A = 1$; $\cos A \times \sec A = 1$; $\sin^2 A + \cos^2 A = 1$
=> $(\sin^2 A + \text{cosec}^2 A + 2 \sin A \text{ cosec } A) + (\cos^2 A + \sec^2 A + 2 \cos A \sec A)$
=> $\sin^2 A + \text{cosec}^2 A + 2(1) + \cos^2 A + \sec^2 A + 2(1)$

=> $(\sin^2 A + \cos^2 A) + \text{cosec}^2 A + \sec^2 A + 2 + 2$

=> $1 + \text{cosec}^2 A + \sec^2 A + 4$

=> $5 + \text{cosec}^2 A + \sec^2 A$

Therefore The correct answer is $5 + \text{cosec}^2 A + \sec^2 A$.

Additional Information

Trigonometric Identities

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

Reciprocal Relations

Reciprocal products: $\sin \theta \times \text{cosec}\ \theta = 1$, $\cos \theta \times \sec \theta = 1$, and $\tan \theta \times \cot \theta = 1$.

Q20. Answer: (b) Suktas

The correct answer is Suktas

Key Points

• Rigveda

• It is an ancient Indian collection of Vedic Sanskrit hymns.

• It is the oldest known Vedic Sanskrit text.

• It is one of the four sacred canonical texts of Hinduism.

• It contains 1028 hymns which are arranged in 10 mandalas.

• The sum of the hymns in Rigveda is in the form of Dialogue.

• Hymns of the Rigveda are known as Sukta.

Additional Information

• Janas: Refers to early Vedic tribes or communities in ancient India, led by kings or chieftains (rajas), which formed the basis of Vedic social organization.

• Rudras: A group of deities in Vedic tradition, often associated with storms, wind, and destruction. Rudra, a fierce aspect of Shiva, is the leader of these deities.

• Rituals: In Vedic culture, rituals were central to religious practices, involving sacrifices (yajnas) performed to honor gods, maintain cosmic order, and seek blessings for prosperity and success.

Q21. Answer: (b) v1 > v2 > v3

The correct answer is v1 > v2 > v3

Key Points

• The refractive index (n) of a medium is related to the speed of light (v) in that medium by the formula:

• n = c / v

• where c is the speed of light in a vacuum

• Therefore, we can write the following equations for the given mediums:

• 1.31 = c / v1

• 1.36 = c / v2

• 1.44 = c / v3

• From these equations, we can deduce that:

• v1 > v2 > v3

• This means that the speed of light is greatest in medium 1 and smallest in medium 3.

• So, the correct relation between the speeds of light in the three mediums is:v1 > v2 > v3

Q22. Answer: (a) Kerala

The correct answer is Kerala

Key Points

• The Painkuni Festival is celebrated in Kerala, India

• The festival takes place at the Sree Padmanabha Swamy Temple in Thiruvananthapuram, Kerala

• The festival is celebrated in March or April

• The festival is a 10-day celebration

• The festival is closely associated with the Royal Family of Travancore

Additional InformationSome festivals of given options

State	Festival

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Assam	Bihu
Assam	Rongali Bihu
West Bengal	Durga Puja
West Bengal	Kali Puja
Odisha	Rath Yatra
Odisha	Nuakhai
Kerala	Onam
Kerala	Thrissur Pooram

Q23. Answer: (b) $x^2 - 6x + 8$

Shortcut Trick

Factorize all polynomials: $x^4 - 8x = x(x - 2)(x^2 + 2x + 4)$ and $2x^2 + 5x - 3 = (2x - 1)(x + 3)$.

Substitute and cancel common terms: $P = [x(x-2)(x^2+2x+4) / (2x-1)(x+3)] \times [(2x-1) / (x^2+2x+4)] \times [(x+3)(x-3) / x(x-2)]$.

After cancellation of all common factors, the simplified value is $P = x - 3$.

Calculate the final expression: $P^2 - 1 = (x - 3)^2 - 1 = x^2 - 6x + 9 - 1 = x^2 - 6x + 8$.

Therefore The correct answer is $x^2 - 6x + 8$.

Alternate Method

Given:

$P = [(x^4 - 8x) / (2x^2 + 5x - 3)] \times [(2x - 1) / (x^2 + 2x + 4)] \times [(x^2 - 9) / (x^2 - 2x)]$

Formula Used:

1. $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
2. $a^2 - b^2 = (a - b)(a + b)$
3. $(a - b)^2 = a^2 - 2ab + b^2$

Calculations:

=> Factorizing Term 1: $x^4 - 8x = x(x^3 - 8) = x(x - 2)(x^2 + 2x + 4)$

=> Factorizing Denominator of Term 1: $2x^2 + 5x - 3 = 2x^2 + 6x - x - 3 = 2x(x + 3) - 1(x + 3) = (2x - 1)(x + 3)$

=> Factorizing Term 3: $x^2 - 9 = (x - 3)(x + 3)$ and $x^2 - 2x = x(x - 2)$

=> $P = [x(x - 2)(x^2 + 2x + 4) / ((2x - 1)(x + 3))] \times [(2x - 1) / (x^2 + 2x + 4)] \times [(x - 3)(x + 3) / (x(x - 2))]$

=> Cancelling common factors: $P = x - 3$

=> $P^2 - 1 = (x - 3)^2 - 1$

=> $P^2 - 1 = (x^2 - 6x + 9) - 1$

=> $P^2 - 1 = x^2 - 6x + 8$

Therefore The correct answer is $x^2 - 6x + 8$.

Additional Information

Cubic Identity Factorization

The identity $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$ is frequently used to simplify rational expressions involving higher-degree polynomials.

Quadratic Polynomial Simplification

A quadratic expression $ax^2 + bx + c$ can be factored into two linear factors by finding two numbers whose sum is b and whose product is ac.

Difference of Squares

The property $a^2 - b^2 = (a - b)(a + b)$ is a fundamental tool for reducing the complexity of algebraic fractions before multiplication or division.

Q24. Answer: (b) a is the reproductive part, whereas b is the vegetative part

The correct answer is a is the reproductive part, whereas b is the vegetative part.

Key Points

- a represents the sporangium, which is the reproductive structure in Rhizopus.
- The sporangium contains spores, which are released for reproduction.
- b represents the hyphae, which are the vegetative parts of Rhizopus.
- Hyphae are responsible for nutrient absorption and growth of the fungus.

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Additional Information

• Rhizopus

• Rhizopus is a genus of common fungi that grows on organic substances like bread, fruits, and vegetables.

• They are known for their fast-growing nature and are often referred to as bread molds.

• Rhizopus species play a significant role in decomposition and nutrient cycling in ecosystems.

• Sporangium

• The sporangium is a structure found in fungi, algae, and some plants, which produces and contains spores.

• In Rhizopus, the sporangium is the reproductive organ that releases spores to propagate the fungus.

• Hyphae

• Hyphae are the long, thread-like structures that make up the body of a fungus.

• They form a network called mycelium, which is involved in nutrient absorption and growth.

• Spores

• Spores are reproductive units in fungi, capable of developing into a new individual without sexual fusion.

• They are usually resistant to adverse environmental conditions and can remain dormant until conditions are favorable for growth.

Q25. Answer: (c) Iron ore

The correct answer is Iron ore.

Key Points

• The Ballary-Chitradurga-Chikmagalur-Tumkur belt located in Karnataka is renowned for its vast reserves of iron ore.

• It is considered one of the major iron ore belts in India, contributing significantly to the country's iron and steel industry.

• The Kudremukh mines, located in the Western Ghats of Karnataka, are entirely focused on exports.

• A pipeline carries the ore in a slurry form to a port close to Mangalore.

• One of the three main iron ore belts is the one that runs through Odisha and Jharkhand.

• The other two are the Bellary-Chitradurga-Chikmagalur-Tumkur belt and the Durg-Bastar Chandrapur belt.

• The Odisha-Jharkhand belt's Badampahar mines produce high-grade hematite ore.

Additional Information

• Manganese ore can be found in the districts of Balaghat, Chhindwara, and Jhabua in Madhya Pradesh, in Nagpur and Bhandara in Maharashtra and Sundargarh, Koraput, and Ganjam in Odisha.

• The major copper mines are the Khetri copper belt in Rajasthan, Singhbhum copper belt in Jharkhand and Malanjkhand copper belt in Madhya Pradesh which are mined by HCL.

• Singhbhum belt is mined by M/s Indian Copper Complex.

• Titanium Sponge Plant of India is located at Kerala Minerals and Metals Ltd (KMML), Chavara, Kollam district of Kerala.

Q26. Answer: (d) 5 cm

The correct answer is 5 cm

Key Points

• When a ray of light is incident on a concave mirror parallel to its principal axis, after reflection it passes through the focus of the mirror.

• For a concave mirror, the relationship between focal length (f) and radius of curvature (R) is:

• f = R/2

• Here, R = 10 cm is given.

• Therefore, f = 10 cm / 2 = 5 cm

• Hence, the reflected ray will pass through a point on the axis at a distance of 5 cm from the mirror.

Q27. Answer: (a) Maintenance cost is very high

The correct answer is Maintenance costs is very high

Key Points

• The disadvantage of watershed management among the given options is Maintenance cost is very high.

• While watershed management offers numerous benefits, such as mitigating droughts and floods, increasing the life of downstream dams and reservoirs,

• and Increasing the income of the watershed community, it also involves significant maintenance costs.

• These costs can arise from activities like:

• Infrastructure maintenance: Repairing and maintaining dams, canals, and other structures within the watershed.

• Reforestation and afforestation: Planting trees to improve soil erosion control and water retention.
• Monitoring and evaluation: Tracking the effectiveness of watershed management practices and making necessary adjustments.
• These maintenance costs can be substantial, especially in large or complex watersheds.
• Therefore, while watershed management is a valuable approach to sustainable resource management,
• it is important to consider the associated costs and ensure adequate funding is available for long-term maintenance.

Q28. Answer: (c) 14

Given: A certain number of people are sitting in a row, facing north.
S is seventh to the right of L.
K is third to the right of J.
L is third to the right of K.
If no other person is sitting in the row.
There are 14 total number of persons seated.
Hence, the correct answer is "Option 4".

Q29. Answer: (a) Social Justice and Empowerment

The correct answer is Social Justice and Empowerment
Key Points
• The National Backward Classes Finance & Development Corporation (NBCFDC) is a Government of India undertaking under the aegis of the Ministry of Social Justice and Empowerment
• The Ministry is responsible for promoting the welfare and empowerment of socially disadvantaged groups, including backward classes, Scheduled Castes, and Scheduled Tribes.
• This Ministry implements various schemes and programs to address the socio-economic challenges faced by these communities, such as education, employment, and housing.
Additional Information
• Ministry of Micro, Small and Medium Enterprises
• The Ministry is responsible for promoting the growth and development of micro, small, and medium enterprises (MSMEs) in India.
• The Ministry provides financial assistance, technology support, and market access to MSMEs, thereby contributing to job creation and economic growth.
• Ministry of Tribal Affairs
• The Ministry is responsible for the welfare and development of tribal communities in India.
• The Ministry implements various schemes and programs to address the unique challenges faced by tribal communities, such as education, healthcare, and infrastructure development.
• Ministry of Rural Development
• The Ministry is responsible for promoting the development of rural areas in India.
• The Ministry implements various schemes and programs to improve rural infrastructure, agriculture, and livelihoods, thereby reducing poverty and inequality.

Q30. Answer: (a) Bardoli

The correct answer is Bardoli
Key Points
• Bardoli is the taluka in Gujarat where Vallabhbhai Patel led the peasant movement against the enhancement of land revenue in 1928.
• Th is movement, known as the Bardoli Satyagraha, was a significant milestone in India's struggle for independence.
• Due to the flood, ignoring the plight of the farmers, the Bombay Presidency increased the tax rates by 22%, resulting in the Bardoli Satyagraha.
• In January 1928, farmers in Bardoli invited Vallabhai Patel to launch a protest movement, in which they all took a pledge not to pay taxes.
• A large number of women took an active part in the movement.
• It was these women who gave Patel the nickname Sardar.
• The movement focused on the conditions of the rich and middle-class farmers and largely neglected the poor farmers.
Additional Information
• Vallabhbhai Patel

• Vallabhbhai Patel, known as the "Iron Man of India," was a prominent Indian statesman and freedom fighter.
• He played a crucial role in uniting India after independence.
• He negotiated with hundreds of princely states, persuading most of them to join the Indian Union.
• He was a dedicated follower of Mahatma Gandhi and participated in several civil disobedience movements against British rule.
• His leadership in the Kheda and Bardoli satyagrahas demonstrated his courage and commitment to the Indian independence struggle.

Q31. Answer: (d) 1/40 kg

Given:
Grams = 25 g
Formula used:
Kilograms = Grams / 1000
Calculations:
Kilograms = 25 g / 1000
=> Kilograms = 25 / 1000
=> Kilograms = 1 / 40
Therefore 25 grams = 1/40 kilograms

Q32. Answer: (b) 24^(th) March

The correct answer is 24 March.
Key Points
• World TB Day is celebrated every year on 24 March annually to commemorate the date when Dr. Robert Koch announced his discovery of Mycobacterium tuberculosis, the bacillus that causes TB in 1882.
• This Day is observed to educate people about TB, its impact around the world.
• The theme of World TB Day 2022 - 'Invest to End TB. Save Lives.'
Additional Information
• List of Important Days/Events in March:

Days	Events
01 March	Zero Discrimination Day, World Civil Defence Day
03 March	World Wildlife Day
04 March	National Safety Day
08 March	International Women’s Day
10 March	CISF Raising Day
15 March	World Consumer Rights Day, World Sleep Day

Q33. Answer: (c) 1

Given: (Left) S $ 3 & H P W 8 # J * M 2 F A 2 $ Y 1 V (Right)
Now,
Symbols, which are immediately preceded by a letter and also immediately followed by a number
So, Needed pattern is: Letter - Symbol - Number.
(Left) S $ 3 & H P W 8 # J * M 2 F A 2 $ Y 1 V (Right)
There are 1 Symbols which are preceded by a letter and also immediately followed by a number.
Hence, the correct answer is 'Option 3'.

Q34. Answer: (c) 4281/495

Shortcut Trick
For a mixed recurring decimal like 4.56767..., keep the integer 4 aside.
Fraction part = (Entire non-repeating and repeating digits − Non-repeating digits) ÷ (9 for each repeating digit followed by 0 for each non-repeating decimal digit).
Fraction = (567 − 5) ÷ 990 = 562 ÷ 990.
Simplify 562 ÷ 990 by dividing by 2 → 281 ÷ 495.

Therefore The correct answer is 4(281/495).

Alternate Method

Given: x = 4.5676767...

Method: Multiply by powers of 10 to isolate the period and subtract.

=> 1000x − 10x = 4567.6767... − 45.6767...

=> 990x = 4522

=> x = 4522 ÷ 990

=> x = 2261 ÷ 495

=> Converting to mixed fraction: 4522 ÷ 990 = 4 + 562/990

=> x = 4(281/495)

Therefore The correct answer is 4(281/495).

Additional Information

Pure Recurring Decimal

A decimal in which all the figures after the decimal point are repeated. Example: 0.666... = 6/9 = 2/3.

Mixed Recurring Decimal

A decimal in which at least one figure after the decimal point is not repeated and some figures are repeated. Example: 0.1666... = (16−1)/90 = 15/90 = 1/6.

Rational Number Property

Every terminating or recurring decimal can be expressed in the form p/q and is therefore a rational number.

Q35. Answer: (b) 56

The logic followed here is:

Hence, the correct answer is "Option 2".

Q36. Answer: (d) MKN : QOR

The logic followed here is:

UPR : YTV

LZB : PDF

Similarly,

MKN : QOR

Hence, the correct answer is "Option 4".

Q37. Answer: (d) it damages the cilia in the upper respiratory tract

The correct answer is it damages the cilia in the upper respiratory tract

Key Points

• Cigarette smoke contains harmful chemicals that damage the cilia, tiny hair-like structures in the upper respiratory tract.

• These cilia help to clear mucus and debris from the lungs.

• When damaged, the cilia become less effective, leading to increased mucus buildup and potential respiratory infections.

• The harmful effects of cigarette smoking on the cilia in the upper respiratory tract:

• Cilia impairment: The chemicals in cigarette smoke, such as tar and nicotine, can damage or paralyze the cilia.

• Mucus buildup: With impaired cilia, mucus can accumulate in the lungs, creating a breeding ground for bacteria and other harmful microorganisms.

• Increased risk of infections: The buildup of mucus can lead to respiratory infections like bronchitis and pneumonia.

• Chronic obstructive pulmonary disease (COPD): Long-term damage to the cilia and lungs can contribute to COPD, a serious lung disease characterized by difficulty breathing.

Q38. Answer: (d) 6

Shortcut Trick

Subtract the remainders from the numbers: 7072 − 22 = 7050, 8505 − 45 = 8460, 9925 − 55 = 9870.

Find the HCF of 7050, 8460, and 9870.

The differences between the numbers are 1410 and 1410.

The HCF x = 1410.

Sum of digits of 1410 = 1 + 4 + 1 + 0 = 6.

Therefore The correct answer is 6.

Alternate Method

Given: Numbers are 7072, 8505, 9925 and remainders are 22, 45, 55.

Formula: Greatest number x = HCF of (N1−R1, N2−R2, N3−R3)

=> Required numbers: (7072 − 22) = 7050; (8505 − 45) = 8460; (9925 − 55) = 9870

=> Finding differences between consecutive numbers: (8460 − 7050) = 1410 and (9870 − 8460) = 1410

=> Since 1410 divides all three numbers, HCF (x) = 1410

=> Sum of digits of x = 1 + 4 + 1 + 0 = 6

Therefore The correct answer is 6.

Additional Information

HCF of Numbers with Remainders

To find the greatest number that divides several numbers leaving specific remainders, always subtract each remainder from its respective number first, then calculate the HCF.

HCF by Difference Method

The HCF of two or more numbers is either the difference between the numbers or a factor of that difference.

Common Remainder Property

If the remainder is the same in each case (but unknown), the greatest number is the HCF of the differences (N2−N1), (N3−N2), and (N3−N1).

Q39. Answer: (a) Mango

The correct answer is Mango

Key Points

• Vegetative propagation:

• This is a type of asexual reproduction where new plants grow from the vegetative parts (like stem, root, leaf) of a plant.

• Mango, grape, sugarcane, and rose:

• All these plants can reproduce through vegetative propagation.

• For example, mango can be propagated by grafting, grape by cuttings, sugarcane by stem cuttings, and rose by cuttings.

• Mango:

• Mango is primarily grown from seeds. Although mango trees can be propagated by grafting, it's not a widely used method.

• Therefore, out of the given options, mango is the plant that does not primarily reproduce through vegetative propagation.

Additional Information

• Grape: Grapes can be easily propagated by cutting a vine and planting it.

• Sugarcane: Sugarcane stem cuttings can be planted to grow new plants.

• Rose: Rose cuttings can be planted in soil to produce new plants.

Q40. Answer: (c) (A)

Shortcut Trick

For Scheme (A), Net Discount = 12 + 15 − (12 × 15) ÷ 100 = 25.2%.

For Scheme (B), Net Discount = 15 + 10 + 2 − (150 + 20 + 30) ÷ 100 + (15 × 10 × 2) ÷ 10000 = 25.03%.

For Scheme (C), total discount on 10 toys = (40% × 3 + 15% × 7) ÷ 10 = (120 + 105) ÷ 10 = 22.5%.

For Scheme (D), Net Discount = (Free items ÷ Total items) × 100 = (2 ÷ 12) × 100 = 16.67%.

Comparing all values: 25.2% > 25.03% > 22.5% > 16.67%.

Therefore The correct answer is (A).

Alternate Method

Given → Marked Price (MP) of 1 toy = 100 | Total toys to buy = 10.

Formulas: Successive Discount = a + b − (ab ÷ 100) | Net Discount% = (Total Discount ÷ Total MP) × 100.

=> Scheme A: 12 + 15 − (12 × 15 ÷ 100) = 27 − 1.8 = 25.2%.

=> Scheme B: 15 + 10 − 1.5 = 23.5%; then 23.5 + 2 − (23.5 × 2 ÷ 100) = 25.5 − 0.47 = 25.03%.

=> Scheme C: (3 × 40 + 7 × 15) = 120 + 105 = 225 total units. Discount % = 225 ÷ (10 × 100) × 100 = 22.5%.

=> Scheme D: Buy 10 get 2 free means 12 toys for price of 10. Discount % = (2 ÷ 12) × 100 = 16.67%.

=> Scheme (A) provides the maximum discount.

Therefore The correct answer is (A).

Additional Information

Successive Discounts

When multiple discounts are applied, the final price is lower than the sum of individual percentages. Formula: 100 − [100 × (1 − d1/100) × (1 − d2/100) ...]

Free Item Calculation

Discount % = [Free Articles ÷ Total Articles (Paid + Free)] × 100.

Q41. Answer: (a) Rs. 250

Shortcut Trick

Change in Consumption = MPC × Change in Income.

Given MPC = 0.5 and ΔIncome = Rs. 500.

ΔConsumption = 0.5 × 500 = 250.

Therefore The correct answer is Rs. 250.

Alternate Method

Given → Marginal Propensity to Consume (MPC) = 0.5, Increase in Income (ΔY) = Rs. 500.

Formulas: MPC = ΔC ÷ ΔY | ΔC = MPC × ΔY

Steps:

=> We know that MPC represents the ratio of change in consumption to the change in income.

=> ΔC = MPC × ΔY

=> ΔC = 0.5 × 500

=> ΔC = 250

Therefore The correct answer is Rs. 250.

Additional Information

Marginal Propensity to Consume (MPC)

It measures the proportion of an aggregate raise in pay that a consumer spends on the consumption of goods and services. Formula: MPC = ΔC / ΔY.

Marginal Propensity to Save (MPS)

It is the fraction of an increase in income that is not spent and instead used for saving. MPC + MPS = 1.

Q42. Answer: (d) Lord Rippon

The correct answer is Lord Ripon

Key Points

• Lord Ripon is known in India as the father of local self-government.

• He is known as the father of local self-government because he passed a resolution of local self-government which laid the democratic forms of municipal governance in India in 1882.

• The Municipal Institutions that had grown up in the country since the British Crown occupied India developed his local self-government scheme.

• He was the viceroy and Governor-General of India.

Additional Information

• Lord Warren Hastings (1773-1785):

• First Governor-General of Bengal, overseeing the early consolidation of British rule in India.

• He Reformed the judicial system by setting up civil and criminal courts (diwani and faujdari courts).

• Faced impeachment in Britain for alleged corruption but was acquitted after a long trial.

• Lord Canning (1856-1862):

• The last Governor-General and the first Viceroy of India after the Government of India Act, 1858.

• He Managed the aftermath of the Revolt of 1857, known for his policy of clemency toward rebels.

• He Introduced significant reforms, including the Indian Penal Code and the foundation of modern civil service.

• Lord Cornwallis (1786-1793):

• He Introduced the Permanent Settlement of Bengal in 1793, fixing land revenue and granting landlords hereditary rights.

• He is Reformed the administration and judiciary, introducing the Cornwallis Code, which professionalized civil services.

• He Played a significant role in the Third Anglo-Mysore War against Tipu Sultan, leading to British victories in southern India.

Q43. Answer: (a) 220

Shortcut Trick

Area of Rectangle = Area of Circle

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$77 \times 50 = (22/7) \times r^2$

$r^2 = (77 \times 50 \times 7) / 22 = (7 \times 50 \times 7) / 2 = 7 \times 25 \times 7 \Rightarrow r = 7 \times 5 = 35$ m

Perimeter (Circumference) $= 2 \times (22/7) \times 35 = 2 \times 22 \times 5 = 220$ m

Therefore The correct answer is 220 m.

Alternate Method

Given: Length (l) = 77 m, Breadth (b) = 50 m

Formula Used: Area of rectangle = l × b; Area of circle = πr^2; Circumference = $2\pi r$

=> Area of Rectangle $= 77 \times 50 = 3850$ m²

=> Area of Circle $= \pi r^2 = 3850$

=> $(22/7) \times r^2 = 3850$

=> $r^2 = (3850 \times 7) \div 22$

=> $r^2 = 175 \times 7 = 1225$

=> $r = \sqrt{1225} = 35$ m

=> Perimeter of Circle $= 2 \times (22/7) \times 35$

=> Perimeter $= 2 \times 22 \times 5 = 220$ m

Therefore The correct answer is 220 m.

Additional Information

Area and Perimeter of a Rectangle

The Area is l × b and the Perimeter is $2(l + b)$. The diagonal is $\sqrt{(l^2 + b^2)}$.

Circle Properties

For a circle with radius r, Area = πr^2 and Circumference = $2\pi r$. Diameter (d) = 2r.

Standard Ratios for Circle

If r = 7, then Circumference = 44 and Area = 154. Scaling the radius by k scales Area by k^2 and Circumference by k.

Q44. Answer: (a) increase in their atomic masses

The correct answer is an increase in their atomic masses

Key Points

• Dobereiner arranged elements in triads based on the observation that the atomic mass of the middle element in a triad was approximately

• the average of the atomic masses of the other two elements.

• This arrangement implies that the elements within a triad were arranged in order of increasing atomic masses.

• He called these groups of three elements "triads."

• Examples of Dobereiner's Triads:

• Chlorine (35.5), Bromine (79.9), Iodine (126.9): The atomic mass of bromine (79.9) is approximately the average of chlorine (35.5) and iodine (126.9).

• Lithium (6.9), Sodium (23), Potassium (39.1): The atomic mass of sodium (23) is approximately the average of lithium (6.9) and potassium (39.1).

Q45. Answer: (a) erect, 1.0 cm

The Correct answer is erect, 1.0 cm.

Key Points

• The problem involves a convex mirror, where the focal length (f) is given as 8 cm, and the object distance (u) is -24 cm (negative as it is placed in front of the mirror).

• The mirror formula is used to determine the image distance (v): $1/f = 1/v + 1/u$

• Substituting the values: $1/8 = 1/v + 1/(-24)$

• Solving for v: v = 6 cm

• The image distance is positive, indicating that the image is formed on the same side as the reflecting surface, characteristic of a convex mirror.

• The magnification (m) is calculated using the formula: $m = v/u$

• Substituting the values: $m = 6/(-24) = -1/4$

• The negative sign of magnification indicates that the image is erect.

• The height of the image is determined using the magnification: Image height = Magnification × Object height

• Substituting the values: Image height = 1/4 × 4.0 cm = 1.0 cm

• Hence, the image formed is erect and has a height of 1.0 cm.

Additional Information

• Convex mirrors

• Convex mirrors always form virtual, erect, and diminished images, irrespective of the object's position.

• They are commonly used in vehicle rearview mirrors as they provide a wider field of view.

• Mirror formula

• The mirror formula is applicable for all spherical mirrors and is expressed as: 1/f = 1/v + 1/u, where:

• f is the focal length,

• v is the image distance, and

• u is the object distance.

• Magnification

• Magnification (m) is the ratio of the image height to the object height and is also related to the object and image distances as: m=v/u

• A positive magnification indicates an erect image, while a negative magnification indicates an inverted image.

Q46. Answer: (c) 2022

The correct answer is 2022

Key Points

• The 15th edition of the Indian Premier League (IPL) was played in the year 2022.

• It featured eight teams competing for the title.

• Gujarat Titans emerged as the champions for the first time, defeating Rajasthan Royals in the final.

Additional Information

• The Indian Premier League (IPL) is a professional Twenty20 cricket league in India.

• It was founded in 2008 and is considered one of the most popular and valuable sports leagues in the world.

• The IPL is a franchise-based league, meaning that teams are owned by private companies.

• This model has contributed to the league's commercial success.

• Players are selected for teams through an auction system.

Q47. Answer: (d) 3

The correct answer is 3

Key Points

• The number of field lines drawn inside a solenoid is proportional to the magnetic field strength within it.

• The magnetic field strength of a solenoid is directly proportional to the product of its number of turns and the current flowing through it.

• Given that the current in both solenoids is the same, the magnetic field strength is directly proportional to the number of turns.

• Since the number of field lines drawn inside solenoid P is thrice that drawn inside solenoid Q,

• the magnetic field strength in P is also thrice that in Q.

• Therefore, the number of turns in solenoid P is 3 times the number of turns in solenoid Q.

Q48. Answer: (d) 3(1)/(3)%

Shortcut Trick

Simple Interest (SI) = Amount − Principal = 9,250 − 7,500 = Rs. 1,750

SI per year = 1,750 ÷ 7 = Rs. 250

Rate % = (SI per year ÷ Principal) × 100

Rate % = (250 ÷ 7,500) × 100 = 250 ÷ 75 = 10/3 = 3(1/3)%

Therefore The correct answer is 3(1/3)%.

Alternate Method

Given:

Principal (P) = Rs. 7,500

Amount (A) = Rs. 9,250

Time (T) = 7 years

Formula Used:

SI = (P × R × T) / 100

Amount = P + SI

Calculations:

=> SI = Amount − Principal

=> SI = 9,250 − 7,500 = 1,750

=> 1,750 = (7,500 × R × 7) / 100

=> 1,750 = 75 × R × 7

=> 1,750 = 525 × R

=> R = 1,750 / 525

=> R = 70 / 21 (Dividing by 25)

=> R = 10 / 3 (Dividing by 7)

=> R = 3(1/3)%

Therefore The correct answer is 3(1/3)%.

Additional Information

Simple Interest Formula

SI is calculated only on the Principal amount: SI = (P × R × T) / 100, where P is Principal, R is Rate, and T is Time.

Relationship between Amount and SI

The total Amount (A) received at the end of the period is the sum of Principal and Interest: A = P × [1 + (RT/100)].

Principal Formula

To find the Principal when Amount, Rate, and Time are given: P = (100 × A) / (100 + RT).

Q49. Answer: (b) Decomposers

The correct answer is Decomposers

Key Points

• Decomposers are the group of organisms that break down dead and decaying organisms

• Decomposers break down dead organisms into simpler substances, releasing nutrients and carbon into the soil.

• These nutrients are then used by primary producers and plants.

• Bacteria and fungi are examples of decomposers

• Decomposers play a vital role in the flow of energy through an ecosystem.

• They make up the largest population in the food chain.

Additional Information

• Consumers:

• Organisms that cannot produce their own food and rely on other organisms for nutrition.

• Examples: Herbivores (eat plants), carnivores (eat animals), omnivores (eat both plants and animals).

• Producers:

• Organisms that can produce their own food through photosynthesis or chemosynthesis.

• Examples: Plants, algae, bacteria.

• Scavengers:

• Organisms that consume dead or decaying organic matter.

• Examples: Vultures, hyenas, crows.

Q50. Answer: (a) 288

Shortcut Trick

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

Given: a = 18 and b = 72.

Calculation: (72 × 72) ÷ 18 => 4 × 72 = 288.

Therefore The correct answer is 288.

Alternate Method

Given: First number (a) = 18, Second number (b) = 72.

Formula Used: If x is the third proportional to a and b, then a : b :: b : x.

=> 18 / 72 = 72 / x

=> 1 / 4 = 72 / x

=> x = 72 × 4

=> x = 288

Therefore The correct answer is 288.

Additional Information

Mean Proportional

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

Fourth Proportional

If a, b, and c are three numbers, the fourth proportional x is such that a : b = c : x, meaning x = (b × c) ÷ a.

Continued Proportion

Three numbers a, b, and c are in continued proportion if a/b = b/c, which implies $b^2 = ac$.

Q51. Answer: (d) Rs. 1 lakh to Rs. 2 lakh

The correct answer is Rs. 1 lakh to Rs. 2 lakh

Key Points

• As of March 2022, Pradhan Mantri Jan Dhan Account holders were entitled to an accidental insurance cover ranging from Rs. 1 lakh to Rs. 2 lakh.

• The PMJDY scheme provides free accidental insurance coverage to all account holders.

• This cover is designed to provide financial support to the family of the account holder in the event of an accidental death or permanent total disability.

• The accidental insurance coverage is linked to the RuPay debit card issued to PMJDY account holders.

• The card must be used for at least one transaction (financial or non-financial) in the preceding 90 days to be eligible for the insurance.

• The coverage amount varies depending on the type of PMJDY account and the premium paid.

• While the basic coverage was Rs. 1 lakh, some account holders may have been eligible for higher coverage amounts.

Q52. Answer: (d) 800 metres

Shortcut Trick

Speed in m/s = 36 × (5/18) = 10 m/s.

Length of train = Speed × Time = 10 × 80 = 800 m.

Therefore The correct answer is 800 metres.

Alternate Method

Given:

Time taken to cross the pole = 80 seconds

Speed of the train = 36 km/h

Formula Used:

Distance = Speed × Time

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

Calculations:

=> Speed = 36 × (5/18) m/s

=> Speed = 2 × 5 = 10 m/s

=> Distance (Length of train) = Speed × Time

=> Length = 10 m/s × 80 s

=> Length = 800 metres

Therefore The correct answer is 800 metres.

Additional Information

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 Crossing Stationary Object

When a train crosses a point object (pole, man, tree), the distance covered is equal to the length of the train.

Train Crossing Platform

When a train crosses a platform or bridge, the total distance covered = Length of train + Length of platform.

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Q53. Answer: (d) 180°

Shortcut Trick

A straight angle is an angle that forms a straight line. By definition, the measure of a straight angle is exactly 180°. It is equivalent to two right angles (90° + 90°).

Therefore The correct answer is 180°.

Alternate Method

Given: Angle type = Straight Angle.

Definition: A straight angle is an angle whose measure is exactly 180 degrees. It represents a half-rotation around a point.

=> Measure of a right angle = 90°

=> Measure of a straight angle = 2 × right angle

=> Straight angle = 2 × 90° = 180°

Therefore The correct answer is 180°.

Additional Information

Types of Angles

Acute Angle: Measures between 0° and 90°. Obtuse Angle: Measures between 90° and 180°.

Reflex and Complete Angles

Reflex Angle: Measures between 180° and 360°. Complete Angle: Measures exactly 360°.

Q54. Answer: (a) 182

The logic followed here is:

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

Now,

For, 11 : 132

=> (11 + 1) × 11 = 12 × 11 = 132.

For, 12 : 156

=> (12 + 1) × 12 = 13 × 12 = 156.

Similarly, for 13 : ?

=> (13 + 1) × 13 = 14 × 13 = 182.

Hence, the correct answer is "Option 1".

Q55. Answer: (d) 87,000

Shortcut Trick

Apply Cross-Multiplication Method on Income and Expenditure ratios.

Income (7 : 5) and Expenditure (17 : 12) with savings (12000, 9000).

(7 × 12) − (5 × 17) units = (17 × 9000) − (12 × 12000)

|84 − 85| units = |153000 − 144000| => 1 unit = Rs. 9,000

Income of Seema = 7 × 9000 = Rs. 63,000; Darshan = 5 × 9000 = Rs. 45,000

Total Expenditure = (63000 − 12000) + (45000 − 9000) = 51000 + 36000 = Rs. 87,000

Therefore The correct answer is Rs. 87,000.

Alternate Method

Given: Ratio of Income = 7 : 5, Savings = Rs. 12,000 and Rs. 9,000, Ratio of Expenditure = 17 : 12.

Formula Used: Income − Savings = Expenditure

=> Let the incomes be 7x and 5x.

=> (7x − 12000) / (5x − 9000) = 17 / 12

=> 12(7x − 12000) = 17(5x − 9000)

=> 84x − 144000 = 85x − 153000

=> x = 153000 − 144000 = 9000

=> Seema Expenditure = 7(9000) − 12000 = 51000

=> Darshan Expenditure = 5(9000) − 9000 = 36000

=> Total Expenditure = 51000 + 36000 = 87000

Therefore The correct answer is Rs. 87,000.

Additional Information

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Income-Expenditure Relationship

The fundamental relation is Income = Expenditure + Savings. Ratio problems can be solved by assuming a variable for either income or expenditure.

Cross-Multiplication Technique

Used when two ratios and the absolute changes (savings/additions) are given: (a:b) → (c:d) with changes m and n, then 1 unit = |dm − bn| / |ad − bc|.

Ratio Balancing

If savings were equal, the difference between ratio parts of income and expenditure could be equated by multiplying the ratios by the difference of the other ratio.

Q56. Answer: (c) Anthracite - Lowest grade of hard coal

The correct answer is Anthracite - Lowest grade of hard coal

Key Points

• Anthracite - Lowest grade of hard coal

• Anthracite is actually the highest grade of hard coal, not the lowest.

• It has the highest carbon content and the lowest amount of volatile matter, making it the most efficient coal for burning.

• It is primarily used for heating and cooking due to its high heat output and clean burning properties.

Additional Information

• Bituminous coal is the most popular coal in commercial use due to its versatility and high energy content.

• Metallurgical coal is used for smelting iron in blast furnaces because it has a high carbon content and low sulfur content, which are essential for the iron-making process.

• Lignite is a low-grade brown coal with a high moisture content and low heat content.

Q57. Answer: (d) F

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

1) D is sitting at one of the corners.

2) H was sitting to the immediate left of D.

3) Only A was sitting between G and D.

4) B was sitting second to the right of G.

5) C was sitting fourth to the left of G.

6) Only E was sitting between B and C.

Final arrangement:

So, F was sitting third to the right of D.

Hence, the correct answer is "Option 4".

Q58. Answer: (c) Only (b)

The correct answer is Only(b)

Key Points

• The angle of refraction at surface AB is the same for different colours of white light.

• This statement is incorrect.

• When white light passes through a refracting surface like AB of a prism,

• the different colours (wavelengths) of light bend by different amounts due to their different refractive indices in the glass.

• This is the phenomenon of dispersion.

• Since the refractive index depends on the wavelength, each colour will have a different angle of refraction.

• The angle of refraction at the surface AC is different for different colours.

• This statement is correct.

• As light exits through surface AC, the different colours of light will refract at different angles

• because they travel through the prism at different speeds (due to different refractive indices for different wavelengths).

• This results in different angles of refraction for each colour, which is why a spectrum of colours emerges from the prism.

Q59. Answer: (d) Goalkeeper

The correct answer is Goalkeeper

Key Points

• Sreejesh P.R. played a crucial role as the Goalkeeper for the Indian men's hockey team during the Tokyo Olympics in 2021.

• His remarkable saves, especially in the bronze medal match against Germany, were instrumental in securing India's first Olympic hockey medal in 41 years.

• The goalkeeper is the last line of defence in hockey.

• Their primary responsibility is to prevent the opposing team from scoring by blocking shots directed at the goal.

• Unlike other players, the goalkeeper is allowed to use any part of their body, including hands, feet, and stick, to stop the ball within the shooting circle.

Additional Information

• Defender:

• Defenders primarily focus on preventing the opposing team from scoring.

• They play in the backline, protecting the goal and trying to intercept or block attacks.

• They also help in building up play from the back by passing the ball to midfielders or forwards.

• Tackling, positioning, marking opponents, and clearing the ball from dangerous areas.

• Forward:

• Forwards are the main attackers who are responsible for scoring goals.

• They play near the opponent's goal and work on creating scoring opportunities by dribbling, passing, and shooting the ball.

• Speed, dribbling, positioning, finishing (shooting), and quick decision-making.

• Midfielder:

• Midfielders play a versatile role, linking both the defense and the attack.

• They are involved in both defending and creating opportunities for forwards.

• Midfielders need to control the game, distribute the ball, and support both offensive and defensive plays.

• Passing, ball control, stamina, positioning, and vision to make key plays.

Q60. Answer: (a) 6

Given Equation: [{(19 × 12) - (2 ÷ 4)} + (2 - 3)] ÷ 2

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	÷	•	•	×

Now replacing the symbols from left to right using BODMAS Rule, we get:

=> [{(19 - 12)} + (2 × 4)] ÷ (2 + 3)] × 2

=> [{(7)} + (8)] ÷ (2 + 3)] × 2

=> [7 + 8] ÷ 5 × 2

=> 15 ÷ 5 × 2

=> 3 × 2 = 6.

Hence, the correct option is "Option 1".

Q61. Answer: (b) 12 years

Shortcut Trick

Average age of 6 children = 42 ÷ 6 = 7 years.

Since the ages are in Arithmetic Progression with a common difference of 2, the average lies exactly between the 3^(rd) and 4^(th) child.

Age of 3^(rd) child = 7 − 1 = 6 years | Age of 4^(th) child = 7 + 1 = 8 years.

Age of 6^(th) (eldest) child = 8 + (2 × 2) = 12 years.

Therefore The correct answer is 12 years.

Alternate Method

Given: Sum of 6 children = 42, Interval = 2 years.

Let the age of the youngest child be x.

=> Ages are: x, (x + 2), (x + 4), (x + 6), (x + 8), (x + 10).

=> Sum = x + (x + 2) + (x + 4) + (x + 6) + (x + 8) + (x + 10) = 42

=> 6x + 30 = 42

=> 6x = 42 − 30

=> 6x = 12

=> x = 2 years

=> Eldest child age = x + 10 = 2 + 10 = 12 years.

Therefore The correct answer is 12 years.

Additional Information

Arithmetic Progression (AP) in Ages

When values are at equal intervals, the sum is given by $S_n = n/2 \times [2a + (n-1)d]$. Here n=6, d=2, and S_n=42.

Middle Term Concept

For an even number of terms in AP, the average is the mean of the two middle terms. Average = Total Sum ÷ Number of terms.

Q62. Answer: (c) Only conclusion II follows

Given statements:

All paintings are arts

Some walls are doors

Some paintings are windows

The least possible diagram:

Conclusions:

(I) Some arts are walls - False (Because, there is no relation between arts and walls, so it can be possible only)

(II) Some arts are windows - True (Because, All paintings are arts and Some paintings are windows implies that Some arts are windows)

(III) Some paintings are doors - False (Because, there is no relation between paintings and doors, so it can be possible only)

So, Only conclusion II follows.

Hence, the correct answer is "Option 3".

Q63. Answer: (a) A

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

Only three people sit between G and F.

Only two people sit to the left of G.

B is not an immediate neighbour of F.

B sits second to the right of D.

C sits to the immediate right of E.

Thus, A sits at the extreme left end of the row.

Hence, the correct answer is "Option 1".

Q64. Answer: (c) i - c, ii - b, iii - a

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

Key Points

• The correct matches are:

• | Functional Group | Compound Type |

i)-COOH	**Carboxylic c)acid**
ii)R-CO-R	b)Ketone
iii)-COOR	a)Ester

• Carboxylic acid:

• This functional group consists of a carbonyl group (C=O) attached to a hydroxyl group (-OH).

• Carboxylic acids are organic compounds that often have acidic properties.

• Ketone:

• This functional group also contains a carbonyl group (C=O), but it is located within a carbon chain, not at the end.

• Ketones are often used as solvents or flavoring agents.

• Ester:

• This functional group is formed by the reaction between a carboxylic acid and an alcohol.

• Esters are often found in natural oils and fats, and they are used as flavorings and fragrances.

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Q65. Answer: (b) A N L A S L

The logic followed here is:

Given Sequence: S L _ _ G S _ _ N G _ _ A N G

Now, putting the letters in the blank spaces given in the option one by one:

Option 1) L A N A L S → S L L A G / S N A N G / L S A N G

Option 2) A N L A S L → S L A N G / S L A N G / S L A N G

Here, 'S L A N G' followed a pattern.

Option 3) A L N A S L → S L A L G / S N A N G / S L A N G

Option 4) A L A N L S → S L A L G / S A N N G / L S A N G

Hence, the correct answer is "Option 2".

Q66. Answer: (d) dry and hot winds

The correct answer is dry and hot winds

Key Points

• The Loo is a strong, dry, and hot wind that blows over the plains of North India, especially during the summer months (April to June).

• It typically occurs during the afternoon and can cause severe heat waves, with temperatures often exceeding 45°C.

• The Loo is dangerous as it can cause heatstroke and dehydration if one is exposed to it for long periods.

Additional Information

• Types of Winds:

• Primary Winds (or Planetary Winds):

• Trade Winds:

• These winds blow from the subtropical high-pressure areas towards the equatorial low-pressure belt.

• In both hemispheres, they move from east to west between 30° latitude and the equator.

• Westerlies:

• These winds blow from the subtropical high-pressure areas towards the subpolar low-pressure areas, generally from the west.

• They dominate the middle latitudes between 30° and 60°.

• Polar Easterlies: These are cold winds that blow from the polar high-pressure areas towards the subpolar low-pressure areas, moving from east to west.

• Secondary Winds (or Periodic Winds):

• Monsoons:

• Monsoons are seasonal winds, characterized by the reversal of wind direction.

• In India, the Southwest Monsoon brings heavy rainfall during the summer, while the Northeast Monsoon brings dry weather in the winter.

• Land and Sea Breezes:

• These are diurnal (day-night) winds.

• Land breezes blow from the land to the sea at night, and sea breezes blow from the sea to the land during the day due to differences in heating between land and water.

• Tertiary Winds (or Local Winds):

• Loo: As mentioned above, the Loo is a hot, dry wind blowing across northern India.

• Chinook: A warm, dry wind that blows down the eastern slopes of the Rockies in North America, causing rapid temperature increases.

• Mistral: A cold, dry wind blowing from the northwest towards the Mediterranean in southern France.

• Föhn: A warm wind blowing down the northern slopes of the Alps.

Q67. Answer: (c) 1 - c, 2 - a, 3 - b

The correct answer is 1 - c, 2 - a, 3 - b

Key Points

• The correct matches are:

• | Category | Number of Elements |

Total number of elements found	**118**
Naturally available elements	94

Elements found through laboratory processes	24

• Total number of elements found: As of October 2024, there are 118 elements recognized by the International Union of Pure and Applied Chemistry (IUPAC).

• Naturally available elements: Out of the 118 elements, 94 are found naturally on Earth or in astronomical spectra.

• Elements found through laboratory processes: The remaining 24 elements are heavier and not found naturally. These elements have been synthesized in laboratories or nuclear reactors.

Q68. Answer: (d) 2380 and 2390

Shortcut Trick

Check the common difference for divisors 24 and 32: 24 − 11 = 13 and 32 − 19 = 13.

Find LCM of (24, 32) = 96. General form: 96k − 13.

Also, the number must satisfy (N − 2) is divisible by 15 and N is divisible by 31.

Testing k = 25 => N = 96 × 25 − 13 = 2400 − 13 = 2387.

Check: 2387 ÷ 31 = 77 (Rem = 0) and 2387 ÷ 15 (Rem = 2). Both satisfy.

Therefore The correct answer is 2380 and 2390.

Alternate Method

Given:

Divisors: 15, 24, 32, 31

Remainders: 2, 11, 19, 0

Calculations:

=> Let the number be N.

=> N = 24a + 11 => N = 24(a + 1) − 13

=> N = 32b + 19 => N = 32(b + 1) − 13

=> Common Difference = Divisor − Remainder = 24 − 11 = 13 and 32 − 19 = 13.

=> N must be of form: LCM(24, 32) × k − 13 = 96k − 13.

=> Condition 1: (96k − 13) ÷ 31 => Remainder = (3k − 13) ÷ 31. For Rem = 0, 3k − 13 = 0, 31, 62...

=> 3k = 13 + 62 = 75 => k = 25.

=> Condition 2: (96k − 13) ÷ 15 => Remainder = (6k − 13) ÷ 15. For k = 25:

=> (6 × 25 − 13) = 150 − 13 = 137. 137 ÷ 15 gives Remainder = 2. (Condition satisfied).

=> N = 96 × 25 − 13 = 2400 − 13 = 2387.

Therefore The correct answer is 2380 and 2390.

Additional Information

LCM and Remainder Theorem

When a number leaves the same negative remainder (Divisor − Remainder = constant d), the number is LCM(divisors) × k − d.

Divisibility Rules

A number N is divisible by 31 if the result of subtracting three times the last digit from the rest is divisible by 31.

Common Remainder Property

If N = a×q1 + r and N = b×q2 + r, then N = LCM(a, b) × k + r.

Q69. Answer: (d) 1,33,000

Shortcut Trick

Value of a = 50 and b = 20.

Directly calculate the cubes of given numbers.

$a^3 = 50^3 = 1,25,000$

$b^3 = 20^3 = 8,000$

$a^3 + b^3 = 1,25,000 + 8,000 = 1,33,000$.

Therefore The correct answer is 1,33,000.

Alternate Method

Given:

=> a = 50

=> b = 20

Formula Used:

=> $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Calculations:

=> $a + b = 50 + 20 = 70$

=> $a^2 = 50 \times 50 = 2,500$

=> $b^2 = 20 \times 20 = 400$

=> $ab = 50 \times 20 = 1,000$

=> $(a^2 - ab + b^2) = 2,500 - 1,000 + 400 = 1,900$

=> $a^3 + b^3 = 70 \times 1,900$

=> $a^3 + b^3 = 1,33,000$

Therefore The correct answer is 1,33,000.

Additional Information

Sum of Cubes Formula

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$. This is a basic algebraic identity used for factorisation.

Difference of Cubes Formula

$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$. Note the change in signs of b and the product ab.

Whole Cube Expansion

$(a + b)^3 = a^3 + b^3 + 3ab(a + b)$. This can be rearranged to find the sum of individual cubes.

Q70. Answer: (b) 100

Given:

[89 - (336/301) × {68 - (50 ÷ 3 + 7/6)} + 67]

Calculation:

[89 - (336/301) × {68 - (50 ÷ 3 + 7/6)} + 67]

=> [89 - (336/301) × {68 - (50/3 + 7/6)} + 67]

=> [89 - (336/301) × {68 - (100/6 + 7/6)} + 67]

=> [89 - (336/301) × {68 - (107/6)} + 67]

=> [89 - (336/301) × { 408/6 - 107/6 } + 67]

=> [89 - (336/301) × { 301/6 } + 67]

=> 89 - 56 + 67

=> 156 - 56 = 100

Therefore The correct answer is 100.

Q71. Answer: (b) (9/4) R

The correct answer is (9/4) R

Key Points

• The resistance of a wire is directly proportional to its length and inversely proportional to its cross-sectional area.

• We can use the formula:

• R = ρL/A

• where:

• R is the resistance

• ρ is the resistivity of the material

• L is the length of the wire

• A is the cross-sectional area of the wire

• Therefore, the new resistance is:

• R' = ρ(1.5L) / (2/3A) = (9/4)ρL/A = (9/4)R

• If the length of the wire increases by 50%, the new length becomes 1.5L.

• Since the volume of the wire remains constant, the cross-sectional area must decrease by a factor of 2/3 to maintain the same volume.

• Therefore, the new resistance is:

• R' = ρ(1.5L) / (2/3A) = (9/4)ρL/A = (9/4)R

• So, the resistance of the new wire is (9/4) times the resistance of the original wire.

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Q72. Answer: (c) 100

Given:

Fund spent on security = 70 crores

Fund spent on education = 30 crores

Fund spent on health = 60 crores

Calculation:

Difference between the funds spent on security and education = 70 - 30

=> 40 crores

The sum of the 'difference between the funds spent on security and education and the funds spent on health,

=> 40 + 60 = 100 crores

Therefore The correct answer is 100 crores.

Q73. Answer: (c) E

According to the given information:

1) C lives on floor number 5.

2) B lives on an odd numbered floor but not an floor number 3.

3) Neither D nor E lives on the lowermost floor.

4) A lives on an odd numbered floor and is immediately above D.

Floor No.	Person
1	B
2	E
3	A
4	D
5	C
6	F

So, E lives on floor number 2.

Hence, the correct answer is "Option 3".

Q74. Answer: (a) uniform

The correct answer is Uniform

Key Points

• A solenoid produces a uniform magnetic field inside it.

• This means that the magnetic field strength is the same at all points within the solenoid, regardless of the distance from the centre.

• This uniformity is due to the way the magnetic field lines are arranged within the solenoid.

• The field lines are parallel to each other and run the length of the solenoid.

• This creates a consistent magnetic field throughout the interior space.

Additional Information

• The magnetic field inside a long solenoid is uniform for several reasons related to the structure and operation of the solenoid:

• Even Distribution of Turns: In a solenoid, the wire is wound evenly around a cylindrical form, creating a series of loops or turns that are distributed along the length of the solenoid. This even distribution of turns ensures that, at every point inside the solenoid (except near the ends), there is an equal contribution to the magnetic field from each coil of wire.

• Parallel Magnetic Field Lines: Due to the shape and arrangement of the coils, the magnetic field lines inside the solenoid are nearly parallel to each other and to the longitudinal axis of the solenoid. This parallelism results from the superposition of the magnetic fields produced by each turn of the solenoid, with the directional components perpendicular to the axis canceling out and only the components along the axis adding up. This creates a uniform direction and magnitude of the magnetic field in the central region of the solenoid.

• Negligible Edge Effects: In a long solenoid, the effects that disrupt uniformity, such as the fringing of the magnetic field, are significant only near the ends of the solenoid. In the central region, these effects are negligible, contributing to the uniformity of the magnetic field.

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Q75. Answer: (a) 37.13

Shortcut Trick

Assume Base Average = 20

Net Deviation = [31 × (26 − 20)] + [41 × (56 − 20)]

=> Net Deviation = (31 × 6) + (41 × 36) = 186 + 1476 = 1662

Total Students = 25 + 31 + 41 = 97

Actual Average = 20 + (1662 ÷ 97) ≈ 20 + 17.13 = 37.13

Therefore The correct answer is 37.13.

Alternate Method

Given:

Number of students (n1, n2, n3) = 25, 31, 41

Average marks (A1, A2, A3) = 20, 26, 56

Formula Used:

Combined Average = (n1A1 + n2A2 + n3A3) ÷ (n1 + n2 + n3)

Calculations:

=> Total Marks = (25 × 20) + (31 × 26) + (41 × 56)

=> Total Marks = 500 + 806 + 2296

=> Total Marks = 3602

=> Total Students = 25 + 31 + 41 = 97

=> Average = 3602 ÷ 97

=> Average ≈ 37.134...

Therefore The correct answer is 37.13.

Additional Information

Weighted Average Formula

Weighted Average = (∑ w_ix_i) ÷ (∑ w_i), where w_i represents weights (number of students) and x_i represents values (marks).

Deviation Method for Averages

Actual Average = Assumed Average + (Net Deviation ÷ Total Count). This simplifies large multiplications by focusing on differences from a central value.

Rounding Off Rule

If the third decimal digit is 5 or more, round up the second digit; if less than 5, keep it as is. Here, 37.134 rounds down to 37.13.

Q76. Answer: (b) Potential difference across each resistor is equal.

The correct answer is Potential difference across each resistor is equal.

Key Points

• In a parallel circuit, the potential difference (V) across each resistor is the same, regardless of their resistance values.

• This is due to the nature of parallel connections, where each component is directly connected across the power source.

• Therefore, the correct statement is that the potential difference across each resistor (3 Ω, 2 Ω, and 6 Ω) is equal.

• The formula for voltage in parallel circuits is V = IR, where I is current and R is resistance, but here, the key is that V remains constant across all resistors.

Q77. Answer: (a) Companion cell

The correct answer is Companion cell

Key Points

• Companion cells are not a component of xylem, but are instead a component of phloem tissue:

• Xylem

• It is a tissue that transports water and nutrients from the roots to other parts of the plant.

• It also provides mechanical strength to the plant. Xylem is made up of tracheids, vessels, xylem fibres, and xylem parenchyma.

• Phloem

• A tissue that transports food from the leaves to other parts of the plant.

• Phloem is made up of sieve tubes, companion cells, phloem parenchyma, and phloem fibres.

Additional Information

• Vessel:

• Vessels are tube-like structures found in the xylem that help transport water and minerals from roots to other parts of the plant.

• They consist of a series of elongated cells called vessel elements, which are connected end-to-end with perforated walls to allow easy flow of water.

• Tracheid:

• Tracheids are elongated, tube-like cells in the xylem that assist in the conduction of water and provide structural support to the plant.

• Unlike vessels, tracheids lack perforated ends but have pits to allow lateral movement of water between cells.

• Parenchyma:

• Parenchyma cells are living, thin-walled cells that play a role in storage, photosynthesis, and wound healing in plants.

• These cells are found throughout the plant body and are also involved in gas exchange and secretion.

Q78. Answer: (c) 24.2

Shortcut Trick

Use the Empirical Formula: Mode = 3 × Median − 2 × Mean.

2 × Mean = 3 × 24 − 23.6

2 × Mean = 72 − 23.6 = 48.4

Mean = 48.4 ÷ 2 = 24.2

Therefore The correct answer is 24.2.

Alternate Method

Given:

Mode = 23.6

Median = 24

Formula Used:

For a moderately skewed distribution, the relationship between Mean, Median, and Mode is:

Mode = 3 × Median − 2 × Mean

Calculations:

=> 23.6 = 3 × (24) − 2 × Mean

=> 23.6 = 72 − 2 × Mean

=> 2 × Mean = 72 − 23.6

=> 2 × Mean = 48.4

=> Mean = 48.4 ÷ 2

=> Mean = 24.2

Therefore The correct answer is 24.2.

Additional Information

Empirical Formula Variations

The formula can also be written as: Mean − Mode = 3(Mean − Median).

Symmetric Distribution

In a perfectly Symmetric Distribution (like the Normal Distribution), Mean = Median = Mode.

Positively Skewed Distribution

In a Positively Skewed distribution, the values generally follow the order: Mean > Median > Mode.

Negatively Skewed Distribution

In a Negatively Skewed distribution, the values generally follow the order: Mean < Median < Mode.

Q79. Answer: (c) Rings of cartilage

The correct answer is Rings of cartilage

Key Points

• Rings of cartilage do not let the air pass in the respiratory system

• Rings of cartilage are present in the trachea and bronchi, and they prevent the airways from collapsing, even when there is less air in them.

• These cartilaginous rings provide structural support to the respiratory system.

• These are C-shaped structures found in the trachea and bronchi.

Additional Information

• Tendons:

• Tendons are connective tissues that attach muscles to bones.

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• They help transmit force generated by muscles to move bones.
• Ligaments:
• Ligaments are fibrous tissues that connect bones to other bones at joints.
• They provide stability to joints by limiting movement.
• Ligaments do not play a role in maintaining the structure of the respiratory system.
• Muscles:
• Muscles in the respiratory system, like the diaphragm and intercostal muscles, aid in breathing by expanding and contracting the chest cavity.
• They facilitate air movement in and out of the lungs.

Q80. Answer: (c) 4 and 3/2

Shortcut Trick
Multiply the quadratic equation by 2 to clear the fraction: $2x^2 - 11x + 12 = 0$.
Find two factors of ($2 \times 12 = 24$) whose sum is −11: these are −8 and −3.
Divide these factors by the coefficient of x^2 (which is 2) and change their signs.
Roots = $-(-8)/2$ and $-(-3)/2$ => 4 and 3/2.
Therefore The correct answer is 4 and 3/2.
Alternate Method
Given:
The quadratic equation is $x^2 - 11x/2 + 6 = 0$.
Formula Used:
Middle-term splitting method: For $ax^2 + bx + c = 0$, split 'b' into two numbers whose sum is 'b' and product is 'ac'.
Calculations:
=> $x^2 - 11x/2 + 6 = 0$
Multiplying the entire equation by 2:
=> $2x^2 - 11x + 12 = 0$
Splitting the middle term −11x into −8x and −3x (since $-8 \times -3 = 24$):
=> $2x^2 - 8x - 3x + 12 = 0$
=> $2x(x - 4) - 3(x - 4) = 0$
=> $(2x - 3)(x - 4) = 0$
Setting each factor to zero:
=> $2x - 3 = 0$ or $x - 4 = 0$
=> $x = 3/2$ or $x = 4$
Therefore The correct answer is 4 and 3/2.
Additional Information
Nature of Roots
The nature of roots is determined by the Discriminant ($D = b^2 - 4ac$). If $D > 0$, the roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.
Sum and Product of Roots
For any quadratic equation $ax^2 + bx + c = 0$, the Sum of roots ($\alpha + \beta$) is $-b/a$ and the Product of roots ($\alpha\beta$) is c/a.
Quadratic Formula
The roots can also be calculated directly using the Sridharacharya formula: $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$.

Q81. Answer: (d) IMGVD

The logic followed here is:
'COUNT' is written as 'ESAVD'
'FIBRE' is written as 'HMHZO'.
Similarly, 'GIANT'
Hence, the correct answer is "Option 4".

Q82. Answer: (b) Only I can be concluded from the given information.

Given,
Statement:

The most popular OTT platform (providing TV and film content over the internet) in country C - 'StreamOn' has recently signed a contract with five of the major film producers to release their movies in theatres and on 'StreamOn' together and on the same date from January 2023 onwards.

Conclusions:

I. The number of tickets sold by theatres will decrease to some extent in 2023 - True (Because, the simultaneous release of movies on an OTT platform and in theatres might lead to a reduction in theatre ticket sales as some people may prefer to watch movies at home).

II. Each of the five film producers release at least one movie each year - False (Because, the statement does not provide any information about the frequency of movie releases by each of the five film producers).

So, Only conclusion I follows.

Hence, the correct answer is "Option 2".

Q83. Answer: (a) Calcium sulphate hemihydrate

The correct answer is Calcium Sulphate Hemihydrate.

Key PointsPlaster of Paris/Calcium Sulphate Hemihydrate ($CaSO_4 \cdot 1/2H_2O$):

• It is a white powdery substance that is commonly used in the medical field for casting broken bones.

• It is created by heating gypsum, a mineral found in sedimentary rocks.

• When mixed with water, it forms a paste that hardens quickly and is used in construction for creating molds and sculptures.

• It is also used in the food industry as a coagulant for tofu and as a calcium supplement in certain types of bread.

Additional Information

• Calcium Acetate ($Ca(C_2H_3O_2)_2$):

• It is a calcium salt used in medical treatments to control phosphate levels in patients with kidney disease.

• In its chemical form, it can also act as a food preservative and is used in various industrial applications.

• Calcium Sulphate Dihydrate($CaSO_4 \cdot 2H_2O$):

• It is a hydrated form of calcium sulfate, commonly known as gypsum, used in the construction industry to make plaster and drywall.

• It is also used in the food industry as a firming agent, particularly in tofu production, and as a coagulant.

• Calcium carbonate ($CaCO_3$):

• Similar to the minerals calcite and aragonite, it is a common component found in rocks, particularly in chalk and limestone, eggshells, gastropod shells, shellfish skeletons, and pearls.

• It is the primary component of agricultural lime and is created when carbonate ions and calcium ions in hard water combine to form limescale.

• It has medical use as a calcium supplement or as an antacid.

Important Points

Some Common Names of Chemical Compounds:

Common Names	Chemical Compounds
Baking Soda	Sodium Bicarbonate or Sodium Hydrogen Carbonate($NaHCO_3$)
Bleaching Powder	Calcium Oxychloride ($CaOCl_2$)
Borax	Sodium Tetraborate Decahydrate or Sodium Borate ($Na_2[B_4O_5(OH)_4].8H_2O$)
Dry Ice	Solid Carbon Dioxide (CO_2)
Green Vitriol	Ferrous Sulphate Heptahydrate ($FeSO_4.7H_2O$)
Gypsum	Calcium Sulphate Dihydrate ($CaSO_4.2H_2O$)
Laughing Gas	Dinitrogen Monoxide or Nitrous Oxide (N_2O)
Quick Lime or Burnt Lime	Calcium Oxide (CaO)
Milk of Magnesia	Magnesium Hydroxide ($Mg(OH)_2$)

Q84. Answer: (c) 70 m, East

Given:

Sheetal steps out of her house and walks 160 m towards the north.

She takes a left turn and walks 60 m.

She takes a left turn again and walks 120 m.

She takes another left turn and walks 130 m.

Finally, she takes right turn and walks 40 m to reach a café.

Thus, the café from Sheetal's house is 70 m, in East.

Hence, the correct answer is "Option 3".

Q85. Answer: (d) equal

Shortcut Trick

By the fundamental Isosceles Triangle Theorem, if two sides of a triangle are congruent, then the angles opposite those sides are also congruent.

In any isosceles triangle, the symmetry about the median to the base ensures that the base angles are identical.

Since the given condition is equal sides, the resulting opposite angles must be equal.

Therefore The correct answer is equal.

Alternate Method

Given: A triangle with two equal sides (AB = AC).

Formula Used: SAS (Side-Angle-Side) or RHS (Right-Hypotenuse-Side) Congruence Rule.

=> Let ΔABC have AB = AC.

=> Draw a perpendicular AD from vertex A to the base BC.

=> In ΔABD and ΔACD:

=> AB = AC (Given equal sides)

=> AD = AD (Common altitude)

=> angle ADB = angle ADC = 90° (By construction)

=> Therefore ΔABD ~= ΔACD by the RHS Congruence Rule.

=> Since the triangles are congruent, their corresponding parts are equal (CPCT).

=> Therefore angle B = angle C.

Therefore The correct answer is equal.

Additional Information

Converse of Isosceles Triangle Theorem

If two angles of a triangle are equal, then the sides opposite to those angles are also equal in length.

Equilateral Triangle Property

In an equilateral triangle, all three sides are equal, which implies all three interior angles are equal to 60° each.

Angle-Side Relationship

In any triangle, the side opposite to the largest angle is the longest side, and the side opposite to the smallest angle is the shortest side.

Q86. Answer: (a) P K Thungon Committee

The correct answer is P.K. Thungon Committee.

Key Points

• P.K. Thungon Committee got constitutional recognition for the local government bodies.

• PK Thungan Committee is related to Panchayati raj.

• In 1989 the P.K. Thungon Committee recommended constitutional recognition for the local government bodies.

• A constitutional amendment to provide for periodic elections to local government institutions, and enlistment of appropriate functions to them, along with funds, was recommended.

Additional Information

Committees on Panchayati Raj:

• Balwant Rai Mehta Committee (1957): The committee submitted its report in November 1957, in which the term 'democratic decentralization' first appears. The important recommendations are:

• Transfer of resources and power to these bodies to be ensured.

• District Collector to be the chairman of Zila Parishad.

• Establishment of a three-tier Panchayati Raj system – gram panchayat at village level (direct election), Panchayat Samiti at the block level, and Zila Parishad at the district level (indirect election).

• Rajasthan (1959) adopted the system first, followed by Andhra Pradesh in the same year.

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• Ashok Mehta Committee (1977): The committee was constituted by the Janata government of the time to study Panchayati Raj institutions. The important recommendations are:

• Constitutional recognition to be given to Panchayati Raj institutions.

• A minister for Panchayati Raj to be appointed by the state council of ministers.

• Zila Parishad to be made responsible for planning at the state level.

• Compulsory powers of taxation to be given to these institutions.

• Political parties should participate at all levels in the elections.

• The three-tier system is to be replaced by a two-tier system.

• G V K Rao Committee (1985): The important recommendations of the G V K Rao Committee are:

• Regular elections to be held.

• Post of DDC (District Development Commissioner) to be created acting as the chief executive officer of the Zila Parishad.

• Zila Parishad to be given prime importance and all developmental programs at that level to be handed to it.

• L M Singhvi Committee (1986): The committee was constituted by the Rajiv Gandhi government on 'Revitalisation of Panchayati Raj institutions for Democracy and Development. The important recommendations are:

• Nyaya Panchayats to be established for clusters of villages.

• Constitutional recognition for Panchayati Raj institution

Important Points

• Panchayati Raj Institution (PRI) is a system of rural local self-government in India.

• Local Self Government is the management of local affairs by such local bodies who have been elected by the local people.

• PRI was constitutionalized through the 73rd Constitutional Amendment Act, 1992 to build democracy at the grassroots level and was entrusted with the task of rural development in the country.

Q87. Answer: (a) E

Given: Amongst six friends A, B, C, D, E and F, each has a different height.

B is taller than only two other friends.

• _ > _ > _ B > _> _

C is shorter than only one friend.

• _ > C > _ B > _> _

E is shorter than B but taller than F.

• _ > C > _ B > E > F

A is shorter than D.

• D > C > A > B > E > F

Thus, E is the second shortest among all the friends.

Hence, the correct answer is "Option 1".

Q88. Answer: (a) -21

Given Equation: 17 ÷ 17 + 21 × 7 - 13 = ?

BODMAS Rule:

Decoding the given information:

Symbol	**÷**	**×**	**•**	**•**
Meaning	Subtraction	Division	Multiplication	Addition

Now replacing the sign from left to right using BODMAS Rule, we get:

=> 17 - 17 × 21 ÷ 7 + 13 = ?

=> 17 - 17 × 3 + 13 = ?

=> 17 - 51 + 13 = ?

=> 30 - 51 = - 21.

Hence, the correct option is "Option 1".

Q89. Answer: (c) 55 Ω

The correct answer is 55Ω

Key Points

• The total resistance (R) of resistors connected in series is calculated by adding the individual resistances:

• R = R1 + R2 + R3
• In this case, R1 = 10 Ω, R2 = 15 Ω, and R3 = 30 Ω.
• So, R = 10 Ω + 15 Ω + 30 Ω = 55 Ω
• Therefore, the correct answer is 3) 55 Ω.

Q90. Answer: (a) North - west

Given:
Pole P is to the north of pole R.
Pole Q is to the east of pole R and north of pole S.
Thus, North - west is the position of pole R with respect to pole S.
Hence, the correct answer is "Option 1".

Q91. Answer: (a) • 19/4

Shortcut Trick
For 8x2 + 22x − 21 = 0, find factors of (8 × −21) = −168 that sum to 22.
The factors are +28 and −6.
Roots are obtained by dividing factors by 'a' (8) and changing the signs: −28/8 and 6/8.
Roots are −7/2 (−3.5) and 3/4 (0.75). Since β > α, β = 3/4 and α = −7/2.
Value = 2(−7/2) + 3(3/4) = −7 + 2.25 = −4.75 = −19/4.
Therefore The correct answer is −19/4.
Alternate Method
Given: The quadratic equation is 8x2 + 22x − 21 = 0 where α and β are roots and β > α.
Method: Solve using factorization by splitting the middle term.
=> 8x2 + 28x − 6x − 21 = 0
=> 4x(2x + 7) − 3(2x + 7) = 0
=> (4x − 3)(2x + 7) = 0
=> 4x − 3 = 0 OR 2x + 7 = 0
=> x = 3/4 OR x = −7/2
=> Comparing the roots, 0.75 > −3.5, so β = 3/4 and α = −7/2.
=> Required value = 2α + 3β
=> 2(−7/2) + 3(3/4)
=> −7 + 9/4
=> (−28 + 9) / 4 = −19/4
Therefore The correct answer is −19/4.
Additional Information
Nature of Roots
For ax2 + bx + c = 0, the discriminant D = b2 − 4ac determines the nature. If D > 0, roots are real and distinct.
Sum and Product of Roots
For a quadratic equation, α + β = −b/a and αβ = c/a.
Quadratic Formula
Roots can be found directly using x = [−b ± √(b2 − 4ac)] / 2a.

Q92. Answer: (b) Deepak Dhar

The correct answer is Deepak Dhar
Key Points
• Indian physicist Deepak Dhar shared the prestigious Boltzmann Medal in 2022 with American scientist John Hopfield.
• This award recognizes significant contributions to statistical mechanics.
• His work focuses on phase transitions and complex systems in statistical mechanics.
Additional Information
• Archana Bhattacharyya:
• An Indian physicist known for her work in space and atmospheric sciences.
• She specializes in geomagnetism and ionospheric studies.
• She is not associated with the Boltzmann Medal but is a prominent researcher in her field.

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• Dhiraj Bora:
• An Indian physicist with expertise in plasma physics and nuclear fusion research.
• He has served as the Director-General of the Institute for Plasma Research (IPR).
• He is not linked to the Boltzmann Medal but is known for contributions to fusion energy.
• Radha Balakrishnan:
• An Indian theoretical physicist known for her work in nonlinear dynamics and condensed matter physics.
• She has made contributions to solitons and integrable systems.

Q93. Answer: (d) T > M

Given Statement: Q ≤ S ≤ C < F > T ≥ H > M

Now,

Conclusions:

Option 1: S ≥ F → False (S ≤ C < F It gives S < F)

Option 2: Q > H → False (Q ≤ S ≤ C < F > T ≥ H It gives Q ≤ H)

Option 3: C = H → False (C < F > T ≥ H It gives C > H)

Option 4: T > M → True (T ≥ H > M It gives T > M)

Hence, the correct answer is "Option 4".

Q94. Answer: (d) magnesium oxide

The correct answer is magnesium oxide

Key Points

• When magnesium is burnt in the presence of air, it reacts with oxygen to form magnesium oxide (MgO). 4
• The reaction releases a bright white light and is represented by the equation:
• 2Mg+O 2 →2MgO

Additional Information

• Magnesium Carbonate (MgCO3):
• Magnesium carbonate is typically found in minerals like magnesite and is formed through reactions with carbon dioxide, not through burning in air.
• It is used in products like antacids, chalk for sports, and as a drying agent.
• Magnesium Chloride (MgCl2):
• Magnesium chloride is formed when magnesium reacts with hydrochloric acid (HCl), not by burning in air.
• It is commonly used for de-icing roads, in magnesium supplements, and in seawater desalination.
• Magnesium Sulphate (MgSO4):
• Magnesium sulphate, commonly known as Epsom salt, forms when magnesium reacts with sulfuric acid (H2SO4), not through combustion.
• It is widely used in agriculture, medicine (as a laxative), and therapeutic baths.

Q95. Answer: (b) low cost and better quality product produced by machines

The correct answer is low-cost and better-quality product produced by machines

Key Points

• The Industrial Revolution in Britain led to the mass production of goods using machines, which allowed for lower production costs and higher quality products compared to traditional handicraft methods.
• This stiff competition negatively impacted Indian handicraft industries, which struggled to compete with the efficiency and affordability of machine-made goods.
• As British industries flooded the market with cheaper and more uniform products, the demand for traditional Indian handicrafts significantly declined.
• Consumers began to favour the mass-produced items due to their lower prices and perceived quality, leading to reduced sales for local artisans and craftsmen.
• This decline not only affected individual craftsmen but also disrupted entire communities that depended on handicraft production for their livelihoods, resulting in economic instability.

Additional Information

• Lack of skills of the handicraft industry:
• Handicraft industries in India were skilled and had a rich tradition of craftsmanship.
• The competition was more due to industrial processes rather than a lack of skills.

• No raw material available for handicrafts:

• Indian handicraft industries had access to raw materials; the issue was more about production efficiency.

• Many traditional crafts used locally sourced materials, which were not the limiting factor.

• Expensive factors of production:

• While factors of production may have been a concern, the primary competition stemmed from the efficiency and low costs associated with machine production.

• Handicraft industries faced difficulties not solely due to expensive production factors but rather because they could not match machine output and pricing.

Q96. Answer: (d) Only conclusion II is true

Given Statements:

1. All greens are reds.

2. Some reds are browns.

3. All greys are browns.

The least possible diagram:

Conclusions:

I. Some greys are greens. - False (Because, there is no direct relative between greys and greens.)

II. All browns are reds is a possibility. - True (Because, Some reds are browns so All browns can be reds)

III. Some browns are greens. - False (Because, there is no direct relative between browns and greens.)

So, Only conclusion II is true.

Hence, the correct answer is "Option 4".

Q97. Answer: (c) ZZMQTHE

The logic followed here is: Vowels - 1 and Consonants + 1

‘CLIMATE’ is written as ‘DUZNHMD’

‘COMPLEX’ is written as ‘YDMQNND’.

Similarly, ‘DISPLAY’

Hence, the correct answer is "Option 3".

Q98. Answer: (d) 8 : 7

Given:

Marks scored by A in Hindi = 86

Marks scored by B in English = 74

Marks scored by C in English = 70

Marks scored by D in Science = 70

Calculation:

The sum of the marks scored by A in Hindi and B in English = 86 + 74 = 160

The sum of the marks scored by C in English and D in Science = 70 + 70 = 140

The required ratio = 160/140 = 8/7

Therefore The correct answer is 8:7.

Q99. Answer: (b) Two

Given: D & C N E ^ & G ^ Y % % @ G Y & I & * H K Z

Now,

vowels are there that are immediately followed by a symbol.

So, Needed pattern is: Vowels - Symbol.

D & C N E ^ & G ^ Y % % @ G Y & I & * H K Z

There are Two Vowels that are immediately followed by a symbol.

Hence, the correct answer is 'Option 2'.

Q100. Answer: (b) Nausheen

According to the given information:

1) Five people live between the floors where Jai and Rekha live.

2) There are two floors between Tarun’s and Ravi’s house.

3) Tarun lives on one of the floors below Ravi's floor.

4) Ravi's house is not at the top floor.

5) Nausheen's house is just above Tarun's house.

No.	Case 1	Case 2
7	Jai/Rekha	Rekha/Jai
6	Ravi	
5		Ravi
4	Nausheen	
3	Tarun	Nausheen
2		Tarun
1	Rekha/Jai	Jai/Rekha

6) Only two people live between Nausheen's and Jai's house.

Here case 2 gets eliminate.

7) Only two people are above Bharti's house.

No.	Case 1
7	Jai/Rekha
6	Ravi
5	Bharti
4	Nausheen
3	Tarun
2	Shilpi
1	Rekha/Jai

So, Nausheen among the following lives on floor number 4.

Hence, the correct answer is "Option 2".

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