RRB Group D Previous Year Paper (Held on: 2 Sept 2022 Shift 1)

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

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CBT

Q1. Select the number from among the given options that can replace the question mark (?) in the following series.

1, 2, 11, 36, 85, ?, 287

(a) 184
(b) 166
(c) 168
(d) 90

Q2. A ray of light is incident on a refracting surface AB of a glass prism, kept in air, and emerges out of the other refracting surface AC. Consider the following statements:

(a) The angle of refraction at surface AB is less than the angle of incidence.

(b) The angle of refraction at the surface AC is more than the angle of incidence.

Which of the above statements is/are correct?

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

Q3. The sum of two consecutive multiples of 6 is 66. Find the smaller of these two multiples.

(a) 36
(b) 24
(c) 30
(d) 42

Q4. This question is based on the five, three-digit numbers given below.

(Left) 429 847 922 213 757 (Right)

(Example: 697 – first digit = 6, second digit = 9, third digit = 7)

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

If all the numbers are arranged in descending order, the position of how many numbers will remain unchanged?

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

Q5. Which of the following statements is correct?

(a) Biodegradable substances persist for a long time in the environment.
(b) Non-biodegradable substances cannot be decomposed by physical processes like heat and pressure.
(c) Non-biodegradable substances help the various members of the ecosystem.
(d) Enzymes, bacteria or other saprophytes act on biodegradable substances and decompose them.

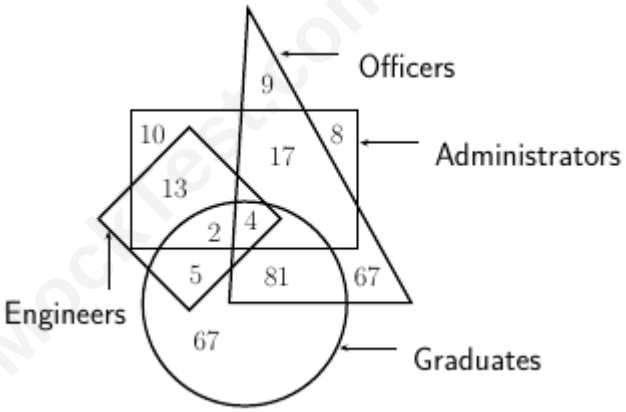
Q6. Generally, a Gram Panchayat is constituted for _____ year/s.

(a) three
(b) four
(c) five
(d) one

Q7. Two numbers are in the ratio 2 : 7. If the first number is increased by 14 and the second number is decreased by 6, then the ratio becomes 4 : 3. What is the sum of the original two numbers?

(a) 27
(b) 45
(c) 18
(d) 36

Q8. Study the Venn diagram given below and answer the question that follows.



How many non-graduate officers are neither administrators nor engineers?

(a) 8
(b) 9
(c) 67
(d) 76

Q9. A trader gives 5% discount on the marked price of an article and gives 2 articles free for buying 14 articles and gains 33% in the entire transaction. Assuming a customer pays for 14 articles, the marked price of an article is what per cent more than its cost price?

(a) 48%
(b) 60%
(c) 50%
(d) 55%

Q10. A statement is given followed by two assumptions numbered I and II. You have to assume everything in the statement to be true and decide which of the assumptions is/are implicit in the statement.

Statement:

Increase in the tax rates will hurt the pockets of the salaried middle class.

Assumptions:

I. Increase in the prices of goods will hurt the poor too.

II. The middle class will reduce their extra expenditure to save money.

(a) Neither assumption I nor II is implicit
(b) Only assumption I is implicit
(c) Both assumptions I and II are implicit
(d) Only assumption II is implicit

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Q11. If the length of a rectangle is thrice its breadth and the perimeter of that rectangle is 48 cm, then find its breadth.

(a) 4 cm
(b) 8 cm
(c) 9 cm
(d) 6 cm

Q12. Seven people, A, B, C, D, E, F and G, are sitting in a straight row, facing north. Only three people sit between F and E. Only two people sit to the left of F. D is not an immediate neighbour of E. D sits second to the right of A. G sits to the immediate right of B. Who sits at the extreme left end of the row?

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

Q13. Which of the following properties is NOT governed by the position of elements in the Periodic Table?

(a) Colour of element
(b) Valency
(c) Atomic size
(d) Electrons present in outermost shell

Q14. Which of the following point(s) always lie(s) on the principal axis of a lens?

(i) Point of refraction
(ii) Optical Centre
(iii) Point of incidence

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

Q15. The total surface area of a solid cylinder having radius 24 cm and height 6 cm is:

(a) 3440 π cm2
(b) 1440 π cm2
(c) 2440 π cm2
(d) 4440 π cm2

Q16. Which of the following organisms shows a parasitic nutritive strategy?

(a) Mushroom
(b) Cuscuta
(c) Amoeba
(d) Yeast

Q17. A train travelling at a speed of 45 km/h crosses a pole in 24 sec. What is the length of the train?

(a) 1.5 m
(b) 300 m
(c) 125 m
(d) 30 m

Q18. Simplify the given expression.

$(13^2-5^2)^{(3/2)}\times 8^{(2/3)}\div (1/6)^{(-3)}$

(a) 24
(b) 32
(c) 16
(d) 12

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Q19. Clouds appear white during sunshine because the particles in clouds are _____ than the wavelength of different colours in white light coming from the sun and all colours of white light are scattered by _____ amount(s).

(a) larger, about the same
(b) smaller, different
(c) larger, different
(d) smaller, about the same

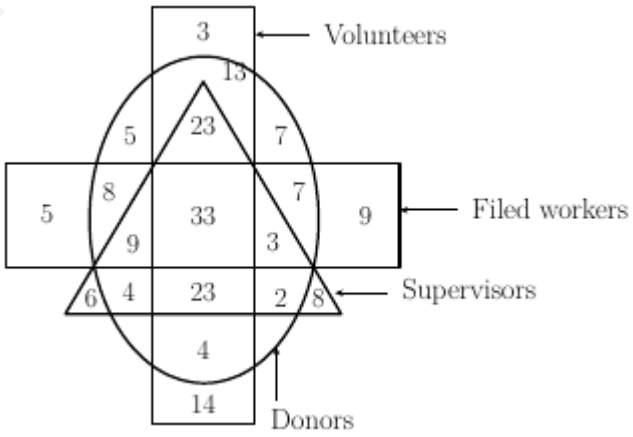
Q20. Raghav starts from Point A and drives 16 km towards the north. He then takes a right turn, drives 10 km, turns right and drives 17 km. He then takes a right turn and drives 13 km. He takes a final right turn, drives 1 km and stops at Point P. How far and towards which direction should he drive in order to reach Point A from Point P in a straight line? (All turns are 90 degree turns only)

(a) 5 km towards the north
(b) 3 km towards the west
(c) 1 km towards the south
(d) 3 km towards the east

Q21. Amongst six friends P, Q, R, S, T and U, each has a different height. S is taller than only four other friends. R is taller than only one friend. U is taller than T but shorter than P. P is not the tallest. Who is the second tallest among all the friends?

(a) T
(b) S
(c) P
(d) Q

Q22. Study the Venn Diagram given below and answer the question that follows.



How many volunteers are supervisors but neither donors nor field workers?

(a) 33
(b) 14
(c) 0
(d) 8

Q23. Who is the highest law officer in India?

(a) Advocate General of India
(b) Attorney General of India
(c) President of India
(d) Prime Minister of India

Q24. Select the number from among the given options that can replace the question mark (?) in the following series.
58, 118, 208, 334, ?, 718

(a) 512
(b) 502
(c) 524

(d) 510

Q25. In the Government Budget, when the expenses made by a nation are more than the source of income, then the difference between the income and expenses is termed as _____.

(a) Revenue Deficit
(b) Unbalanced Budget
(c) Financial Statement
(d) Budget Deficit

Q26. If '+' means '-', '-' means '+', '×' means '÷', and '÷' means '×', what will come in place of the question mark (?) in the following equation ?

40 - 17 ÷ 3 + 25 × 5 = ?

(a) 88
(b) 90
(c) 86
(d) 92

Q27. Which Fundamental Duty was added through the 86^(th) Constitutional Amendment Act, 2002?

(a) The 11th Fundamental Duty
(b) The 10th Fundamental Duty
(c) The 8th Fundamental Duty
(d) The 9th Fundamental Duty

Q28. An object is placed in front of a concave mirror at a distance equal to its focal length. The image is formed at:

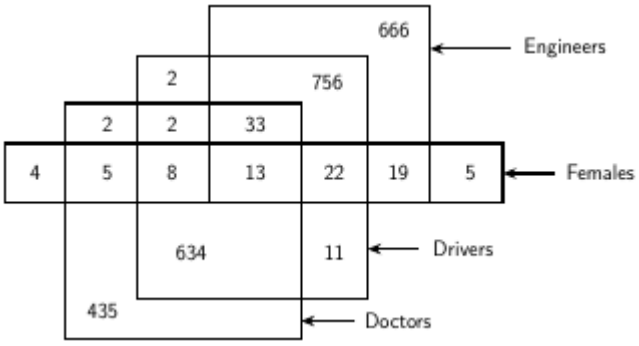
(a) infinity
(b) a point between F and C
(c) a point between P and F
(d) C

Q29. Y, Z, A, B, C and D live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it number 2, and so on till the topmost floor is numbered 6.

Only Y lives on the floor between the floors occupied by D and C. B lives on an even numbered floor, but not on floor 6. Z lives on the lowermost floor. D is immediately above B. Who is on the topmost floor?

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

Q30. Study the Venn Diagram given below and answer the question that follows.



How many female engineers are drivers but NOT doctors?

(a) 22
(b) 19
(c) 13
(d) 8

Q31. NABARD and which of the following organisations has jointly launched the Adavi brand to market the forest produce harvested by Nilambur tribes people?

(a) Jan Sikshan Sansthan
(b) Sarva Sikshan Sansthan
(c) Sarva Raksha Sansthan
(d) Jan Raksha Sansthan

Q32. The mean and the mode of a set of data are 58.7 and 61.1, respectively. Find the median of the data, using the empirical formula.

(a) 59.5
(b) 55.8
(c) 55.2
(d) 54.6

Q33. The magnetic field around a current carrying conductor:

(a) decreases with increase in distance
(b) is unaffected by any variation in distance
(c) increases with increase in distance
(d) remains constant with increase in distance

Q34. A shopkeeper marks an article at Rs. x and offers a discount of 20% on it. He sells it for Rs. 432 after charging VAT of 12.5% on the discounted price. What is the value of Rs. x?

(a) Rs. 450
(b) Rs. 500
(c) Rs. 520
(d) Rs. 480

Q35. In a certain code language, 'GAURD' is written as 'LDYTE' and 'CLOVE' is written as 'HOSXF'. How will ‘HORSE be written in that language?

(a) DGOJO
(b) IHFGD
(c) MORDG
(d) MRVUF

Q36. Sri Lanka is separated from India by a narrow channel of sea called the _____.

(a) Palk Strait
(b) Malacca Strait
(c) Sunda Strait
(d) Otranto Strait

Q37. A retailer permits a trade discount of 25% followed by a cash discount of 8% on the already discounted price of his goods, and still makes a net gain of 17.3% of the cost price. At what percentage above the cost price of the goods is the marked price fixed?

(a) 50%
(b) 75%
(c) 70%
(d) 60%

Q38. The Tamil language was declared as the classical language of India in _____.

(a) 2005
(b) 2002
(c) 2004
(d) 2003

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Q39. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(14, 98)

(22, 242)

(a) 12, 132
(b) 16, 80
(c) 6, 18
(d) 8, 48

Q40. In this question, a statement is followed by four conclusions. Find out which conclusion is true based on the given statement.

Statement:

E ≥ R = S ≤ T < N > O = Z

Conclusions:

1. E ≥ S
2. T ≥ E
3. R > N
4. T < Z

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

Q41. Which of the following schemes aims to establish a lab focusing on the development of sustainable technologies for a rural area?

(a) Clinical Training Translational Research Workshops
(b) Clinical/Public Health Research Centre Schemes
(c) Cross-Cutting and Futuristic Initiatives
(d) Cognitive Science Research Initiative (CSRI)

Q42. The cost of 12 pens and 7 pencils is Rs. 233. If the cost of a pen decreases by Rs. 1.50 and the cost of a pencil increases by Rs. 1, then the cost of 2 pens and 3 pencils is Rs. 48. What is the original cost of 4 pens and 1 pencil?

(a) Rs. 74
(b) Rs. 77
(c) Rs. 78
(d) Rs. 71

Q43. _____, established by Atmaram Pandurang in Bombay (Mumbai) in 1867, was a movement for religious and social reform.

(a) Satya Shodhak Samaj
(b) Prarthana Samaj
(c) Brahmo Samaj
(d) Arya Samaj

Q44. If the current passing through a conductor is doubled and the potential difference is tripled then the power will increase:

(a) three fold
(b) five fold
(c) six fold
(d) two fold

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Q45. Maru Sri (or Maru Shri) is a desert pageant held at the _____.

(a) Hornbill Festival
(b) Jaisalmer Desert Festival
(c) Pushkar Fair
(d) Goa Carnival

Q46. Identify the double displacement reaction from the following.

(i) $2AgCl\ (s) \rightarrow 2Ag(s) + Cl_2(g)$
(ii) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
(iii) $2KBr\ (aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$
(iv) $Pb(s) + CuCl_2(aq) \rightarrow PbCl_2(aq) + Cu(s)$

(a) (iii)
(b) (iv)
(c) (ii)
(d) (i)

Q47. Which of the following elements has the highest effective nuclear charge?

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

Q48. The positive square root of $(34^2 – 16^2)$ is:

(a) 50
(b) 40
(c) 30
(d) 60

Q49. Four friends Aman, Renu, Mohan and Rakesh are sitting at the corners of a square table and all are facing the centre. Only two persons are sitting between Aman and Renu. Rakesh is sitting to the immediate right of Mohan. If Aman is sitting immediately to the left of Mohan, which of the following statements is definitely true?

(a) Aman is sitting diagonally opposite to Mohan.
(b) Aman is sitting diagonally opposite to Renu.
(c) Rakesh is sitting diagonally opposite to Mohan.
(d) Renu is sitting diagonally opposite to Mohan.

Q50. Refer to the following letter, number, symbol series and answer the question.

(Left) D 2 R X 5 8 T ^ & 9 3 H 8 C % K T A # 3 T 5 4 $ % 9 & R % 5 (Right)

If all the letters are dropped from the series, which of the following will be in the middle of the series formed?

(a) $
(b) 5
(c) %
(d) #

Q51. If angles A, B, C and D of a quadrilateral ABCD, taken in order, are in the ratio 3 : 7 : 6 : 4, then ABCD is a:

(a) trapezium
(b) parallelogram
(c) rhombus
(d) kite

Q52. Consider the below statements and identify the correct answer.

Statement-I: The metals high up in the reactivity series are very reactive.

Statement-II: The metals high up in the reactivity series can be obtained from their compounds by electrolytic reduction.

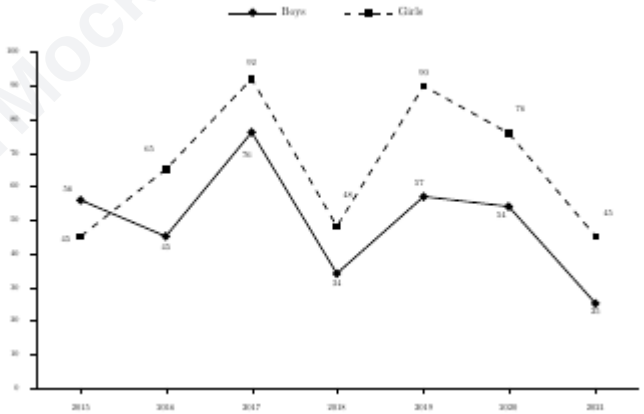
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(a) Both the statements are true.
(b) Statement-II is true, and Statement-I is false.
(c) Both the statements are false.
(d) Statement-I is true, and Statement-II is false.

Q53. In March 2022, Indian badminton player_____ defeated Olympic champion Viktor Axelsen to enter the men's singles final of the German Open Tournament.
(a) Lakshya Sen
(b) Chirag Shetty
(c) B Sai Praneeth
(d) Srikanth Kidambi

Q54. In February 2022, scientists from Defence Research and Development Organisation (DRDO) and _____ successfully demonstrated Quantum Key Distribution link between Prayagraj and Vindhyachal in Uttar Pradesh.
(a) Indian Institute of Technology (IIT) Delhi
(b) Indian Institute of Technology (IIT) Madras
(c) Indian Institute of Technology (IIT) Kharagpur
(d) Indian Institute of Technology (IIT) Kanpur

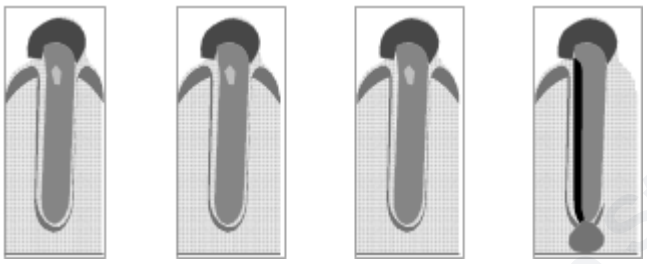
Q55. Study the given graph and answer the question that follows.
The graph presents the number of athletes that qualified for national camp during the years 2015 to 2021.



By what percentage (approximately) have the girls qualified more than the boys in the given years taken together?
(a) 46%
(b) 25%
(c) 15%
(d) 33%

Q56. In a certain code language, 'PUTRE' is written as 'RXXWK' and 'DGHKL' is written as 'FJLPR'. How will 'ZSHJL' be written in that language?
(a) BVROL
(b) BVLRO
(c) BRVOL
(d) BVLOR

Q57. The figure given below shows the different stages of gradual decay of tooth in humans. All of the following statements related to tooth decay are correct except one. Which one is NOT correct?



(a) Acids soften the enamel, causing tooth ache and tooth loss
(b) Bacteria break down sugars and produce acids
(c) Bacteria act on leftover food in the mouth
(d) No role of bacteria, caused by a virus

Q58. Select the correct match in the context of microfinance.
(a) Grameen Bank – Bhutan
(b) Muhammad Yunus - Sri Lanka
(c) Muhammad Yunus - Vishvaas Bank
(d) Muhammad Yunus - Grameen Bank

Q59. The river _____ flows through the Chotanagpur Plateau.
(a) Meghna
(b) Damodar
(c) Tungabhadra
(d) Bhima

Q60. Pole A is to the west of pole B and north of pole D. Pole E is to the east of pole D, and pole C is to the west of pole D. What is the position of pole D with respect to pole B?
(a) South
(b) North
(c) North - east
(d) South - west

Q61. The sides (in cm) of a right triangle are (x - 2), (x - 4) and x. Its area (in cm^2) is:
(a) 12
(b) 24
(c) 40
(d) 60

Q62. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?
GP32S, LU35X, QZ38C, VE41H,?
(a) MJ42A
(b) AM44J
(c) AJ44M
(d) JA44M

Q63. When was the Prime Minister's Rozgar Yojana (PMRY) launched?
(a) 2000
(b) 1993
(c) 1990
(d) 1995

Q64. A certain number of people are sitting in a row, facing north. D sits fourth to the right of A. B sits third to the right of D. C sits fifth to the left of A. There are only two persons between B and E. If no other person is sitting in the row, what is the total number of persons seated?
(a) 9
(b) 14

(c) 16
(d) 11

Q65. Consider the below statements and identify the correct answer.

Statement I: Most carbon compounds are good conductors of electricity.

Statement II: The force of attraction between the molecules of carbon compounds is not very strong.

(a) Statement II is correct, and Statement I is incorrect.
(b) Statement I is correct, and Statement II is incorrect.
(c) Both the statements are incorrect.
(d) Both the statements are correct.

Q66. The movement of food in the alimentary canal is brought about by the smooth muscles in the body. Which of the following options has all the organs having smooth muscles?

(a) Blood vessels, ureters, bones
(b) Heart, iris of the eye, bones
(c) Iris of the eye, bronchi of lungs, ureters
(d) Bones, ureters, bronchi of lungs

Q67. In Δ ABC, BD perpendicular to AC at D and angle DBC = 44°. E is a point on BC such that angle CAE = 34°. What is the measure of angle AEB?

(a) 78°
(b) 46°
(c) 56°
(d) 80°

Q68. What is the value of (2x + 3y), if mean of the following distribution is 54?

Class	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	Total
Frequency	7	11	x	9	y	50

(a) 69
(b) 59
(c) 57
(d) 56

Q69. Which of the following quadratic equations has one of its roots as 4 - 2√5 ?

(a) x2 - 8x + 4 = 0
(b) x2 - 4x - 8 = 0
(c) x2 - 4x + 4 = 0
(d) x2 - 8x - 4 = 0

Q70. Three resistors of 10 Ω, 15 Ω and 30 Ω are connected in parallel. The resistance of the combination is:

(a) 5 Ω
(b) 6 Ω
(c) 55 Ω
(d) 7.5 Ω

Q71. Express 0.79494...+0.87676... in the from p/q, where p and q are integers and q ≠ 0.

(a) 1133/198
(b) 137/55
(c) 1676/990
(d) 115/22

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Q72. Find the greatest number by which when the numbers 158 and 215 are divided, it leaves remainders 4 and 5, respectively.

(a) 14
(b) 7
(c) 18
(d) 21

Q73. In a straight row of students facing north, the position of P is 32^(nd) from the left side of the row and 47^(th) from the right side of the row. Find the total number of students in the row.

(a) 79
(b) 77
(c) 78
(d) 80

Q74. Which element is NOT more reactive than copper?

(a) Ag
(b) Pb
(c) Fe
(d) Zn

Q75. Find the area (in square units) of a triangle with vertices (3, 4), (5, 7) and (-3, 6).

(a) 11
(b) 1
(c) 5
(d) 2

Q76. Study the given arrangement carefully and answer the question that follows.

(Left) 8 @ ! 3 ^ 3 ρ & 6 @ 4 @ & 8 ¥ 2 4 % 1 £ % 7 (Right)

How many such symbols are there in the above arrangement each of which is immediately followed by an odd number and immediately preceded by a symbol?

(a) None
(b) 3
(c) 2
(d) 1

Q77. In Mendel's experiment, when F1 generation plants were self-pollinated, what was the genotypic ratio?

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

Q78. Refer to the following series and answer the question (all numbers are single digit numbers only)

3 7 5 2 8 6 4 1 3 7 4 3 7 6 8 2 6 5 8 9 7 8 6 1 2 7 3

How many such odd digits are there, each of which is immediately preceded by a perfect square and immediately followed by an odd digit? (NOTE: 1 is also a perfect square)

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

Q79. 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.

5 : 30 : : 6 : 42 : : 7 : ?

(a) 50
(b) 58

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(c) 56
(d) 60

Q80. In June 2022, who has become India's first weightlifter to win a gold medal at the IWF Youth World Championships in Leon, Mexico?
(a) Muna Nayak
(b) Gurunaidu Sanapathi
(c) T Madhavan
(d) Vijay Prajapati

Q81. The angle between thumb and middle finger in Fleming's left-hand rule is:
(a) 90°
(b) 45°
(c) 120°
(d) 180°

Q82. A can do a piece of work in 15 days and B can do the same work in 20 days. The time taken by them working together to do the same work is:
(a) 94/7 day
(b) 74/7 day
(c) 84/7 day
(d) 104/7 day

Q83. The sum of two numbers is 35 and their LCM is 306. The two numbers are:
(a) 13, 22
(b) 17, 18
(c) 14, 21
(d) 16, 19

Q84. Which of the following Vedas is a ‘Book of rituals?
(a) The Yajurveda
(b) The Atharvaveda
(c) The Samaveda
(d) The Rigveda

Q85. What is the main difference observed between a slide of human cheek cells and a slide of onion peel when viewed under a compound microscope?
(a) Presence of cell wall in human cheek cells
(b) Presence of plastids in cheek cells
(c) Presence of mitochondria in onion peel cells
(d) Presence of cell wall in onion peel cells

Q86. Which of the following options is the closest approximate value which will come in place of question mark(?) in the following equation?
$4.98 \times 2 + 1.96 \times 4 - 8 \div 2 + 1 = ?$
(a) 20
(b) 12
(c) 18
(d) 15

Q87. The Tropical Deciduous Forests in India receives rainfall between _____.
(a) 40 to 60 cm
(b) 25 to 50 cm
(c) 70 to 200 cm
(d) Below 25 cm

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Q88. If the simple interest on Rs. 4,800 at 15% per annum for 'n' years is Rs. 2,160, then find the value of 'n'.

(a) 6
(b) 4
(c) 3
(d) 5

Q89. If $x = (\sec\theta - \cos\theta)(\cot\theta + \tan\theta)$ and $y = \sec\theta(\sec\theta + \tan\theta)(1 - \sin\theta)$, $0° < \theta < 90°$, then xy is equal to:

(a) $\tan\theta \sec\theta$
(b) $\cot\theta$
(c) $\operatorname{cosec}\theta \cot\theta$
(d) $\sin\theta$

Q90. The Minimum Needs Programme was introduced in India in the _____ year of the Fifth Five-Year Plan.

(a) fourth
(b) first
(c) third
(d) second

Q91. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?

$14.999 \times 4.999 + 17.988 \div 2.998 + 24.999 \div 4.998 - 8.997 = ?$

(a) 72
(b) 70
(c) 87
(d) 77

Q92. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.

BFHN : HBDI : : DHFM : JDBH : : FSWL : ?

(a) KPSH
(b) LOSG
(c) KOTF
(d) LPSF

Q93. What is the formula of cyclohexane?

(a) C_6H_{12}
(b) C_6H_{14}
(c) C_6H_6
(d) C_6H_{10}

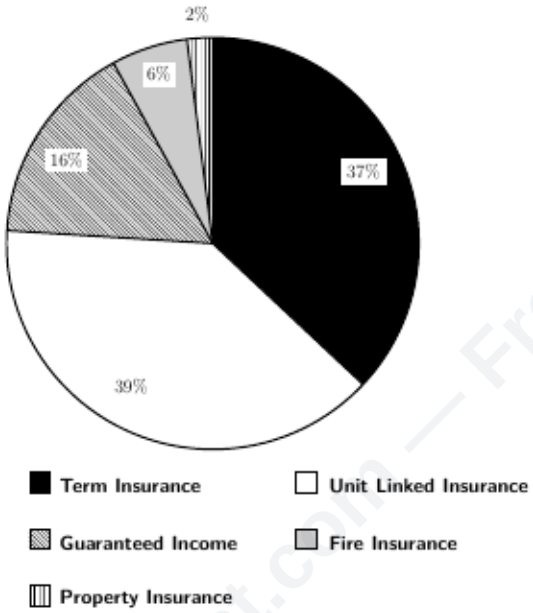
Q94. As of July 2022, a life insurance cover of _____ under the Pradhan Mantri Jan Dhan Yojana, gives life insurance cover on death of the life assured, due to any reason, to the deceased's family.

(a) Rs. 75,000
(b) Rs. 50,000
(c) Rs. 30,000
(d) Rs. 40,000

Q95. Study the given pie-chart and answer the question that follows.

The pie-chart presents the total share of different insurance products offered by an insurance company.

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If the total insurance sold by the company in a given year was 36000, then how many fire and property insurances were sold in that year?

(a) 5760
(b) 2160
(c) 2880
(d) 720

Q96. In a mixture of 80 litres, the ratio of milk to water is 3 : 1. If this ratio is to be 2 : 3, then the quantity of water to be further added is:

(a) 30 litres
(b) 50 litres
(c) 70 litres
(d) 20 litres

Q97. Which of the following activities is environmentally friendly?

(a) Using polythene bags for shopping
(b) Using ACs and coolers during the summer
(c) Using solar-power for generation of electricity
(d) Construction of skyscrapers

Q98. When 6 Ω, 9 Ω and 6 Ω resistors are connected in parallel combination then the resultant resistance will be:

(a) 2.50 Ω
(b) 2.25 Ω
(c) 2.40 Ω
(d) 2.75 Ω

Q99. Which of the following statements is INCORRECT regarding the surgical methods of birth control?

(a) They are also called sterilisation procedures
(b) In males vas deferens and in females fallopian tube is blocked
(c) They block gamete transport and prevent fertilisation
(d) They are not very effective methods

Q100. Which of the following is NOT a use of plaster of Paris?

(i) Manufacture of glass, soap and paper
(ii) used in plaster for supporting fractured bones.
(iii) making toys, materials for decoration and for making surfaces smooth.
(iv) Used in chemistry laboratories for sealing air gaps in apparatus where air tight arrangement is required.

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(a) only ii
(b) only iii
(c) ii and iii
(d) only i

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) 166

The logic followed here is;

Hence, the correct answer is "166".

Q2. Answer: (c) Both (a) and (b)

The correct answer is option 3) Both (a) and (b)

Key Points

• Refraction is the bending of light or any electromagnetic wave as it passes from one medium into another with a different refractive index.

• Snell's Law, also known as the Law of Refraction, describes the relationship between the angles of incidence and refraction when a ray of light or any electromagnetic wave passes from one medium into another with a different refractive index.

Snell's Law:

n1Sin(i1)=n2Sin(r1)

Here n1 and n2 are refractive index of Air and glass prism respectively and (i1) and (r1) are angles of incident ray and reflected ray on a same surface AB.

Refractive index of Prism (n2) is approximately 1.414 > Refractive index of Air (n1) is approximately closed to greater than 1.

Then by Snell's law if n2>n1 Then to maintain equality Sin(i1) must be greater than Sin(r1).

We know than Sin function is strictly increasing in the interval 0 to 90 degree, Thats why,The angle of refraction at surface AB is less than the angle of incidence.

Similarly,

In surface AC now incident ray is r2Which is equal to r_(1.)

Applying Snell's Law:

n1Sin(i2)=n2Sin(r2)

Here n1 and n2 are refractive index of Air and glass prism respectively

and (i2) and (r2) are angles of Refracted ray and Incident ray on a same surface AC.

Refractive index of Prism (n2) is approximately 1.414 > Refractive index of Air (n1) is approximately closed to greater than 1.

Then by Snell's law if n2>n1 Than to maintain equality Sin(i2) must be greater than Sin(r2).

We know than Sin function is strictly increasing in the interval 0 to 90 degree,

Thats why The angle of refraction at the surface AC is more than the angle of incidence.

Additional Information Critical Angle: The critical angle is the angle of incidence at which the refracted ray travels along the

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boundary between the two media, parallel to the interface. It occurs when light passes from a denser medium to a less dense medium.

Total Internal Reflection: When the angle of incidence is greater than the critical angle, total internal reflection occurs. This phenomenon is essential in the operation of optical fibers and prisms.

Q3. Answer: (c) 30

Shortcut Trick

For consecutive multiples, the Average of the numbers is the middle value.

Average of 2 numbers = 66 ÷ 2 = 33

Since the multiples are of 6, the gap between them is 6 units.

The multiples are (33 − 3) and (33 + 3), which are 30 and 36.

Smaller multiple = 30.

Therefore The correct answer is 30.

Alternate Method

Given: Sum of two consecutive multiples of 6 is 66.

Formula: Let the smaller multiple be x. The next consecutive multiple is (x + 6).

=> x + (x + 6) = 66

=> 2x + 6 = 66

=> 2x = 66 − 6

=> 2x = 60

=> x = 60 ÷ 2

=> x = 30

=> Smaller multiple = 30; Larger multiple = 30 + 6 = 36.

Therefore The correct answer is 30.

Additional Information

Consecutive Multiples

Multiples of a number n always have a common difference of n between them.

Arithmetic Mean of Multiples

For any AP (Arithmetic Progression) with two terms, the mean lies exactly at the midpoint (Sum ÷ 2).

Properties of Multiples

If the sum of k consecutive multiples of n is given, the middle term is (Sum ÷ k) if k is odd.

Q4. Answer: (a) 1

Given Series:

(Left) 429 847 922 213 757 (Right)

Now arranging all the numbers in descending order,

(Left) 922 847 757 429 213 (Right)

So now only 847 remains unchanged after rearranging the series.

Hence, the correct answer is "1".

Q5. Answer: (d) Enzymes, bacteria or other saprophytes act on biodegradable substances and decompose them.

The correct answer is Option 4.

Key Points

• Bacteria or other saprophytes break down or decompose dead organisms, animal waste, and plant litter to obtain nutrients by the action of enzymes.

• In this way, decomposition occurs by Enzymes, bacteria, or other saprophytes.

Important Points

Difference between Biodegradable substances and Non-biodegradable substances.

BIODEGRADABLE SUBSTANCE	NON-BIODEGRADABLE SUBSTANCE
1. Decomposes naturally in the environment	Can be decomposed by physical processes like heat and pressure but not naturally.
2. Safe for the environment.	Harmful to the environment.

3. Persist for a small period of time interval in the environment.	Persist for a longer period of time in the environment.

Additional Information

• Examples of Biodegradable substances are -

• Human feces, Manure, Sludge from sewage treatment plants, waste that come from slaughterhouses, Animal, and plants that have died, wooden plants, books, cotton cloths, fruit peels, and rotten fruits.

• Examples of Non-biodegradable substances are -

• Glass, Plastics, Metals, Pesticides, Aluminium cans, E-wastes, Styrofoam, Razors, Carbon paper, Polythene.

Q6. Answer: (c) five

The correct answer is five.

Key Points

• The Panchayat Raj system has three tiers: Zila Parishad, at the district level; Panchayat Samiti, at the block level; and Gram Panchayat, at the village level.

• Article 243 to 243O of Part IX mentions the Panchayats.

• The 3-tier Panchayati Raj was reintroduced with the 73^(rd) Constitutional Amendment Act of 1992.

• The Act gives a five-year term of office to all Panchayat levels.

• A fresh election should be conducted before the expiration of existing tenure.

• In case of dissolution, a fresh election should be within 6 months.

Additional Information

• The Balwant Rai Mehta Committee, 1957 recommended a 3-tier Panchayati Raj: Gram Panchayat, Panchayat Samiti and Zila Parishad.

• Following its recommendation in 1959, the first Gram Panchayat was established in Bagdari village of Rajasthan.

• Lack of participation by the people was observed in this system.

• Ashok Mehta Committee, 1977 replaced the 3-tier system with a 2-tier system: Zila Parishad, at the district level; and the Mandal Panchayat at a group of villages level.

• The 73rd Constitutional Amendment Act of 1992 brought the 3-tier system back.

• Under this Act, states with a population of less than 20 lakhs may not constitute the intermediate level.

Q7. Answer: (a) 27

Shortcut Trick

Apply Cross-Multiplication Method on ratios:

Initial Ratio = 2 : 7, Final Ratio = 4 : 3, Changes = +14 and −6

(2 × 3) − (7 × 4) units = (4 × −6) − (3 × 14)

|6 − 28| units = |−24 − 42| => 22 units = 66 => 1 unit = 3

Sum of original numbers = (2 + 7) = 9 units = 9 × 3 = 27

Therefore The correct answer is 27.

Alternate Method

Given: Initial ratio = 2 : 7, New ratio = 4 : 3 after changes +14 and −6.

Let the numbers be 2x and 7x.

=> (2x + 14) / (7x − 6) = 4 / 3

=> 3 × (2x + 14) = 4 × (7x − 6)

=> 6x + 42 = 28x − 24

=> 28x − 6x = 42 + 24

=> 22x = 66

=> x = 3

=> Original Sum = 2x + 7x = 9x

=> Original Sum = 9 × 3 = 27

Therefore The correct answer is 27.

Additional Information

Ratio and Proportion

A Ratio compares two quantities. If a : b = c : d, then ad = bc (Product of extremes = Product of means).

Cross-Multiplication Method

Used when an initial ratio is changed by specific values to reach a new ratio. It saves time by avoiding linear equations.

Sum of Ratio Parts

The actual sum of numbers is always a multiple of the sum of their ratio parts (here, 2+7=9).

Q8. Answer: (d) 76

According to the given information

We can see that the shaded part denotes the number of non-graduate officers that are neither administrators nor engineers = 67 + 9

Non- graduates officers that are neither administrators nor engineers = 76

Hence, the correct answer is "76".

Mistake PointsHere, non-graduate officers that are neither administrators nor engineers means that the officers cannot be graduates, administrators and engineers.

17 would not add as it belongs to officers that are engineers.

4 would add as it belongs to graduate officers that are administrators.

81 would not add as it belongs to Graduate officers.

Hence, the correct answer is "76".

Q9. Answer: (b) 60%

Shortcut Trick

Total articles given = 14 + 2 = 16. Articles paid for = 14.

Effective discount from free articles = (2 ÷ 16) × 100 = 12.5%.

Successive discounts of 5% and 12.5%: Net Discount = 5 + 12.5 − (5 × 12.5 ÷ 100) = 17.5 − 0.625 = 16.875%.

Ratio CP : MP = (100 − Net Discount%) : (100 + Profit%) = (100 − 16.875) : (100 + 33) = 83.125 : 133.

MP ÷ CP = 133 ÷ 83.125 = 1.6. Percentage above CP = (1.6 − 1) × 100 = 60%.

Therefore The correct answer is 60%.

Alternate Method

Given → Discount = 5%, Free Articles = 2 on 14, Net Profit = 33%.

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

=> Let CP of 1 article be 1. Total CP for 16 articles = 16.

=> Total SP (after 33% profit) = 16 × 1.33 = 21.28.

=> SP of 14 articles = 21.28 => SP per article customer pays for = 21.28 ÷ 14 = 1.52.

=> Since 5% discount is given on MP: 0.95 × MP = 1.52.

=> MP = 1.52 ÷ 0.95 = 1.6.

=> Percentage more than CP = (1.6 − 1) ÷ 1 × 100 = 60%.

Therefore The correct answer is 60%.

Additional Information

Free Articles Discount

When 'x' articles are free on the purchase of 'y' articles, the discount % = [x ÷ (x + y)] × 100.

CP and MP Relation

The ratio of Marked Price to Cost Price is given by CP ÷ MP = (100 − D%) ÷ (100 + P%).

Q10. Answer: (d) Only assumption II is implicit

Given:-

Statement:

Increase in the tax rates will hurt the pockets of the salaried middle class.

Assumptions:

I. Increase in the prices of goods will hurt the poor too → Not Implicit (As in the statement only the effect of increase in tax rates on middle class is mentioned.)

II. The middle class will reduce their extra expenditure to save money → Implicit (As in the statement it is given that due to increase in tax rates middle class spending will be affected. So, middle class will reduce their extra spending to save money.)

Hence, the correct answer is "Only assumption II is implicit".

Q11. Answer: (d) 6 cm

Shortcut Trick

Ratio of Length (L) to Breadth (B) = 3 : 1

Perimeter Ratio = 2 × (3 + 1) = 8 units

8 units = 48 cm => 1 unit = 6 cm

Breadth = 1 unit = 6 cm

Therefore The correct answer is 6 cm.

Alternate Method

Given:

Perimeter of rectangle = 48 cm

Length (L) = 3 × Breadth (B)

Formula Used:

Perimeter of rectangle = 2 × (Length + Breadth)

Calculations:

Let the breadth be x cm.

=> Length = 3x cm

=> 2 × (3x + x) = 48

=> 2 × 4x = 48

=> 8x = 48

=> x = 48 ÷ 8

=> x = 6 cm

Therefore The correct answer is 6 cm.

Additional Information

Area of Rectangle

The area is calculated as the product of its dimensions: Area = Length × Breadth.

Diagonal of Rectangle

The diagonal forms a right-angled triangle with sides: Diagonal = $\sqrt{(L^2 + B^2)}$.

Properties of Rectangle

Opposite sides are equal and parallel, and each interior angle is exactly 90°.

Q12. Answer: (b) C

Given

Seven People - A, B, C, D, E, F and G are sitting in a straight line facing North.

1) Only two people sit to the left of F.

2) Only three people sit between F and E.

3) D is not an immediate neighbour of E. D sits second to the right of A.

Case 1:

Case 2:

4) G sits to the immediate right of B.

Case 1:

Case 2:

Not Possible as no two immediate positions are available.

5) The vacant position to the left of A will be occupied by C as only C is left to be seated.

Hence, the correct answer is "C".

Q13. Answer: (a) Colour of element

The correct Answer is option 1) Colour of element

Color is primarily determined by the interactions of electrons in the outermost energy levels of atoms or ions, specifically their electronic transitions. Transitions are influenced by factors such as the energy difference between electronic energy levels and the nature of the chemical bonds in the compound.

Key Points

• The colors of elements are primarily determined by the interactions of electrons in the outermost energy levels of atoms or ions.

• Colour arises from electronic transitions where electrons move between different energy levels, also known as electronic orbitals.

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• Transitions involve the absorption and emission of specific wavelengths of light, which give rise to the observed color.

the color of elements is determined by the intricate interplay of electronic structure, energy levels, and chemical bonding, and it is not a simple, predictable property based solely on an element's position in the Periodic Table.

Additional Information Properties that are influenced by the position of elements in the Periodic Table:

Atomic Number	**Increases by one as you move from left to right across a period (horizontal row) in the Periodic Table.**
Atomic Mass	Generally increases as you move from left to right across a period due to the addition of more protons and neutrons in the nucleus.
Valence Electrons	(electrons in the outermost energy level) is determined by the element's position in the Periodic Table. Elements in the same group (vertical column) have the same number of valence electrons.
Chemical Reactivity:	Elements in the same group tend to have similar chemical reactivity because they have the same number of valence electrons, which determines how they can form bonds with other elements
Electronegativity	An element's ability to attract electrons in a chemical bond, generally increases from left to right across a period.
Atomic Radius	Tends to decrease from left to right across a period and increase down a group. This trend is due to changes in the effective nuclear charge and electron shielding
Melting and Boiling Points	It varies based on their position in the Periodic Table. For example, noble gases have very low melting and boiling points, while metals tend to have higher melting and boiling points.
Metallicity:	The classification of elements as metals, nonmetals, and metalloids is based on their position in the Periodic Table. Metals are generally found on the left side, nonmetals on the right side, and metalloids in between
Ionic Charge:	Related to their position in the Periodic Table. Elements on the left side tend to lose electrons to form positive ions (cations), while elements on the right side tend to gain electrons to form negative ions (anions).
Electron Configuration:	The electron configuration of elements follows certain patterns based on their position in the Periodic Table, helping to predict the arrangement of electrons in atomic orbitals.

Q14. Answer: (d) Only (ii)

The correct answer is Option 4 i.e. Optical Centre.

Key Points

• The principal axis of a lens is the line that passes through the Geometric centre of the lens and joins the two centres of the curvature of its surfaces.

• The optical centre is a point lying on the principal axis of the lens so that the ray of light whose refracted path passes through this point will have its emergent path parallel to the direction of the incident ray.

• Hence, a point on the principal axis of the lens through which light passes undeviated is called an Optical centre.

Hint

The RED line is the principal axis.

Additional Information

• Point of Incidence - It is the point at which light strikes the surface.

• Point of Refraction - It is the point through which light gets refracted.

• Refraction- Refraction is the bending of light as it passes from one medium to another.

• Refractive Index - It is the value calculated from the ratio of the speed of light in a vacuum to that medium.

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Q15. Answer: (b) 1440 π cm2

Shortcut Trick

Total Surface Area (TSA) of a cylinder = 2πr(r + h)

Given: r = 24 cm and h = 6 cm

TSA = 2 × π × 24 × (24 + 6)

TSA = 48π × 30 = 1440π cm²

Therefore The correct answer is 1440π cm².

Alternate Method

Given:

Radius (r) = 24 cm

Height (h) = 6 cm

Formula Used:

Total Surface Area of a Solid Cylinder = Curved Surface Area + Area of two bases

TSA = 2πrh + 2πr² = 2πr(h + r)

Calculations:

=> TSA = 2 × π × 24 × (6 + 24)

=> TSA = 48 × π × 30

=> TSA = 1440π cm²

Therefore The correct answer is 1440π cm².

Additional Information

Curved Surface Area of Cylinder

The area of the side surface only is given by 2πrh.

Volume of Cylinder

The total space occupied by the cylinder is πr²h.

Hollow Cylinder TSA

For a hollow cylinder with external radius R and internal radius r, TSA = 2π(R + r)(h + R − r).

Q16. Answer: (b) Cuscuta

The correct answer is option 2) Cuscuta

Cuscuta, commonly known as dodder, is a parasitic plant that lacks chlorophyll, which is essential for photosynthesis. As a result, it cannot produce its own food through photosynthesis like typical green plants.

Key Points

• Cuscuta begins its life cycle as a seed, germinating under favorable conditions.

• The seedling develops specialized structures called haustoria. These haustoria penetrate the host plant's tissues.

• Establish a physical and physiological connection between Cuscuta and the host plant.

• Cuscuta is a plant that obtains water, minerals, and nutrients from the vascular system of its host.

Additional InformationPlants can be classified into two categories based on their mode of nutrition:

autotrophic and heterotrophic

Autotrophic plants	Heterotrophic plants
primary producers produce their own food using light, carbon dioxide, and water through a process called photosynthesis	Depend on other organisms for their food.
Chlorophyll is a green pigment present in the chloroplasts that helps in capturing light energy from the sun to produce food.	categories of heterotrophic plants: 1. Parasitic Plants: Ex :- Dodder (Cuscuta) and broomrape (Orobanche). 2.. Mycoheterotrophic Plants: Indian pipe (Monotropa uniflora) and some orchids. 3. Insectivorous:- Pitcher plant, Venus flytrap 4. Saprophytic:- Ex- mushrooms, 5. Symbiotic plants:- relationship between nitrogen-fixing bacteria and leguminous plants like soybeans.

Saprophytic plants obtain their nutrition from dead organic matter.

Symbiotic plants form a mutually beneficial relationship with other organisms to obtain their nutrition.

Q17. Answer: (b) 300 m

Shortcut Trick

Speed in m/s = 45 × (5/18) = 12.5 m/s.
Length of train = Speed × Time
=> 12.5 × 24 = 300 m.
Therefore The correct answer is 300 m.
Alternate Method
Given:
Speed of the train = 45 km/h
Time taken to cross the pole = 24 sec
Formula Used:
1 km/h = 5/18 m/s
Distance (Length of train) = Speed × Time
Calculations:
=> Speed in m/s = 45 × (5/18) m/s
=> Speed = (5 × 5) / 2 = 12.5 m/s
=> Length of train = 12.5 × 24
=> Length of train = 300 m
Therefore The correct answer is 300 m.
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 a stationary object
When a train crosses a pole or a person, the distance traveled is equal to the length of the train.
Train crossing a platform
When a train crosses a platform or bridge, the total distance covered = Length of train + Length of platform.

Q18. Answer: (b) 32

Calculation:
$(13^2-5^2)^{(3/2)}\times 8^{(2/3)}\div (1/6)^{(-3)}$
=> $((13-5)(13+5))^{(3/2)}\times 2^2\div 6^3$
=> $(8\times 18)^{(3/2)}\times 4\div 216$
=> $(144)^{(3/2)}\times 4\div 216$
=> $(12)^3\times 4\div 216$
=> $(1728\times 4)\div 216$
=> 32
Therefore Option 2 is the correct answer.

Q19. Answer: (a) larger, about the same

The correct answer is Option 1
Key Points
• The clouds are nearer the Earth's surface and they contain dust particles and aggregates of water molecules of bigger size than the wavelength of visible light.
• Therefore, the dust particles and water molecules present in the clouds scatter all colors of incident white light from the sun to the same extent, and hence scattered light reaches our eye, the clouds are seen white.
Additional Information
• Scattering of light- Scattering of light is the phenomenon by which a beam of light is redirected in many different directions when it interacts with the particle.

Examples of Scattering	**The red color of the sun at sunshine and sunset, the White color of the sky at noon, the Blue color of the sky, the Red color used as a danger signal, White color of clouds.**

Confusion Points
• When white light strikes a cloud, white light is scattered and reflected. This is why clouds are white.
• But why sky is blue?
• Because in a clear sky, sunlight is scattered by air particles that are smaller than the wavelength of light.

• So here, Blue light is scattered more than the other colors because it travels as shorter, smaller waves.

Q20. Answer: (d) 3 km towards the east

The movement of Raghav is shown in the image given below:

AB = 16 km, BC = 10km, CD = 17 km, DE = 13 km, EP = 1 km

Given point A is the starting point and P is the final point and all turns are at 90o so,

PA = 13 - 10 => PA = 3 km

Thus, point A is 3 km away in the East direction.

Hence, the correct answer is, "3 km towards the east".

Q21. Answer: (b) S

Given, there are six friends P, Q, R, S, T and U, each has a different height.

1. S is taller than only four other friends.

2. R is taller than only one friend.

3. U is taller than T but shorter than P and P is not the tallest, i.e. P > U > T and T will not take the tallest position.

4. Q will take the only position left, thus

So as per the above arrangement, S is the second tallest among all friends.

Hence, the correct answer is "S".

Q22. Answer: (c) 0

As per the given Venn diagram, volunteers who are supervisors are depicted by the common region bound by the triangle and the vertical rectangle,

As the colored region shows the volunteers who are supervisors.

But the volunteers who are supervisors but neither donors nor field workers are should be depicted by the region that is not bounded by the oval and the horizontal rectangle.

As there is no such region to follow the above condition, so the results will be 0.

Hence, the correct answer is "0".

Q23. Answer: (b) Attorney General of India

The correct answer is Attorney General of India.

Key Points

• The Attorney General(AG) is the highest law officer in India.

• The AG is the chief legal advisor to the government of India and also the primary lawyer representing the Union Government in the Supreme Court of India.

• Article 76 under Part-V of the Indian Constitution deals with the position of AG of India.

• The President appoints the AG on the advice of the government.

• The AG is a part of the Union Executive.

• The term of the office of the AG is not fixed by the Constitution and may be removed at any time by the President.

Additional Information

• The Advocate General holds the corresponding office in the states.

• Article 165 deals with the position of the Advocate General.

• The Advocate General advises the respective state government.

Q24. Answer: (b) 502

The pattern followed here is;

Hence, the correct answer is "502".

Q25. Answer: (d) Budget Deficit

The correct answer is Budget Deficit.

Key Points

• A Budget Deficit means the overall expenses of a nation have exceeded its overall income.

Budget Deficit = Total Expenditures by the Government − Total Income of the government

• The budget deficit is found to occur in various forms. These include Primary Deficit, Fiscal Deficit, and Revenue Deficit.

• Revenue deficit: It is defined as the extent to which the total revenue expenditure exceeds the overall revenue received. It indicates that the government’s revenue generated is not adequate enough to bear the expenses.

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Revenue Deficit = Revenue Expenditure - Revenue Receipt

• Fiscal deficit: It includes the extent to which the expenses exceed the total receipts, excluding the borrowings.

Fiscal deficit = Total expenditure - Total Non Borrowing Receipt

• Primary deficit: It is defined as the difference between the fiscal deficit of a year and the interest payments due for the previous loans.

Primary Deficit = Fiscal Deficit - Interest Payment to Other

Additional Information

• Revenue deficit: It is defined as the extent to which the total revenue expenditure exceeds the overall revenue received. It indicates that the government's revenue generated is not adequate enough to bear the expenses.

Revenue Deficit = Revenue Expenditure - Revenue Receipt

• Unbalanced Budget: A budget is said to be unbalanced if the estimated government receipts are not equal to the estimated government expenditure.

• Financial Statement: It is a summary of revenues and expenses of the business and calculates the net figure termed as profit or loss.

Q26. Answer: (c) 86

Let's solve the given series using BODMAS rule in each option;

Symbol	•	•	×	÷
Meaning	•	•	÷	×

Given Equation: 40 - 17 ÷ 3 + 25 × 5 = ?

Now, let's place the final symbol in the given equation,

40 + 17 × 3 - 25 ÷ 5 = ?

40 + 17 × 3 - 5 = ?

40 + 51 - 5 =?

91 - 5 = ?

86 = ?

Hence, the correct answer is "86".

Q27. Answer: (a) The 11th Fundamental Duty

The correct answer is The 11^(th) Fundamental Duty.

Key Points:

• Fundamental Duties were taken from the constitution of Russia.

• These were incorporated in Part IV-A of the Constitution by the 42^(nd) Constitutional Amendment Act,1976.

• It was recommended by Sardar Swarna Singh's Committee.

• Originally 10 in number, one more Duty was added through the 86^(th) Constitutional Amendment Act, of 2002.

• Like the Directive Principles of State policy, Fundamental Duties are also Non-justiciable in nature.

• 11^(th) Fundamental Duty provides opportunities for education to his child or ward between the ages of 6-14 years.

• The 86^(th) Amendment inserted Article 21A which made the Right to Education a Fundamental Right in Part III of the Constitution.

Additional Information

• There are 11 Fundamental Duties:

• To abide by the Constitution and respect its ideals and institutions, the National Flag, and the National Anthem.

• To cherish and follow the noble ideals that inspired the national struggle for freedom.

• To uphold and protect the sovereignty, unity, and integrity of India.

• To defend the country and render national service when called upon to do so.

• To promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic, and regional or sectional diversities and to renounce practices derogatory to the dignity of women.

• To value and preserve the rich heritage of the country's composite culture.

• To protect and improve the natural environment including forests, lakes, rivers, and wildlife, and to have compassion for living creatures.

• To develop scientific temper, humanism, and the spirit of inquiry and reform.

• To safeguard public property and to abjure violence.

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• To strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavor and achievement.

• To provide opportunities for education to his child or ward between the ages of six and fourteen years (added by the 86th Constitutional Amendment Act, 2002)

Q28. Answer: (a) infinity

The correct answer is option1) infinity

• When an object is placed in front of a concave mirror at a distance equal to its focal length, the image will be formed at infinity.

Key Points

• A concave mirror has two focal points, one on each side.

• The focal length (f) is considered positive for a concave mirror.

• an object is placed at a distance equal to the focal length (d = f), the reflected rays of light from the object will become parallel after reflecting off the mirror.

• parallel rays do not converge to form a real image, they appear to diverge from a point at infinity.

• the image is said to be formed at infinity and is virtual.

Additional Information

Image Formation:

Concave mirrors can create both real and virtual images, depending on the object's position relative to the mirror:

• When the object is beyond twice the focal length (2f), a real, inverted, and diminished image forms on the mirror's opposite side.

• When the object is at a distance less than twice the focal length (2f) but greater than the focal length (f), a real, inverted, and enlarged image is formed on the opposite side.

• When the object is at a distance equal to twice the focal length (2f), a real, inverted, and same-sized image is formed on the opposite side.

When the object is between the focal point (F) and the mirror, a virtual, upright, and magnified image is formed on the same side as the object. The image is virtual because the reflected rays do not converge; they appear to diverge from behind the mirror.

Plane mirror	Convex mirror	Concave mirror
Plane mirrors always create virtual images.	Convex mirrors always create virtual images.	Concave mirrors can create both real and virtual images.
The virtual images formed by plane mirrors are upright and of the same size as the object.	The virtual images formed by convex mirrors are upright and diminished (smaller) compared to the object.	The virtual images formed by concave mirrors can be upright or inverted, depending on the object's position.
The image is located behind the mirror at the same distance as the object is in front of the mirror.	The magnification is always positive.	The magnification can be positive (for virtual and upright images) or negative (for real and inverted images).
• Image Distance (v) =Object Distance (u) - Magnification (M) = +1 (no inversion or magnification)	Mirror Equation: not used for convex mirrors, as they have no real focal point Magnification M=(-v)/u (always positive for virtual and upright images.	Mirror Equation: 1/f =1/v + 1/u Magnification M=(-v)/u (negative for real and inverted images, positive for virtual and upright images.

Q29. Answer: (a) A

Let's arrange the order using the information given,

1) Z lives on the lowermost floor.

6	
5	
4	
3	
2	
1	Z

2) B lives on an even numbered floor, but not on floor 6.

3) D is immediately above B.

Case 1:

6	
5	
4	
3	D
2	B
1	Z

Case 2:

6	
5	D
4	B
3	
2	
1	Z

4) Only Y lives on the floor between the floors occupied by D and C.

Case 1:

6	
5	C
4	Y
3	D
2	B
1	Z

Case 2:

6	
5	D
4	B
3	
2	
1	Z

Case 2 gets eliminated as it doesn't satisfy point 4.

Thus, the final arrangement is,

6	A
5	C
4	Y
3	D
2	B
1	Z

Here, we can see that A lives on the topmost floor.

Hence, the correct answer is "A".

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Q30. Answer: (a) 22

Female engineers are drivers but NOT doctors are shown below →

So, the number of female engineers who are drivers but NOT doctors are "22".

Hence, the correct answer is "22".

Q31. Answer: (a) Jan Sikshan Sansthan

The correct answer is Jan Sikshan Sansthan.

In News

• The NABARD and JSS collaborated on the implementation of the Gotramruth project, which included the Adavi brand.

• An exhibition titled DISHA was organized by the NABARD and JSS during the Tribal Festival.

Key Points

• The National Bank for Agriculture and Rural Development (NABARD) is an apex regulatory body for the overall regulation of regional rural banks and apex cooperative banks in India.

• NABARD was established on the recommendations of the B. Sivaramman Committee (by Act 61, 1981 of Parliament) on 12 July 1982 to implement the National Bank for Agriculture and Rural Development Act 1981.

• Headquarters- Mumbai

• Current Chairman- Shri Shaji KV

Q32. Answer: (a) 59.5

Shortcut Trick

The empirical formula relating central tendencies is: 3 × Median = Mode + 2 × Mean.

Substitute the given values: 3 × Median = 61.1 + 2 × 58.7

3 × Median = 61.1 + 117.4 = 178.5

Median = 178.5 ÷ 3 = 59.5

Therefore The correct answer is 59.5.

Alternate Method

Given:

Mean = 58.7

Mode = 61.1

Formula Used:

Mode = 3(Median) − 2(Mean)

Calculations:

=> 61.1 = 3 × Median − 2 × 58.7

=> 61.1 = 3 × Median − 117.4

=> 3 × Median = 61.1 + 117.4

=> 3 × Median = 178.5

=> Median = 178.5 ÷ 3

=> Median = 59.5

Therefore The correct answer is 59.5.

Additional Information

Empirical Relationship

The formula Mode = 3 Median − 2 Mean is applicable for moderately skewed frequency distributions. It is also known as Karl Pearson's formula.

Symmetric Distribution

In a perfectly symmetrical distribution, the values of Mean, Median, and Mode are identical (Mean = Median = Mode).

Types of Skewness

In a positively skewed distribution, Mean > Median > Mode. In a negatively skewed distribution, Mean < Median < Mode.

Mean Deviation

The relationship can also be expressed as: Mean − Mode = 3 (Mean − Median).

Q33. Answer: (a) decreases with increase in distance

The correct answer is option 1) decreases with increase in distance

Biot-Savart Law: This law describes the magnetic field (B) produced by an infinitesimal current element (dI) at a point in space. It

is used to find the magnetic field at a specific location due to a current-carrying conductor.

Key Points

• dB (magnetic field vector produced by the current element.) is inversely proportional to r^2 (r is the distance from the current element to the point where the magnetic field is being calculated).

• When a current flows through a conductor, it generates a magnetic field around it.

• The decrease in the magnetic field with distance follows the inverse square law.

Additional Information

• Ampère's Law: Ampère's law relates the circulation of the magnetic field around a closed loop to the total current enclosed by the loop. It is used to calculate the magnetic field around a closed loop or a solenoid.

• Magnetic Field Due to a Long Straight Conductor: The magnetic field (B) at a distance (r) from a long straight current-carrying conductor.

• Magnetic Field Inside a Solenoid: Inside an ideal solenoid (a tightly wound coil of wire), the magnetic field is nearly uniform and parallel to the axis of the solenoid.

• Biot-Savart Law: This law describes the magnetic field (B) produced by an infinitesimal current element (dI) at a point in space. It is used to find the magnetic field at a specific location due to a current-carrying conductor.

Q34. Answer: (d) Rs. 480

Shortcut Trick

Let the Marked Price (x) be 100 units.

Discounted Price = 100 − 20% of 100 = 80 units.

Selling Price (with VAT) = 80 × (112.5 ÷ 100) = 80 × (9 ÷ 8) = 90 units.

Given, 90 units = Rs. 432.

Multiplier = 432 ÷ 90 = 4.8.

Value of x = 100 × 4.8 = Rs. 480.

Therefore The correct answer is Rs. 480.

Alternate Method

Given: Marked Price = Rs. x, Discount = 20%, VAT = 12.5%, Final SP = Rs. 432.

Formulas: Price after Discount = MP × (100 − D%) ÷ 100 | Final SP = Price after Discount × (100 + VAT%) ÷ 100

=> Price after discount = x × (80 ÷ 100) = 0.8x

=> Final Selling Price = 0.8x × (112.5 ÷ 100) = 432

=> 0.8x × 1.125 = 432

=> 0.9x = 432

=> x = 432 ÷ 0.9 = 480

Therefore The correct answer is Rs. 480.

Additional Information

VAT Calculation

VAT (Value Added Tax) is always calculated on the actual selling price (the price after all discounts have been applied).

Successive Percentage Changes

When a discount (d%) is followed by a tax (t%), the net change is −d + t − (dt ÷ 100). In this case: −20 + 12.5 − (20 × 12.5 ÷ 100) = −7.5 − 2.5 = −10% net change.

Q35. Answer: (d) MRVUF

The positional value of alphabet series is;

The pattern followed here is,

GUARD → LDYTE

CLOVE → HOSXF

Similarly;

HORSE → MRVUF

Hence, the correct answer is "MRVUF".

Q36. Answer: (a) Palk Strait

The correct answer is Palk Strait.

Key Points

• Sri Lanka is separated from India by the Palk Strait and the Gulf of Mannar.

• It is situated between Tamil Nadu (India) and Jaffna district (Sri Lanka).
• The strait is named after the former governor of Madras, Robert Palk.
• The Palk Strait is bounded by
• Pamban Island (India)
• Adam's (RAM Setu) Bridge
• The Gulf of Mannar (Sri Lanka)
Additional Information
• Malacca Strait
• Joins: Andaman Sea and South China Sea
• Locations: Indonesia - Malaysia
• Sunda Strait
• Joins: Java Sea and Indian Ocean
• Locations: Indonesia
• Otranto Strait
• Joins: the Adriatic Sea and the Ionian Sea
• Locations: Italy - Albania

Q37. Answer: (c) 70%

Shortcut Trick
Let the Marked Price (MP) be 100.
Successive discounts = 25% and 8% => Total Selling Price (SP) = 100 × 0.75 × 0.92 = 69.
Given Gain = 17.3%, so SP = 1.173 × Cost Price (CP).
69 = 1.173 × CP => CP = 69 ÷ 1.173 = 58.823.
Markup % = [(MP − CP) ÷ CP] × 100 = [(100 − 58.823) ÷ 58.823] × 100 = 70%.
Therefore The correct answer is 70%.
Alternate Method
Given: Trade Discount = 25%, Cash Discount = 8%, Profit = 17.3%.
Formulas: Effective Discount = a + b − (a × b)/100 | MP/CP = (100 + Profit%)/(100 − Discount%).
=> Effective Discount = 25 + 8 − (25 × 8)/100 = 33 − 2 = 31%.
=> Let CP = 100, then SP = 100 + 17.3 = 117.3.
=> SP is after 31% discount on MP: 117.3 = MP × (100 − 31)/100.
=> 117.3 = MP × 0.69 => MP = 117.3 ÷ 0.69 = 170.
=> Markup percentage = MP − CP = 170 − 100 = 70%.
Therefore The correct answer is 70%.
Additional Information
Relation between MP and CP
The ratio of Marked Price to Cost Price is directly given by (100 + Profit%)/(100 − Discount%).
Successive Discounts
When two discounts d1 and d2 are given, the single equivalent discount is (d1 + d2 − d1d2/100)%.

Q38. Answer: (c) 2004

The correct answer is 2004.
Key Points
• The Tamil language was declared as a classical language in 2004.
• Tamil is the first language to attain the status of a classical language.
• Tamil is one of the oldest languages spoken by over 84 million people in India.
Additional Information
• The classical language has its independent tradition of written literature.
• Classical languages are listed in the 8th schedule of the Constitution of India.
• 6 Classical languages are there in the 8th schedule as of now, these are-
1. Tamil (2004)
2. Sanskrit (2005)

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3. Kannada (2008)

4. Telugu (2008)

5. Malayalam (2013)

6. Odia (2014)

• India currently has 11 classical languages, after five new languages—Marathi, Assamese, Bengali, Pali, and Prakrit—were granted this status in October 2024, adding to the six languages previously designated as classical.

Q39. Answer: (c) 6, 18

LOGIC USED :

FIRST NUMBER × FIRST NUMBER ÷ 2 = SECOND NUMBER

In (14, 98) →

14 × 14 ÷ 2 = 98

In (22, 242) →

22 × 22 ÷ 2 = 242

Similarly;

In (6, 18) →

6 × 6 ÷ 2 = "18"

Hence, the correct answer is "18".

Q40. Answer: (b) 1

Given statement: E ≥ R = S ≤ T < N > O = Z

Conclusions:

(1) E ≥ S → True (As E ≥ R = S, E is easily move forward to S and both have = sign).

(2) T ≥ E → False (As E ≥ R = S ≤ T, T is move forward to R but not to E because in between R and E closed gate are applied).

(3) R > N → False (As R = S ≤ T < N, R is move forward to S but not to N because after S closed gate are applied).

(4) T < Z → False (As T < N > O = Z, T is not able to move forward because after T closed gate are applied).

Hence, the correct answer is "E ≥ S".

Important Points Assume →

→ Open gate (In this symbol you can move forward in series according to your conclusion).

< → Close gate (In this symbol you can't move forward in series).

= → Both side open gate (in this symbol you can move both side in series).

Q41. Answer: (c) Cross-Cutting and Futuristic Initiatives

The correct answer is Cross-Cutting and Futuristic Initiatives.

Key Points

"Cross-Cutting and Futuristic Initiatives" seem to indicate a program or a set of policies that could encompass a wide range of topics depending on its specific goals and application. Based on the generic understanding of such terms, we can surmise the following characteristics:

1. Interdisciplinary Approach: The scheme likely involves "cross-cutting" aspects, meaning it covers numerous fields or sectors and encourages different disciplines to work together. For example, experts in technology, sociology, economics, and ecology might collaborate to develop initiatives that address complex, multifaceted issues.

2. Forward-Thinking Focus: The term "futuristic" suggests the scheme is geared towards emerging technologies, trends, and societal challenges. It could involve research and development into innovative solutions, anticipating future challenges, and fostering progress in areas like AI, climate change, sustainable technology, etc.

Q42. Answer: (d) Rs. 71

Shortcut Trick

Let original costs be x and y. 12x + 7y = 233.

New condition: 2(x − 1.5) + 3(y + 1) = 48 => 2x + 3y = 48.

Multiply second by 6: 12x + 18y = 288.

Subtracting: (18 − 7)y = 288 − 233 => 11y = 55 => y = 5.

Then 12x + 7(5) = 233 => 12x = 198 => x = 16.5.

Required: 4(16.5) + 5 = 66 + 5 = 71.

Therefore The correct answer is Rs. 71.

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Alternate Method

Given: Original cost of 12 pens and 7 pencils = Rs. 233.

Let original cost of 1 pen = x and 1 pencil = y.

=> 12x + 7y = 233 −−− (Eq 1)

=> 2(x − 1.5) + 3(y + 1) = 48

=> 2x − 3 + 3y + 3 = 48

=> 2x + 3y = 48 −−− (Eq 2)

Multiply Eq 2 by 6:

=> 12x + 18y = 288 −−− (Eq 3)

Subtract Eq 1 from Eq 3:

=> (12x − 12x) + (18y − 7y) = 288 − 233

=> 11y = 55 => y = 5

Substitute y in Eq 2:

=> 2x + 3(5) = 48 => 2x = 48 − 15 = 33 => x = 16.5

Original cost of 4 pens and 1 pencil:

=> 4(16.5) + 1(5) = 66 + 5 = 71

Therefore The correct answer is Rs. 71.

Additional Information

Linear Equations in Two Variables

Standard form is ax + by = c. Systems can be solved using elimination, substitution, or cross-multiplication methods.

Elimination Method

Multiplying one or both equations by a constant to make the coefficients of one variable equal, then adding or subtracting to eliminate that variable.

Cost Price Calculations

Total cost = (Quantity1 × Price1) + (Quantity2 × Price2). Changes in price must be applied to the unit rate before multiplying by quantity.

Q43. Answer: (b) Prarthana Samaj

The correct answer is Prarthana Samaj.

Key Points

• The Prarthana Samaj was established by Atmaram Pandurang in 1867 in Bombay.

• He was assisted by Keshab Chandra Sen.

• The Prarthana Samaj was a religious socio-reform movement in Maharashtra.

• The Prarth Samaj supported Monotheism and denounced idol denounced played a very important rol Maharashtra Renaissance.

• Some important members of Prarthana Samaj were Mahadev Ranade, Sir Ramakrishna Gopal Bhandakar, and Sir Narayan Chandavarkar.

Additional Information

Reform	About
Satya Shodhak Samaj	Satya Shaodhak Samaj was founded by Jyotiba Phule in Pune on September 24, 1873.
Brahmo Samaj	Raja Ram Mohan Roy founded Atmiya Sabha in 1815. It was splitted into two in 1866 namely Brahmo Samaj and Adi Brahmo Samaj.
Arya Samaj	Arya Samaj was founded by Swami Dayananda Saraswati at Bombay in 1875.

Q44. Answer: (c) six fold

The correct answer is option 3) six-fold

The power (P) in an electrical circuit can be calculated using

Ohm's law : P=V×I

P_(original)	P_(new)

Poriginal=V_(original)×I_(original)	P_(new)=3(V_(original))×2(I_(original))
	Pnew=6 (P_(original))

Key Points

• P is the power in watts (W).

• I is the current in amperes (A).

• V is the voltage in volts (V).

Additional Information

• Kirchhoff's Laws:

1. Kirchhoff's Current Law (KCL):-KCL states that the sum of currents entering a junction equals the sum of currents leaving it

2. Kirchhoff's Voltage Law (KVL):- KVL states that the total voltage around any closed loop in a circuit is equal to the sum of the voltage drops.

These are fundamental principles used to analyze complex electrical circuits.

Q45. Answer: (b) Jaisalmer Desert Festival

The correct answer is Jaisalmer Desert Festival.

Key Points

• The Rajasthan state government has granted permission for organizing the annual Maru desert festival in Jaisalmer.

• The festival has numerous added attractions like turban tying, moustache competitions, cultural as well as musical performances.

• The four-day international annual Maru desert festival is going to be an attraction for locals and tourists as well because the administration has appealed to residents to decorate their homes during the festival and make 'rangolis' in front of their houses.

Q46. Answer: (a) (iii)

The correct answer is option 1) (iii) 2KBr (aq) + BaI2(aq) → 2KI(aq) + BaBr2(s)

potassium bromide (KBr) and barium iodide (BaI2) exchange ions to form potassium iodide (KI) and barium bromide (BaBr2). This reaction demonstrates the characteristic exchange of ions between two compounds, making it a double displacement reaction.

• The reactants are potassium bromide (KBr) and barium iodide (BaI2).

• In potassium bromide (KBr), potassium (K+) is the cation, and bromide (Br-) is the anion.

• In barium iodide (BaI2), barium (Ba^(2+)) is the cation, and iodide (I^-) is the anion.

• In a double displacement reaction, the cations and anions of the reactants switch partners to form new compounds. In this case:

• The potassium cation (K^+) from KBr combines with the iodide anion (I^-) from BaI2 to form potassium iodide (KI).

• The barium cation (Ba^(2+)) from BaI2 combines with the bromide anion (Br^-) from KBr to form barium bromide (BaBr2).

Ionic equation, focusing on the species that are involved in the chemical change:

2K+(aq) + 2I^-(aq) + Ba2+(aq) + 2Br^-(aq) → 2K^+(aq) + 2I^-(aq) + BaBr2(s)

Key Points

• A double-displacement or replacement reaction occurs when parts of two ionic compounds are exchanged, making two new compounds.

• A characteristic of a double-replacement equation is that there are two compounds as reactants and two different compounds as products.

• Double displacement reactions usually occur in an aqueous solution.

• Ions in the compounds are free to move and interact with each other.

• Compounds consist of positively charged ions (cations) and negatively charged ions (anions).

• A double displacement reaction is used to synthesize specific compounds, precipitation reactions, and acid-base reactions.

Additional Information Types of chemical reactions:

• Combination (Synthesis) Reactions:

• Two or more substances combine to form a single product

Example: 2H2(g) + O2(g) → 2H2O(l)

• Decomposition Reactions:

A single compound breaks down into two or more simpler substances.

General form: AB → A + B.

Example: 2H2O(l) → 2H2(g) + O2(g)

• Single Replacement (Displacement) Reactions:

An element replaces another element in a compound, resulting in the formation of a new compound and a free element.

General form: A + BC → AC + B.

Example: Zn(s) + 2HCl(aq) → ZnCl2(aq) + H2(g) (zinc displaces hydrogen from hydrochloric acid).

• Double Displacement (Metathesis) Reactions:

The cations and anions of two different compounds exchange places to form new compounds.

General form: AB + CD → AD + CB.

Example: AgNO3(aq) + NaCl(aq) → AgCl(s) + NaNO3(aq) (formation of silver chloride and sodium nitrate).

• Redox (Oxidation-Reduction) Reactions:

Electrons are transferred between reactants. One substance loses electrons (oxidation), and another gains electrons (reduction).

Examples:

2Mg(s) + O2(g) → 2MgO(s) (oxidation of magnesium, reduction of oxygen).

Cu(s) + 2AgNO3(aq) → Cu(NO3)2(aq) + 2Ag(s) (oxidation of copper, reduction of silver ions).

• Combustion Reactions:

A substance reacts rapidly with oxygen, usually producing heat and light.

Often involves hydrocarbons (compounds of hydrogen and carbon).

Examples:

CH4(g) + 2O2(g) → CO2(g) + 2H2O(g) (combustion of methane).

C6H12O6(aq) + 6O2(g) → 6CO2(g) + 6H2O(l) (combustion of glucose).

• Acid-Base (Neutralization) Reactions:

An acid reacts with a base to produce salt and water.

General form: Acid + Base → Salt + Water.

Example: HCl(aq) + NaOH(aq) → NaCl(aq) + H2O(l) (neutralization of hydrochloric acid and sodium hydroxide).

• Precipitation Reactions:

Two soluble compounds in aqueous solution react to form an insoluble product (precipitate).

General form: AB(aq) + CD(aq) → AD(s) + CB(aq).

Example: Pb(NO3)2(aq) + 2KI(aq) → PbI2(s) + 2KNO3(aq) (formation of lead iodide precipitate).

Q47. Answer: (b) F

The correct answer is option 2) F

Because of this electron configuration, the outermost electrons in fluorine are found in the second shell, and there are 7 electrons in that shell. These electrons are strongly attracted to the nucleus because of the 9 protons in the nucleus, resulting in a highly effective nuclear charge.

Key Points

• Approximately 19.00 atomic mass units (AMU)

• Non-metal

• Electron Configuration: $1s^2\ 2s^2\ 2p^5$

• Group: Halogen (Group 17)

• Period: Period 2

• State at Room Temperature: Gaseous

• Appearance: Pale yellow gas

• Melting Point: -219.62 degrees Celsius (-363.32 degrees Fahrenheit)

• Boiling Point: -188.12 degrees Celsius (-306.62 degrees Fahrenheit)

• Density: Approximately 1.696 g/L at 0 degrees Celsius and 1 atmosphere pressure

• Odor: Highly reactive and pungent odor; it can be toxic even in small amounts

• Reactivity: Extremely reactive and can react violently with many substances, often used as a strong oxidizing agent.

• Occurrence: Found naturally in the Earth's crust, often in the form of fluorite (calcium fluoride) and fluorspar (fluorite mineral).

• Isotopes: Fluorine has one stable isotope, fluorine-19 (F-19), and several radioactive isotopes.

Additional Information

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Atomic Size (Atomic Radius)	**• Across a period (from left to right), atomic size generally decreases. This is because, within the same energy level, increased nuclear charge (more protons) attracts electrons more strongly, resulting in a smaller atomic radius. - Down a group (from top to bottom), atomic size generally increases. This is due to the addition of new energy levels (shells) as you go down the group, leading to larger atomic radii.**
Electronegativity	• Electronegativity, a measure of an atom's ability to attract electrons in a chemical bond, tends to increase across a period from left to right. Elements on the right side of the periodic table are more electronegative. - Electronegativity decreases as you go down a group because the outermost electrons are farther from the nucleus and are shielded by inner electron shells.
Ionization Energy	• Ionization energy, the energy required to remove an electron from an atom or ion, generally increases across a period from left to right. This is because electrons are held more tightly due to increasing nuclear charge. - Ionization energy decreases as you go down a group because outer electrons are farther from the nucleus and experience less attraction.
Metallic Character	• Metallic character refers to the tendency of an element to exhibit properties of metals. Metallic character generally decreases across a period from left to right. - Metallic character increases as you go down a group because outer electrons are farther from the nucleus and are less tightly held, making it easier for elements to lose electrons and exhibit metallic properties.
Chemical Reactivity	• Elements on the left side of the periodic table (alkali metals and alkaline earth metals) tend to be highly reactive due to their low ionization energies and a strong tendency to lose electrons to form positive ions (cations). - Elements on the right side of the periodic table (non-metals and noble gases) tend to be less reactive. Non-metals are more likely to gain electrons to form negative ions (anions), while noble gases are inert and largely unreactive.
Melting and Boiling Points	• The melting and boiling points of elements can vary widely. Generally, metals have lower melting and boiling points than non-metals. - Transition metals often have high melting and boiling points, and the noble gases have extremely low boiling points.
Density	• Density varies among elements, with metals generally being denser than non-metals. - Transition metals can have high densities, while gases (e.g., hydrogen and helium) have very low densities.
Color and Physical States	• Elements can exist in different physical states (solid, liquid, gas) and exhibit a range of colors. For example, most non-metals are gases or solids at room temperature, while many metals are solids. - Transition metals often display colorful compounds, and noble gases are colorless in their elemental forms.

Q48. Answer: (c) 30

Shortcut Trick

Apply the identity $a^2 - b^2 = (a + b)(a - b)$.

Value = $34^2 - 16^2 = (34 + 16)(34 - 16)$

Value = $50 \times 18 = 900$

Square root = $\sqrt{900} = 30$

Therefore The correct answer is 30.

Alternate Method

Given: Expression = $(34^2 - 16^2)$

Formula Used: $\sqrt{(a^2 - b^2)}$

=> Square of 34 = 1156

=> Square of 16 = 256

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=> $34^2 - 16^2 = 1156 - 256$

=> $34^2 - 16^2 = 900$

=> Positive square root = $\sqrt{900}$

=> Result = 30

Therefore The correct answer is 30.

Additional Information

Difference of Squares Identity

The identity $a^2 - b^2 = (a - b)(a + b)$ is highly effective for simplifying calculations involving squares of large numbers.

Square Root Properties

For any positive number x, if $x = y^2$, then $\sqrt{x} = y$. For example, since $30 \times 30 = 900$, the square root of 900 is 30.

BODMAS Rule

In simplification, Orders (powers and square roots) are solved after Brackets but before Division and Multiplication.

Q49. Answer: (d) Renu is sitting diagonally opposite to Mohan.

Given:

Four friends Aman, Renu, Mohan and Rakesh are sitting at the corners of a square table and all are facing the centre.

1) Aman is sitting immediately to the left of Mohan,

2) Rakesh is sitting to the immediate right of Mohan.

3) Only two persons are sitting between Aman and Renu.

Hence, the correct answer is "Renu is sitting diagonally opposite to Mohan".

Q50. Answer: (d) #

Given series →

(Left) D 2 R X 5 8 T ^ & 9 3 H 8 C % K T A # 3 T 5 4 $ % 9 & R % 5 (Right)

After all the letters are dropped from the series the series is as follows:

(Left) 2 5 8 ^ & 9 3 8 % # 3 5 4 $ % 9 & % 5 (Right)

The element which is the middle of the series formed is as shown below:

(Left) 2 5 8 ^ & 9 3 8 % # 3 5 4 $ % 9 & % 5 (Right)

Hence, the correct answer is "#".

Q51. Answer: (a) trapezium

Shortcut Trick

Sum of ratio terms = 3 + 7 + 6 + 4 = 20 units.

Since the sum of angles in a quadrilateral is 360°, 20 units = 360° → 1 unit = 18°.

The angles are: angle A = 54°, angle B = 126°, angle C = 108°, angle D = 72°.

Since angle A + angle B = 54° + 126° = 180° and angle C + angle D = 108° + 72° = 180°, the consecutive interior angles sum to 180°, meaning AD is parallel to BC.

A quadrilateral with exactly one pair of parallel sides is a trapezium.

Therefore The correct answer is trapezium.

Alternate Method

Given:

The ratio of angles of a quadrilateral ABCD taken in order is angle A : angle B : angle C : angle D = 3 : 7 : 6 : 4.

Formula Used:

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

Calculations:

Let the angles be 3x, 7x, 6x, and 4x.

=> 3x + 7x + 6x + 4x = 360°

=> 20x = 360°

=> x = 18°

Now, we calculate each angle:

=> angle A = 3 × 18° = 54°

=> angle B = 7 × 18° = 126°

=> angle C = 6 × 18° = 108°

=> angle D = 4 × 18° = 72°

Let us analyze the relationship between the adjacent angles:

=> angle A + angle B = 54° + 126° = 180°

=> angle C + angle D = 108° + 72° = 180°

Since the sum of consecutive interior angles angle A + angle B = 180° and angle C + angle D = 180°, the line segments AD and BC are parallel (AD || BC).

However, let us check the other pair of sides:

=> angle A + angle D = 54° + 72° = 126° ≠ 180°

Since angle A + angle D ≠ 180°, the line segments AB and CD are not parallel.

Since the quadrilateral ABCD has exactly one pair of parallel sides, it is a trapezium.

Why other options are incorrect:

1. Parallelogram: Opposite angles must be equal (angle A = angle C and angle B = angle D). Here, 54° ≠ 108°, so it is not a parallelogram.

2. Rhombus: A rhombus is a type of parallelogram with all sides equal. Since it is not even a parallelogram, it cannot be a rhombus.

3. Kite: A kite has two pairs of equal adjacent sides and one pair of equal opposite angles, which is not satisfied here.

Therefore The correct answer is trapezium.

Additional Information

Trapezium Properties

A quadrilateral with exactly one pair of parallel sides. The angles on the same side of a non-parallel leg are supplementary (sum to 180°).

Parallelogram Properties

A quadrilateral with both pairs of opposite sides parallel. Opposite angles are equal, and consecutive angles are supplementary.

Angle Sum Property of Polygons

The sum of interior angles of any n-sided polygon is given by (n − 2) × 180°. For a quadrilateral (n = 4), the sum is always 360°.

Q52. Answer: (a) Both the statements are true.

The correct answer is option 1) Both the statements are true.

• The reactivity series of metals is a list of metals arranged in order of their reactivity, from the most reactive to the least reactive.

This is a simplified reactivity series:-

Potassium (K)>Sodium (Na)>Calcium (Ca)>Magnesium (Mg)>Aluminum (Al)>Carbon (C)>Zinc (Zn)>Iron (Fe)>Tin (Sn)>Lead (Pb)>Hydrogen (H)>Copper (Cu)>Silver (Ag)>Gold (Au)>Platinum (Pt)

Key Points

• The reactivity series is a list of metals arranged in order of their reactivity, with the most reactive metals at the top.

• Metals high up in the reactivity series, such as alkali metals and alkaline earth metals, are indeed very reactive. They readily react with water, oxygen, and other substances.

• Metals high up in the reactivity series are often found in nature as compounds, typically oxides or sulfides. These compounds can be reduced to obtain the pure metal using electrolysis, a process that involves passing an electric current through a molten compound or an aqueous solution of the compound. This process separates the metal from the compound by the reduction of metal ions at the cathode. This method is commonly used to obtain highly reactive metals like sodium, potassium, aluminium, and calcium from their compounds.

Additional Information

• Highly Reactive Metals:	**Alkali Metals: This group includes lithium (Li), sodium (Na), potassium (K), rubidium (Rb), cesium (Cs), and francium (Fr). These metals are extremely reactive and can react vigorously with water, oxygen, and other substances. They readily lose electrons to form cations.**
• Reactive Metals:	Alkaline Earth Metals: This group includes beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and radium (Ra). While not as reactive as alkali metals, alkaline earth metals are still quite reactive. They react with water and oxygen, though not as vigorously as alkali metals.

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• Moderately Reactive Metals:	Transition Metals: Most transition metals are moderately reactive. Their reactivity can vary depending on the specific metal and conditions. Some transition metals, like iron (Fe) and zinc (Zn), readily react with acids, while others, like copper (Cu) and silver (Ag), are less reactive.
• Less Reactive Metals:	Post-Transition Metals: Elements in the post-transition metal category, such as aluminum (Al), tin (Sn), and lead (Pb), are generally less reactive than alkali, alkaline earth, or transition metals. They are more resistant to corrosion and do not react as readily with acids.
• Noble Metals:	Noble metals, including gold (Au), silver (Ag), and platinum (Pt), are among the least reactive metals. They are highly resistant to corrosion and do not readily react with most common chemicals or environmental conditions.
• Metalloids:	Some metalloids, such as boron (B), silicon (Si), and germanium (Ge), exhibit variable reactivity and properties depending on the specific conditions. They may behave as metals or non-metals in different chemical contexts.
• Rare Earth Metals:	The rare earth metals, found in the lanthanide and actinide series, are typically less reactive than the main group metals. Their reactivity can vary within the group.
• Transuranium Elements:	Elements beyond uranium (atomic number 92) in the periodic table are highly unstable and radioactive. They are produced in laboratories and have very short half-lives, making them extremely reactive but not found in nature.

Q53. Answer: (a) Lakshya Sen

The correct answer is Lakshya Sen.

Key Points

• Lakshya Sen won the Men's Singles title of the India open 2022 tournament.

• He defeated the world champion, Loh Kean Yew of Singapore in straight games.

• The men’s doubles pair of Satwiksairaj Rankireddy and Chirag Shetty defeated the top-seeded pair of Mohammad Ahsan and Hendra Setiawan of Indonesia.

• The women's title was won by Busanan Ongbamrungphan of Thailand.

• She defeated PV Sindhu in the finals.

Q54. Answer: (a) Indian Institute of Technology (IIT) Delhi

The correct answer is Indian Institute of Technology (IIT) Delhi.

Key Points

• In February 2022, a joint team of scientists from the Defence Research and Development Organisation (DRDO) and the Indian Institute of Technology (IIT) Delhi, for the first time in the country successfully demonstrated the Quantum Key Distribution link between Prayagraj and Vindhyachal in Uttar Pradesh, a distance of more than 100 kilometres.

• Quantum Key Distribution also called Quantum Cryptography, is a mechanism to develop secure communication.

• It provides a way of distributing and sharing secret keys that are necessary for cryptographic protocols.

• Cryptography is the study of secure communications techniques that allow only the sender and intended recipient of a message to view its contents.

• Cryptographic algorithms and protocols are necessary to keep a system secure, particularly when communicating through an untrusted network such as the Internet.

• The conventional cryptosystems used for data-encryption rely on the complexity of mathematical algorithms, whereas the security offered by quantum communication is based on the laws of Physics.

Q55. Answer: (d) 33%

Calculation:

Total number of girls 45 + 65 + 92 + 48 + 90 + 76 + 45 = 461

Total number of Boys 56 + 45 + 76 + 34 + 57 + 54 + 25 = 347

Acc to question:

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=> % = (461 - 347)/347× 100

=> % = 32.85 or 33%

Therefore Option 4 is the correct answer.

Q56. Answer: (d) BVLOR

The positions of the letters according to the English alphabet series:

The pattern for this code is as follows;

PUTRE →

And;

DGHKL →

Similarly;

ZSHJL →

Hence, the correct answer is "BVLOR".

Q57. Answer: (d) No role of bacteria, caused by a virus

The correct answer is option 4) No role of bacteria.Caused by a virus.

Bacteria in the mouth, particularly Streptococcus mutans, feed on sugars and starches from the food you consume. These bacteria produce acids as a byproduct when they metabolize sugars, leading to the demineralization of tooth enamel

Key Points

• Deminaralization: The initial stage of tooth decay involves the demineralization of tooth enamel. Acids produced by bacteria and derived from sugars or starches soften and weaken the enamel.

• Enamel Erosion: formation of a white spot lesion. This is an early sign of tooth decay and is often reversible through proper oral care.

• Dentin Decay: the decay advances through the enamel and reaches the dentin, which is the layer beneath the enamel. Dentin decay progresses faster due to its composition.

• Pulp Involvement: If the decay continues to progress, it can reach the innermost layer of the tooth, the pulp, which contains nerves and blood vessels. This stage is painful and typically requires root canal treatment or extraction.

• Abscess Formation: In severe cases, an abscess (a pocket of pus) can form at the root of the tooth, causing intense pain and infection. Treatment often involves root canal therapy or tooth extraction.

• Tooth Loss: In the absence of proper treatment, extensive tooth decay can lead to tooth loss.

Additional InformationThe two main treatments for tooth decay are filling and removal:

Dental Fillings	Tooth Removal (Extraction)
• Composite Fillings: These are made of a tooth-colored resin material and are commonly used for filling cavities in visible areas of the mouth. They provide a natural appearance. - Amalgam Fillings: These are silver-colored fillings made of a mixture of metals, including silver, tin, and mercury. They are durable and have been used for many years, especially for filling cavities in the back teeth. - Glass Ionomer Fillings: These are tooth-colored fillings that release fluoride over time. They are often used for small to medium-sized cavities and may be appropriate for children. - Gold Fillings: Gold fillings are made of cast gold and are very durable. They are used for large cavities and in areas where the forces of chewing and grinding are significant.	• Simple Extraction: This is the removal of a tooth that is visible in the mouth and can be performed with local anesthesia. It is often done for teeth that are severely decayed, damaged, or cannot be saved through other treatments. - Surgical Extraction: This is a more complex procedure used for teeth that are impacted (e.g., wisdom teeth), broken at the gumline, or require more extensive surgical techniques. Sedation or general anesthesia may be used. - Orthodontic Extraction: Sometimes, teeth may need to be removed to create space for orthodontic treatment, such as braces or Invisalign.

The choice between filling and removal depends on factors like the extent of decay, the location of the affected tooth, the patient's overall dental health, and their preferences.

Q58. Answer: (d) Muhammad Yunus - Grameen Bank

The correct answer is Muhammad Yunus - Grameen Bank.

Key Points

• Muhammad Yunus, an economist from Bangladesh, founded the Grameen Bank, an institution focused on providing the poor with access to credit without the need of collateral - popularly known as 'Microcredit'.

• The initiative started in Bangladesh and has since been replicated in several countries worldwide.

• For this innovative approach to alleviating poverty, Muhammad Yunus along with Grameen Bank were awarded the Nobel Peace Prize in 2006.

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Q59. Answer: (b) Damodar

The correct answer is Damodar.

Key PointsDamodar

1. Origin and Path: The Damodar River originates from the Chota Nagpur Plateau in the Indian state of Jharkhand. It flows eastwards through the plateau and the coal-rich region known as the "Ruhr of India" before eventually joining the Hooghly River in West Bengal.

2. Economic Significance: The Damodar River is significant for the region because it supplies water for a number of heavy industries in the area, including steel plants and power plants. The Damodar Valley Corporation, a government organization for flood control and generating hydroelectricity, oversees several dams constructed on this river.

3. Environmental Concerns: Once known as the "Sorrow of Bengal" due to its frequent devastating floods, a series of dams and barrages have been built to control the river flow. However, these projects have been criticized for their impact on local ecosystems and displacement of people originally living in the areas developed for industrial use.

Q60. Answer: (d) South - west

According to the information given,

1) Pole A is to the west of pole B and north of pole D.

2) Pole E is to the east of pole D

3) pole C is to the west of pole D.

Now, Combining all the given information we can draw the following figure.

In the figure, we can clearly see that the position of pole D with respect to pole B is south - west.

Hence, the correct answer is "South - west".

Q61. Answer: (b) 24

Shortcut Trick

Check for the standard Pythagorean triplet where the difference between sides is 2.

The standard triplet (6, 8, 10) fits the pattern: $(x - 4) = 6$, $(x - 2) = 8$, and $x = 10$.

Area = (1/2) × base × height = (1/2) × 6 × 8 = 24 cm^2.

Therefore The correct answer is 24 cm^2.

Alternate Method

Given: Sides of the right triangle are $(x - 2)$, $(x - 4)$, and x.

Formula Used: Pythagoras Theorem: $a^2 + b^2 = c^2$, where c is the hypotenuse (longest side).

=> $(x - 2)^2 + (x - 4)^2 = x^2$

=> $(x^2 - 4x + 4) + (x^2 - 8x + 16) = x^2$

=> $2x^2 - 12x + 20 = x^2$

=> $x^2 - 12x + 20 = 0$

=> $(x - 10)(x - 2) = 0$

=> $x = 10$ or $x = 2$ ($x = 2$ is impossible as side $x - 4$ would be negative)

=> Sides are: $(10 - 4) = 6$ cm and $(10 - 2) = 8$ cm

=> Area = (1/2) × 6 × 8 = 24 cm^2

Therefore The correct answer is 24 cm^2.

Additional Information

Pythagorean Triplets

Common triplets include (3, 4, 5), (5, 12, 13), (8, 15, 17), and (7, 24, 25). Any multiple of these is also a triplet.

Right Triangle Area

The Area of a right triangle is always half the product of its two shorter sides (legs): Area = 0.5 × Base × Height.

Hypotenuse Property

The hypotenuse is the side opposite the 90° angle and is always the longest side in a right-angled triangle.

Q62. Answer: (c) AJ44M

Table shows the positional value of alphabets.

Logic:

1) The letter is increased by +5

2) The number is increased by +3

Hence, the correct answer is "AJ44M".

Q63. Answer: (b) 1993

The correct answer is 1993.

Key Points

• Prime Minister Rozgar Yojana (PMRY) was launched in 1993.

• It was launched to provide self-employment to India's educated youth and women.

• This scheme offers subsidised financial assistance to set up self-employment ventures in the manufacturing, trading and service sectors.

• The Central Government sponsors PMRY.

Thus, we can say that Prime Minister Rozgar Yojana (PMRY) was started in the year 1993.

Q64. Answer: (c) 16

The following seating arrangement is as follows:

1) D sits fourth to the right of A.

2) B sits third to the right of D and two persons between B and E.

3) C sits fifth to the left of A.

So the final arrangement is as follows

Hence, the correct answer is "16".

Q65. Answer: (a) Statement II is correct, and Statement I is incorrect.

The correct answer is option 1) Statement II is correct, and Statement I is incorrect.

Statement I is incorrect.

Most carbon compounds are not good conductors of electricity. In fact, they are typically poor conductors and are often referred to as insulators. (CH4), ethane (C2H6), and benzene (C6H6), are generally non-conductive because they lack free electrons to carry an electric current. This is because carbon compounds, especially organic molecules, do not have free electrons that can move and conduct electricity.

Statement II is correct,

The molecules of carbon compounds are not strongly attracted to each other. In particular, organic compounds are usually held together with relatively weak intermolecular forces, such as Van der Waals forces. This makes them easy to separate and explains why they exist as gases, liquids, or solids with low melting and boiling points.

Key Points

• Carbon compounds, are also known as organic compounds.

• Carbon compounds are characterized by a carbon backbone with covalent bonds to hydrogen atoms.

• Carbon-hydrogen (C-H) bonding is a fundamental feature of organic compounds.

• Carbon atoms have four valence electrons and can form up to four covalent bonds with other atoms.

• A vast and diverse group of chemical compounds that contain carbon atoms bonded to other elements, typically hydrogen, oxygen, nitrogen, sulfur, and more.

Additional Information The force of attraction between molecules is primarily governed by intermolecular forces. Intermolecular forces play a crucial role in determining the physical properties of substances, such as their melting points, boiling points, and phase transitions.

There are several types of intermolecular forces:

London Dispersion Forces (Van der Waals Forces):	**These are the weakest intermolecular forces and occur in all molecules, whether they are polar or nonpolar.**
Dipole-Dipole Forces	involve the attraction between the positive end of one polar molecule (the "dipole") and the negative end of another polar molecule. These forces are stronger than London dispersion forces.
Hydrogen Bonding	Hydrogen bonding is a specific and strong type of dipole-dipole interaction that occurs when a hydrogen atom is bonded to a highly electronegative atom (usually nitrogen, oxygen, or fluorine) and is attracted to another electronegative atom in a different molecule.

London dispersion forces < dipole-dipole forces < hydrogen bonding

Intermolecular forces < intramolecular forces (hold atoms within a molecule together).

Q66. Answer: (c) Iris of the eye, bronchi of lungs, ureters

The correct answer is option 3) Iris of the eye, bronchi of lungs, ureters

Smooth muscles are involved in various physiological processes

• eye:- controlling the diameter of blood vessels.

• lungs:-regulating airflow in the bronchi of the lungs.

• ureters :-controlling the movement of substances like urine through the ureters.

Key Points

• Smooth muscles are responsible for involuntary contractions in various organs throughout the body.

• smooth muscles contract automatically and rhythmically.

• The smooth muscles of the digestive tract, including the esophagus, stomach, and intestines, contract to move food through the digestive system.

• Smooth muscles in the bronchi and bronchioles regulate airflow during breathing.

• The smooth muscles of the ureters move urine from the kidneys to the bladder, and the smooth muscle of the bladder contracts to expel urine during urination.

• Smooth muscles are involved in peristaltic contractions of the fallopian tubes and the uterus during childbirth.

• Smooth muscles in the walls of blood vessels help control blood pressure and blood flow by constricting or dilating the vessels. This regulation ensures that various tissues receive an adequate blood supply.

• Controlling Pupillary Size: The iris of the eye contains smooth muscles that control the size of the pupil in response to changes in light intensity. In bright light, the pupil constricts (gets smaller), and in dim light, it dilates (gets larger).

Additional Information

• Visceral Smooth Muscles:

These are the most common type of smooth muscles. They are found in the walls of internal organs like the digestive tract, urinary tract, and blood vessels. Visceral smooth muscles often contract rhythmically and involuntarily. They are also called unitary smooth muscles because they often function as a single unit.

• Multi-Unit Smooth Muscles:

These smooth muscles are found in structures like the iris of the eye, the ciliary muscle of the eye, and the arrector pili muscles in the skin. They are capable of finer and more precise control and are not as coordinated as visceral smooth muscles.

Q67. Answer: (d) 80°

Shortcut Trick

In Δ BDC, since BD perpendicular to AC, angle C = 90° − angle DBC = 90° − 44° = 46°.

In Δ AEC, angle AEB is the exterior angle at vertex E.

By the Exterior Angle Property, angle AEB = angle CAE + angle C.

angle AEB = 34° + 46° = 80°.

Therefore The correct answer is 80 °.

Alternate Method

Given: In Δ ABC, BD perpendicular to AC at D, angle DBC = 44°, and angle CAE = 34°.

Formula Used: Angle Sum Property of a triangle and Exterior Angle Theorem.

=> In Δ BDC, angle BDC = 90° (since BD perpendicular to AC).

=> Using Angle Sum Property in Δ BDC:

=> angle DBC + angle BDC + angle C = 180°

=> 44° + 90° + angle C = 180°

=> angle C = 180° − 134° = 46°

=> Now, consider Δ AEC. The point B lies on the extension of side CE.

=> Therefore, angle AEB is the exterior angle of Δ AEC at vertex E.

=> According to the Exterior Angle Theorem, angle AEB = angle CAE + angle C.

=> angle AEB = 34° + 46° = 80°.

Therefore The correct answer is 80 °.

Additional Information

Exterior Angle Theorem

The measure of an exterior angle of a triangle is equal to the sum of the measures of its two remote interior angles.

Angle Sum Property

The sum of all interior angles of any triangle is always 180°.

Right Triangle Property

In a right-angled triangle, the two acute angles are complementary, meaning their sum is exactly 90°.

Q68. Answer: (b) 59

Shortcut Trick

Total Frequency N = 50 => 7 + 11 + x + 9 + y = 50 => x + y = 23.

Using Assumed Mean (A) = 50: Deviation Sum = 50 × (Mean − A) = 50 × 4 = 200.

Calculation: 7(−40) + 11(−20) + x(0) + 9(20) + y(40) = 200 => −280 − 220 + 180 + 40y = 200.

−320 + 40y = 200 => 40y = 520 => y = 13 and x = 23 − 13 = 10.

Value of 2x + 3y = 2(10) + 3(13) = 20 + 39 = 59.

Therefore The correct answer is 59.

Alternate Method

Given: Mean = 54, Total Frequency (N) = 50.

Formula Used: Mean (χ) = (∑f_ix_i) ÷ ∑f_i, where x_i is the Class Mark.

Step 1: Find the relationship between x and y from total frequency.

=> 7 + 11 + x + 9 + y = 50

=> 27 + x + y = 50

=> x + y = 23 — (Equation 1)

Step 2: Calculate ∑f_ix_i using class marks (10, 30, 50, 70, 90).

=> ∑f_ix_i = (7 × 10) + (11 × 30) + (x × 50) + (9 × 70) + (y × 90)

=> ∑f_ix_i = 70 + 330 + 50x + 630 + 90y = 1030 + 50x + 90y

Step 3: Substitute in the Mean formula.

=> 54 = (1030 + 50x + 90y) ÷ 50

=> 2700 = 1030 + 50x + 90y

=> 50x + 90y = 1670

=> 5x + 9y = 167 — (Equation 2)

Step 4: Solve Equation 1 and Equation 2.

=> Multiplying Eq 1 by 5: 5x + 5y = 115

=> Subtracting from Eq 2: (5x + 9y) − (5x + 5y) = 167 − 115

=> 4y = 52 => y = 13

=> x = 23 − 13 = 10

Step 5: Calculate the final expression.

=> 2x + 3y = 2(10) + 3(13) = 20 + 39 = 59

Therefore The correct answer is 59.

Additional Information

Arithmetic Mean for Grouped Data

The mean is calculated as ∑f_ix_i / N, where f_i is the frequency and x_i is the mid-point of the class interval.

Class Mark Calculation

Class Mark (x_i) = (Upper Class Limit + Lower Class Limit) ÷ 2. It represents the central value of the interval.

Assumed Mean Method

Used to simplify calculations: Mean = A + (∑f_id_i / N), where d_i = x_i − A and A is the assumed mean.

Q69. Answer: (d) x2 - 8x - 4 = 0

Shortcut Trick

If one root of a quadratic equation is 4 − 2√5, its conjugate 4 + 2√5 is the other root.

Sum of roots = 4 + 4 = 8.

Product of roots = $4^2 - (2\sqrt{5})^2 = 16 - 20 = -4$.

The equation is x^2 − (Sum)x + (Product) = 0 → $x^2 - 8x - 4 = 0$.

Therefore The correct answer is $x^2 - 8x - 4 = 0$.

Alternate Method

Given: One root (α) = 4 − 2√5.

Formula Used: For a quadratic equation with rational coefficients, if one root is irrational (a − √b), the other root (β) must be its

conjugate (a + √b). The equation is given by: $x^2 - (\alpha + \beta)x + \alpha\beta = 0$.

=> Let $\alpha = 4 - 2\sqrt{5}$

=> Then $\beta = 4 + 2\sqrt{5}$

=> Sum of roots $(\alpha + \beta) = (4 - 2\sqrt{5}) + (4 + 2\sqrt{5}) = 8$

=> Product of roots $(\alpha\beta) = (4 - 2\sqrt{5}) \times (4 + 2\sqrt{5})$

=> Using $(a - b)(a + b) = a^2 - b^2$: $\alpha\beta = 4^2 - (2\sqrt{5})^2$

=> $\alpha\beta = 16 - 20 = -4$

=> Quadratic Equation: $x^2 - 8x + (-4) = 0$

=> $x^2 - 8x - 4 = 0$

Therefore The correct answer is $x^2 - 8x - 4 = 0$.

Additional Information

Conjugate Root Theorem

If a quadratic equation has rational coefficients, its irrational roots always occur in pairs of the form $a \pm \sqrt{b}$.

Sum and Product of Roots

For $ax^2 + bx + c = 0$, sum = $-b/a$ and product = c/a. The equation is $x^2 - (\text{sum})x + (\text{product}) = 0$ when $a = 1$.

Nature of Roots

The Discriminant $D = b^2 - 4ac$ determines the nature: if $D > 0$ and not a perfect square, roots are irrational and distinct.

Q70. Answer: (a) 5 Ω

The correct answer is Option 1, 5 Ω.

Given-

• Resistance of a combination - R

• There are 3 resistors, i.e.-R1 = 10 Ω, R2= 15 Ω, R3= 30 Ω

• And these are connected in Parallel.

• Formula used-

• 1\R = 1\R1 + 1\R2 +1\R3

• Solution-

• 1\R = 1/10 + 1/15+1/30

• = (6+4+2)/60

• = 1/5

• R=5 Ω

Important Points

Resistance of Parallel combination	Resistance of Series combination
1. Same potential difference at the ends.	The same amount of current flow throughout the combination.
2. Resistors arranged parallelly.	Resistors are arranged in series\ line.
3. If one component breaks down, other parts will function properly.	If one component breaks down, the whole circuit will not function.

Additional Information-

Q71. Answer: (a) 1133/198

Shortcut Trick

Convert bar decimals to fractions: 0.abc… = (Full number − Non-repeating part) ÷ (9 for each repeating digit, 0 for each non-repeating digit after decimal).

0.79494… = (794 − 7) ÷ 990 = 787/990

0.87676… = (876 − 8) ÷ 990 = 868/990

Sum = (787 + 868) ÷ 990 = 1655/990 = 331/198 = 1(133/198)

Therefore The correct answer is 1(133/198).

Alternate Method

Given: Expressions 0.79494... and 0.87676...

Formula Used: Decimal to Fraction conversion for mixed recurring decimals.

=> Let x = 0.79494... and y = 0.87676...

=> x = (794 − 7)/990 = 787/990
=> y = (876 − 8)/990 = 868/990
=> x + y = 787/990 + 868/990
=> x + y = (787 + 868)/990 = 1655/990
=> Simplify by dividing by 5: 1655 ÷ 5 = 331, 990 ÷ 5 = 198
=> 331/198 = 1 + 133/198 = 1(133/198)
Therefore The correct answer is 1(133/198).
Additional Information
Pure Recurring Decimals
Decimals where all digits after the decimal point repeat. Example: 0.aaa... = a/9.
Mixed Recurring Decimals
Decimals where some digits do not repeat and some do. Form: (Total number − Non-repeating part) / 9...0...
Rational Number Form
Any recurring decimal can be expressed in p/q form where p, q are integers and q ≠ 0.

Q72. Answer: (a) 14

Shortcut Trick
Subtract the remainders from the given numbers: (158 − 4) = 154 and (215 − 5) = 210.
The greatest number is the HCF of 154 and 210.
Difference between 210 and 154 = 56.
Factors of 56 are 1, 2, 4, 7, 8, 14, 28, 56. Highest factor dividing both 154 and 210 is 14.
Therefore The correct answer is 14.
Alternate Method
Given: Numbers are 158 and 215; Remainders are 4 and 5.
Formula Used: Required Number = HCF of (N1 − R1) and (N2 − R2).
=> First number = 158 − 4 = 154
=> Second number = 215 − 5 = 210
=> Prime factorization of 154 = 2 × 7 × 11
=> Prime factorization of 210 = 2 × 3 × 5 × 7
=> Common factors = 2 × 7 = 14
=> HCF (154, 210) = 14
Therefore The correct answer is 14.
Additional Information
HCF with Remainders
To find the largest number that divides a, b, c leaving remainders x, y, z, find HCF of (a−x), (b−y), and (c−z).
LCM with Remainders
To find the least number which when divided by a, b, c leaves remainder r in each case, use LCM(a, b, c) + r.
Property of HCF and LCM
For two numbers A and B, Product of numbers = HCF × LCM => A × B = HCF(A,B) × LCM(A,B).

Q73. Answer: (c) 78

Position of P from the Left = 32
Position of P from the Right = 47
Total number of students in the row = (Position of P from the left + Position of P from the right) - 1
Total number of students = (32 + 47) - 1 = 79 - 1 = 78.
Hence, the correct answer is "78".

Q74. Answer: (a) Ag

The correct answer is Option -1 Ag.
Key Points
• As Silver is below the Copper. Copper is below Lead, Iron, and Zinc in the Electrochemical Series,
• Ag(Silver) is less reactive than Cu(Copper); and Cu is less reactive than Pb(lead), Fe(Iron), and Zn(zinc).
• Electrochemical Series-

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• The Electrochemical Series is a sequence of half cells grouped in ascending electrode potential order.
• On the left are oxidants, and on the right are their conjugate reductants.
• The Voltage is produced when a half-cell is linked to the Hydrogen half-cell.
• Standard conditions - 1.00M solution, 1 atm pressure, and 25^0C temperature.

Shortcut Trick

• To remember the order of the order of elements in the electrochemical series, you can use the mnemonic -
• "Please Stop Calling Me A Zebra, I Like Horses, Cobra - Snakes and Gorillas.
• P - Potassium, S- Sodium
• C - Calcium, M- Magnesium
• A - Aluminium, Z - Zinc,
• I - Iron, L - -Lead
• H - Hydrogen,
• C - Copper, S - Silver, Gorilla.

Additional Information

Q75. Answer: (a) 11

Shortcut Trick

Shift one vertex to the origin (0, 0) by subtracting (3, 4) from all points.

(3, 4) − (3, 4) → (0, 0)

(5, 7) − (3, 4) → (2, 3)

(−3, 6) − (3, 4) → (−6, 2)

Area = 1/2 |(2 × 2) − (3 × −6)| = 1/2 |4 + 18| = 11

Therefore The correct answer is 11 square units.

Alternate Method

Given: Vertices of the triangle are A(3, 4), B(5, 7), and C(−3, 6).

Formula Used: Area of triangle = 1/2 |x1(y2 − y3) + x2(y3 − y1) + x3(y1 − y2)|

Calculations:

=> Area = 1/2 |3(7 − 6) + 5(6 − 4) + (−3)(4 − 7)|

=> Area = 1/2 |3(1) + 5(2) + (−3)(−3)|

=> Area = 1/2 |3 + 10 + 9|

=> Area = 1/2 |22|

=> Area = 11

Therefore The correct answer is 11 square units.

Additional Information

Area of a Triangle

The area of a triangle with vertices (x1, y1), (x2, y2), and (x3, y3) is given by 1/2 |x1

Q76. Answer: (c) 2

Given series is as follows:

(Left) 8 @ ! 3 ^ 3 ρ & 6 @ 4 @ & 8 ¥ 2 4 % 1 £ % 7 (Right)

Symbols each of which is immediately followed by an odd number and immediately preceded by a symbol: ! and %

So there are two symbols only.

1) @ ! 3

2) £ % 7

Hence, the correct answer is "Option 3".

Q77. Answer: (b) 1 : 2 : 1

The correct answer is Option 2.

Key Points

• In Mendel's experiment, The F1 generation results from the cross-pollination of two-parent (P) plants and contains all purple flowers. The F2 generation results from the Self-pollination of F1 plants and contains 75% purple flowers and 25% white flowers. (PHENOTYPE).
• The GENOTYPE was 25% pure purple flower, 50% hybrid purple flower, and 25% pure white flower.

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• Through this experiment, Mendel has concluded the Law of Segregation,

• "During the formation of gamete, each gene separates from each other so that each gamete carries only one allele for each gene."

Additional Information

• On the basis of his experiments, Mendel has given three laws of Inheritance -

• Law of Dominance, Law of Segregation, Law of Independent Assortment.

• Mendel has selected 7 pairs of opposite characteristics of the Pea plant.

• The law of dominance is known as the First law of Inheritance.

• In this law, each character is controlled by distinct units called factors (which are later known as Genes), which occur in pairs.

• If the pairs are heterozygous, one will always dominate the other.

• The Law of Independent Assortment states that Alleles for separate traits are passed independently of one another.

Q78. Answer: (b) Three

Given Series:

3 7 5 2 8 6 4 1 3 7 4 3 7 6 8 2 6 5 8 9 7 8 6 1 2 7 3

Odd digits which are immediately preceded by a perfect square and immediately followed by an odd digit :-

3 7 5 2 8 6 4 1 3 7 4 3 7 6 8 2 6 5 8 9 7 8 6 1 2 7 3

3 7 5 2 8 6 4 1 3 7 4 3 7 6 8 2 6 5 8 9 7 8 6 1 2 7 3

3 7 5 2 8 6 4 1 3 7 4 3 7 6 8 2 6 5 8 9 7 8 6 1 2 7 3

Hence, the correct answer is "Three".

Q79. Answer: (c) 56

The logic followed here is :-

(First term)²+ First term

In 5 : 30 → (5)²+ 5 = 30

In 6 : 42 → (6)² + 6 = 42

Similarly,

In 7 : 56 → (7)²+ 7 = 56

Hence, the correct answer is "56".

Q80. Answer: (b) Gurunaidu Sanapathi

The correct answer is ‘Gurunaidu Sanapathi’

Key Points

• At the IWF Youth World Championships in Leon, Mexico, Indian weightlifter Saanapathi Gurunaidu won gold in the men’s 55-kilogramme category event.

• On the first day of the IWF competition, two other additional Indian weightlifters, Vijay Prajapati and Akansha Kishor Vyavhare also won medals, they won the silver medals.

• With a total lift of 230 kilogrammes, Saanapathi won gold in the men’s 55-kilogramme event.

• He won Silver in Snatch with a lift of 104 kg, and Gold in Clean and Jerk with a lift of 126 kilogrammes.

• With a total lift of 175 kg, Vijay placed second in the Men’s 49-kilogramme event.

• In the Snatch category, Vijay lifted 78 kilogrammes, while in the Clean and Jerk category, he lifted 97 kg.

• In the Women’s 40-kilogramme division, Akanksha won the gold medal.

• She won the silver medal with a total of 127 kg after placing first in the Snatch section with a lift of 59 kilogrammes and third in the Clean and Jerk section with a lift of 68 kilogrammes.

Q81. Answer: (a) 90°

The correct answer is Option 1 i.e. 90^0.

Key Points

• Fleming's Left-hand rule states that if we arrange our thumb, forefinger, and middle finger of the left - hand perpendicular (90^0) to each other, then the thumb points towards the direction of the force experienced by the conductor, the forefinger points towards the direction of magnetic field and the middle finger points towards the direction of electric current.

Important Points

• When a current-carrying conductor is placed in an external magnetic field, the conductor experiences a force perpendicular to both the field and the current flow's direction.

• Application of Fleming's left-hand rule-

• Fleming's left-hand rule is used to find the direction of the force acting on the current-carrying conductor placed in a magnetic field.

• This rule is used for Electric motors.

Additional Information

• Fleming's right-hand rule states that if we arrange our thumb, forefinger, and middle finger of the right-hand perpendicular to each other, then the thumb points towards the direction of motion of the conductor relative to the magnetic field, the forefinger points towards the direction of magnetic field and the middle finger points towards the direction of the induced current.

• This rule is used for Electric Generators.

Difference between Fleming's Left - hand rule and Right - hand rule-

Q82. Answer: (c) 84/7 day

Shortcut Trick

Time taken together = (Product of days) ÷ (Sum of days)

Time = (15 × 20) ÷ (15 + 20)

Time = 300 ÷ 35 = 60/7 days

Time = 8(4/7) days

Therefore The correct answer is 8(4/7) days.

Alternate Method

Given: Time taken by A = 15 days, Time taken by B = 20 days.

Formula Used: Total Work = LCM of individual days; Efficiency = Total Work ÷ Time.

Person	Days	Total Work	Efficiency
A	15	60	4
B	20	3	

=> Combined Efficiency of A + B = 4 + 3 = 7 units/day

=> Total Work = 60 units

=> Time taken together = Total Work ÷ Combined Efficiency

=> Time = 60 ÷ 7 = 8(4/7) days

Therefore The correct answer is 8(4/7) days.

Additional Information

Work and Efficiency Relationship

Efficiency is inversely proportional to the time taken to complete the work. If A is twice as efficient as B, A will take half the time taken by B.

Pipes and Cisterns

This concept is identical to Time and Work, where an inlet pipe does positive work and an outlet pipe (leak) does negative work.

Work and Wages

Wages are distributed in the ratio of work done, which is the same as the ratio of efficiencies if all persons work for the same duration.

Q83. Answer: (b) 17, 18

Shortcut Trick

Factorize the given LCM (306) into two factors that sum to 35.

306 = 2 × 153 = 2 × 9 × 17 = 18 × 17

Check the sum: 18 + 17 = 35. Since the sum matches the given condition, the numbers are 17 and 18.

Therefore The correct answer is 17, 18.

Alternate Method

Given: Sum of numbers = 35, LCM of numbers = 306.

Formula Used: For two numbers x and y, if they are co-prime, then Product (x × y) = LCM.

=> Let the two numbers be x and y.

=> x + y = 35

=> Assuming the numbers are co-prime (HCF = 1), x × y = 306

=> From the sum, x = 35 − y

=> (35 − y) × y = 306

=> 35y − y^2 = 306

=> y^2 − 35y + 306 = 0

=> y^2 − 18y − 17y + 306 = 0

=> y(y − 18) − 17(y − 18) = 0

=> (y − 18)(y − 17) = 0

=> y = 18 or y = 17

Therefore The correct answer is 17, 18.

Additional Information

Product of Two Numbers

For any two numbers a and b, the relationship is a × b = HCF(a, b) × LCM(a, b).

Co-prime Numbers

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

Quadratic Property

If the sum (S) and product (P) of two numbers are known, the numbers are the roots of the equation t^2 − St + P = 0.

Q84. Answer: (a) The Yajurveda

The correct answer is Yajurveda.

Key Points

• Vedas:

• The Vedas are the earliest surviving literature of the Indian subcontinent.

• There are four Vedas: the Rig Veda, the Sama Veda, the Yajur Veda, and the Atharva Veda.

• Yajurveda:

• Stands to mean ‘Worship Knowledge’, Yajurveda dates back to 1100-800 BCE; corresponding with Samaveda.

• It compiles ritual-offering mantras/chants. These chants were offered by the priest alongside a person who used to perform a ritual (in most cases yajna fire.)

• It has two types – Krishna (Black/Dark) & Shukla (White/Bright)

• Krishna Yajurveda has an un-arranged, unclear, motley collection of verses

• Shukla Yajurveda has arranged and clear verses.

• Thus, we can say that theVeda which deals with the rituals is known asYajurveda.

Q85. Answer: (d) Presence of cell wall in onion peel cells

The correct answer is Option 4

Key Points

• The main difference observed between a slide of human cheek cells and a slide of onion peel when viewed under a compound microscope is the presence of a cell wall in onion peel cells as onion peel cells are plant cells and the cell wall is present only in plant cell not in the animal cell.

• When you view a "cheek cell" scrapping through a microscope on high power, you will see many cells that have been rolled up and each cell has an irregular shape.

• When you view onion peel under the microscope, they are generally rectangular in shape.

• The animal cells are devoid of Plastids and Cell walls, which are present in Plant cells.

• The presence of cell organelles like cell membranes, endoplasmic reticulum, and the nucleus, etc. is common in both plant cells and animal cells.

Additional Information

The difference between Plant cells and Animal cells -

Animal cell	plant cell
1. Temporary, smaller vacuoles are present.	A larger central vacuole is present.
2. Storage material is Glycogen.	The storage material is starch.
3. Plastids absent	present
4. Cell wall and plasmodesmata Absent	present

Important Points

• A cheek cell is a flat (squamous) cell from the inner lining of the mouth.
• The lining is a mucous membrane similar to those found throughout our digestive tract.

Q86. Answer: (d) 15

Approximate value of → 4.98 ≈ 5; 1.96 ≈ 2
Given equation becomes → 5 × 2 + 2 × 4 - 8 ÷ 2 + 1
By using BODMAS Rule, we get :-
5 × 2 + 2 × 4 - 8 ÷ 2 + 1
5 × 2 + 2 × 4 - 4 + 1
10 + 8 - 4 + 1
10 + 8 + 1 - 4
19 - 4 = 15
Hence, the correct answer is "15".

Q87. Answer: (c) 70 to 200 cm

The correct answer is 70 to 200 cm.
Key Points
• Tropical Deciduous Forests are the most widespread forests in India.
• They are also called the monsoon forests.
• They spread over regions which receive rainfall between 70-200 cm.
• On the basis of the availability of water, these forests are further divided into moist and dry deciduous.
• The Moist deciduous forests are more pronounced in the regions which record rainfall between 100-200 cm.
• These forests are found in the northeastern states along the foothills of Himalayas, eastern slopes of the Western Ghats and Odisha.
• Teak, sal, shisham, hurra, mahua, amla, semul, kusum, and sandalwood etc. are the main species of these forests.
• Dry deciduous forest covers vast areas of the country, where rainfall ranges between 70 -100 cm.
• Tendu, palas, amaltas, bel, khair, axlewood, etc. are the common trees of these forests.

Q88. Answer: (c) 3

Shortcut Trick
Interest for 1 year = 15% of Rs. 4,800 = Rs. 720
Total Interest given = Rs. 2,160
Value of n = Total Interest ÷ Yearly Interest
n = 2,160 ÷ 720 = 3 years
Therefore The correct answer is 3 years.
Alternate Method
Given:
Principal (P) = Rs. 4,800
Rate (R) = 15% per annum
Simple Interest (SI) = Rs. 2,160
Formula Used:
Simple Interest (SI) = (P × R × n) ÷ 100
Calculations:
=> 2,160 = (4,800 × 15 × n) ÷ 100
=> 2,160 = 48 × 15 × n
=> 2,160 = 720 × n
=> n = 2,160 ÷ 720
=> n = 3
Therefore The correct answer is 3 years.
Additional Information
Total Amount Formula
The total amount (A) at the end of the period is the sum of the Principal and the Interest: A = P + SI.
Effective Rate of Interest

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In Simple Interest, the interest remains constant every year because it is always calculated on the original Principal.

Difference between SI and CI

For the first year, Simple Interest and Compound Interest (compounded annually) are always equal on the same principal and rate.

Q89. Answer: (a) tan θ sec θ

Given:

$x = (\sec\theta - \cos\theta)(\cot\theta + \tan\theta)$

$y = \sec\theta(\sec\theta + \tan\theta)(1 - \sin\theta)$

Calculation:

$\Rightarrow xy$

$\Rightarrow (\sec\theta - \cos\theta)(\cot\theta + \tan\theta) \times \sec\theta(\sec\theta + \tan\theta)(1 - \sin\theta)$

$\Rightarrow (1 - \cos^2\theta)(\cos^2\theta + \sin^2\theta)/(\cos^2\theta \sin\theta) \times (1+ \sin\theta)(1 - \sin\theta)/(\cos^2\theta)$

$\Rightarrow (\sin^2\theta)/(\cos^2\theta \sin\theta) \times (1- \sin^2\theta)/(\cos^2\theta)$

$\Rightarrow \tan\theta \sec\theta \times 1$

$\Rightarrow \tan\theta \sec\theta$

Therefore Option 1 is the correct answer.

Q90. Answer: (b) first

The correct answer is first.

Key Points

• The Minimum Needs Programme (MNP) was introduced in the first year of the Fifth Five Year Plan (1974–78), to provide certain basic minimum needs and improve the living standards of people.

• Fifth five-year plan (1974-1979) focused on poverty alleviation, employment, and justice.

• Indian National Highways were introduced during this plan.

• It was prepared by D.P.Dhar.

• The target growth rate was 4.4%.

• The actual growth rate was 4.8%.

Additional Information

Five Year Plans	Period	Details
First Five Year Plan (Target Growth : 2.1 % Actual Growth 3.6 %)	1951-56	• It achieved the targeted growth rate of 3.6% and the main focus was on agriculture. - It was based on the Harrod-Domar model. - The Plan Focused on agriculture, price stability, power and transport.
Second Five Year Plan (Target Growth: 4.5% Actual Growth: 4.3%)	1956-61	• The Plan Focused on rapid industrialization- heavy & basic industries. Advocated huge imports through foreign loans. - It was based on the P.C. Mahalanobis Model.
Third Five Year Plan (Target Growth: 5.6% Actual Growth: 2.8%)	1961-66	• It was not successful and could not achieve the desired growth rate of 5.6%. - This plan is also called ‘Gadgil Yojana.
Fifth Five Year Plan (Target Growth: 4.4% Actual Growth: 4.8%)	1974-79	• The final Draft of the fifth plan was prepared and launched by D.P. Dhar - The main objectives were poverty elimination and the attainment of self-reliance.

Q91. Answer: (d) 77

The given equation is,

$14.999 \times 4.999 + 17.988 \div 2.998 + 24.999 \div 4.998 - 8.997 = ?$

Considering the nearest approximate values of the fraction given in the equation, it will change to

$15 \times 5 + 18 \div 3 + 25 \div 5 - 9 = ?$

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Solving the above equation as per the BODMAS rule

15 × 5 + 18 ÷ 3 + 25 ÷ 5 – 9

15 × 5 + 6 + 5 – 9

75 + 6 + 5 – 9

86 – 9

77

Hence, the correct answer is "77".

Q92. Answer: (b) LOSG

The positions of the letters according to the English alphabet series:

The logic followed here is,

(Sum of positional values of 1st letter-cluster) - (Sum of positional values of 2nd letter-cluster) = 7

BFHN : HBDI →

(2 + 6 + 8 + 14) - (8 + 2 + 4 + 9) => 30 - 23 = 7.

and, DHFM : JDBH →

(4 + 8 + 6 + 13) - (10 + 4 + 2 + 8) => 31 - 24 = 7

Simillarity,

FSWL : LOSG →

(6 + 19 + 23 + 12) - (12 + 15 + 19 + 7) => 60 - 53 = 7

Hence, the correct answer is "LOSG "

Q93. Answer: (a) C6H12

T he correct answer is Option 1

Key Points

• Cyclohexane

is a cycloalkane with the molecular

formula C6H12

• Cyclohexane is a non-polar, colorless flammable liquid with a distinctive detergent-like odor, reminiscent of cleaning products.

• Cyclohexane is mainly used for the industrial production of adipic acid and caprolactam, which are precursors to nylon.

• It is also called Hexanaphthene.

• It is soluble in ether, alcohol, acetone (non-polar solution)

It is immiscible in water.

Structure of Cyclohexane-

Additional Information Production of Cyclohexane-

Cyclohexane is produced by hydrogenation of benzene in the presence of a Raney nickel. catalyst.

Uses of Cyclohexane-

1. It is used as a solvent.

2. It is frequently used as a recrystallization solvent, as many organic compounds exhibit good solubility in hot cyclohexane and poor solubility at low temperature

3. It is used for the calibration of differential scanning calorimetry.

Important Points

• Cyclohexane is the IUPAC name of C6H12.

Q94. Answer: (c) Rs. 30,000

The correct answer is Rs. 30,000

Key Points

• The Hon’ble Prime Minister in his Independence Day Speech announced a comprehensive program of Financial Inclusion targeting a large number of people who are currently deprived of even rudimentary financial services.

• In this direction, the Pradhan Mantri Jan DhanYojana (PMJDY) sets out to provide a basic Bank account to every family who till now had no account.

• The bank account comes with a RuPay debit card with a built-in accidental insurance cover of Rs. 1 lakh.

• During the launch on 28.08.14 in New Delhi, Hon’ble Prime Minister also announced a life cover of Rs. 30,000/- for those subscribing to a bank account with a RuPay debit card before 26th January, 2015 to complement the Rs. 1 lakh accident insurance cover.

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• This life insurance cover of Rs. 30,000/- under Pradhan Mantri Jan DhanYojana, gives life insurance cover on death of the life assured, due to any reason, to the deceased's family.

• The scheme aims to provide security to families from economically weaker sections who cannot afford direct purchase of such insurance.

• The premium subscription for the life cover under PMJDY is borne by the Government of India.

Q95. Answer: (c) 2880

Given:

The total insurance sold by the company in a given year was 36000.

Calculation:

Note that fire and property insurence are 6% and 2% respectively.

According to problem:

=> 36000(6 + 2) × 1/100

=> 360 × 8

=> 2880

Therefore Option 3 is the correct answer.

Q96. Answer: (c) 70 litres

Shortcut Trick

Initial Milk : Water = 3 : 1 | Total 4 units = 80 litres => 1 unit = 20 litres.

Milk remains constant at 3 units (60 litres). New ratio Milk : Water = 2 : 3.

If 2 units = 60 litres, then 1 unit = 30 litres. New Water = 3 units = 90 litres.

Water added = 90 − 20 = 70 litres.

Therefore The correct answer is 70 litres.

Alternate Method

Given: Total mixture = 80 litres, Initial ratio = 3 : 1, Final ratio = 2 : 3.

=> Initial Milk = (3/4) × 80 = 60 litres.

=> Initial Water = (1/4) × 80 = 20 litres.

=> Let x litres of water be added. New ratio: 60 / (20 + x) = 2 / 3.

=> 180 = 2(20 + x)

=> 180 = 40 + 2x

=> 2x = 140 => x = 70 litres.

Therefore The correct answer is 70 litres.

Additional Information

Mixture Constant Property

When only one component is added or removed, the quantity of the other component remains unchanged in absolute terms.

Alligation Rule

Used to find the ratio in which two ingredients at given prices/concentrations are mixed to produce a mixture of a specified mean price/concentration.

Ratio Balancing

Multiply ratios by suitable constants to make the "unchanged" part equal across different states for easier calculation.

Q97. Answer: (c) Using solar-power for generation of electricity

The correct answer is Using solar-power for generation of electricity.

Key Points

• Solar power is a renewable energy source which does not emit harmful carbon dioxide or other pollutants.

• It harnesses the energy of the sun, reducing dependency on fossil fuels.

• This makes it a more sustainable and greener option.

Q98. Answer: (b) 2.25 Ω

The correct answer is Option - 2

Solution-

• Given - Resistance (R1) = 6Ω, R2= 9Ω, R3 = 6Ω

• Resultant Resistance = R

• And these are connected in parallel combinations.

Formula used -

1/R = 1/R1+1/R2+1/R3

1/R=1/6+1/9+1/6

1/R=(3+2+3)/18

1/R=4/9

R = 2.25 Ω

Important Points

Parallel combination -

• Two or more resistors are said to be connected in parallel when the voltage is the same across all the resistors.

• In such circuits, the current is branched out and recombined when branches meet at a common point.

• In this combination, a resistor or any other component can be connected or disconnected easily without affecting other elements.

• The resultant resistance will be the sum of reciprocals of resistance of an individual resistor.

Additional Information

Series combination -

• In a series circuit, the output current of the first resistor flows into the input of the second resistor, therefore, the current is the same in each resistor.

• In such a circuit the voltage across each resistor is different.

• In a series combination, if any resistor is broken or a fault occurs, then the entire circuit is turned off and may burn.

Q99. Answer: (d) They are not very effective methods

The correct answer is Option 4.

Key Points

• A surgical procedure is a medical procedure involving an incision with instruments; performed to repair damage or arrest disease in a living body.

• It is also called an operation, surgery, etc. in general language.

• In medical language, it is called a sterilization procedure.

• It blocks gamete transport and thus prevents fertilization.

Important PointsThe surgical methods of contraception are as follows:

1. Vasectomy: A small fragment of vas deferens is removed from the male reproductive system (Vas deferens)

2. Tubectomy: A small portion of the female fallopian tube is removed, and ends tied with a nylon thread, preventing egg transport into the uterus.

Additional Information

Contraception -

• The products designed to avoid unwanted pregnancy are called contraceptives.

• Natural, hormonal barriers, contraceptive implants, and permanent contraception by surgical methods are few examples of contraceptives.

• Contraceptives also prevent the transmission of STDs.

• Surgical procedures for family planning include tubal ligation for female sterilization and vasectomy for male sterilization.

Advantages of Sterilization

• Sterilization is highly effective and offers permanent protection from unwanted pregnancy with none of the potential side effects of temporary contraceptive methods.

Q100. Answer: (d) only i

The correct answer is Option 4.

Key Points

• Plaster of Paris

is a chemical substance i.e. written as

Ca SO4.1\2H2O.

• POP is a white powdery chemical compound, which is hydrated calcium sulfate.

• It is obtained by heating gypsum at a high temperature.

• POP is used in plaster for supporting fractured bones, making toys, materials for decoration, and making smooth surfaces.

• It is also used in chemistry laboratories for sealing air gaps in apparatus where airtight arrangement is required (Gauze banding).

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Important Points-

• When water is added to POP gypsum crystals are formed, leading it to achieve a solid state.

• POP is retarded by alum or borax.

• POP forms anhydrous calcium sulfate at 473 K. This is known as the dead burnt plaster of Paris.

• The strength of POP is not very strong.

• It is often applied in the form of a quick-setting paste with water.

Additional Information

• Types of Plaster of Paris-

1. Gypsum plaster -

• Used for setting fractured bones in hospitals.

• Used in dentistry to make casts.

• Used for protection as fire-proofing materials.

2. Clay plaster -

• For making the Interior of the house.

• For making toys, decorative materials, etc.

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