RRB Group D Previous Year Paper (Held on: 16 Sept 2022 Shift 3)

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

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CBT

Q1. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

GLE11, KPI13, OTM17, SXQ19, ?

(a) WBU23
(b) UWB27
(c) WBU27
(d) UWB23

Q2. The image of a star is obtained at F of a concave mirror when the incident ray is

(a) along the focal plane
(b) inclined to principal axis
(c) perpendicular to principal axis
(d) parallel to principal axis

Q3. Convert 23/11 to its recurring decimal form.

(a) 2.0909...
(b) 2.1818...
(c) 2.2323...
(d) 2.3232...

Q4. Each of seven colleagues, A, B, C, D, E, F and G, travelled to USA for sales presentation in the months of April, May, June, July, August, September and October, in the year 2019, but not necessarily in the same order. Each colleague travelled in a different month. Exactly four people travelled after D's trip. C travelled between the trips of E and F. G travelled in the month immediately before A's trip. Exactly two people travelled after C's trip. E travelled in the month immediately before B, who travelled in the month of October. Who travelled in the month of July?

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

Q5. Washing soda is:

(a) an acidic salt
(b) a neutral salt
(c) a basic salt
(d) a base

Q6. (cos 45°)/(sec 30°+cosec30°) is equal to:

(a) √3/(2√2(1+√3))
(b) √2/(2√2(1+√3))
(c) √3/(√2(1+√3))
(d) √3/(2√3(1+√2))

Q7. A Large Area Soft X-ray Spectrometer (CLASS), a payload on-board _____ Orbiter, detected a solar proton event which significantly increases the radiation exposure to humans in space, on January 2022.

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

Q8. The value of (6-3)÷[(9-6)÷{(6-4)÷(2+8/13)}] is:

(a) 5/17
(b) 1/17
(c) 13/17
(d) 26/17

Q9. If a square has a side of (5x - 8) cm, then the area of the square (in cm^2) is:

(a) $25x^2 + 80x - 64$
(b) 25x2 + 80x + 64
(c) 25x2 - 80x + 64
(d) 25x2 - 80x - 64

Q10. Refer to the letter and symbol series, and answer the question that follows.

(Left) K B # A @ S * B Q @ R V N % & S (Right)

How many letters are there between the element that is third from the right end and the element that is sixth from the left end of the given series?

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

Q11. The roots of the quadratic equation $x^2 + x - 2 = 0$ are:

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

Q12. On which model was the Second Five-Year Plan made?

(a) Investment Model of Planning Commission
(b) Manmohan Plan
(c) Harrod-Domar model
(d) PC Mahalanobis Model

Q13. A sum of money was invested at a certain rate of simple interest per annum for a period of 4 years. Had the rate of simple interest per annum been 2% more, the sum invested would have earned a total of Rs. 640 more as interest in these 4 years. What was the sum (in Rs.) invested?

(a) 9,500
(b) 7,500
(c) 9,000
(d) 8,000

Q14. The executive power of the State shall be vested in the Governor and shall be exercised by him either directly or through officers subordinate to him in accordance with which Article of the Constitution of India?

(a) Article 124
(b) Article 134
(c) Article 144
(d) Article 154

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Q15. Arrange the following element of group I in the decreasing order of their atomic radii. Atomic numbers are given in parentheses.

Li (3), K (19), Cs (55), Na (11), Rb (37)

(a) Cs > Rb > K > Li > Na
(b) Cs > Rb > Na > K > Li
(c) Cs > Rb > K > Na > Li
(d) Cs > Rb > Li > K > Na

Q16. Two statement are given below, followed by four conclusions given in the options. Find out which conclusion is true based on the given statements.

Statement: J < P = C, T < Q < M = J < A

(a) A > P
(b) C = A
(c) P > A
(d) T < A

Q17. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements:

Some cats are rats.

All rats are dogs.

All dogs are monkeys.

Conclusions:

(I) Some monkeys are cats.

(II) All monkeys are rats.

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

Q18. Six people, A, B, C, D, E and F, travelled in different years 2010, 2012, 2014, 2016, 2018 and 2020 (but not necessarily in the same order). C travelled in 2018. Only three people travelled between D and A. A travelled after D. Only one person travelled between F and E. F travelled before E. Who travelled in 2014?

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

Q19. Three statements are given, followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. All shampoos are brushes.

2. Some brushes are conditioners.

3. No conditioner is towel.

Conclusions:

I. Some towels are conditioners.

II. No shampoo is a towel.

III. Some brushes are shampoos.

(a) Only conclusions III follows
(b) Only conclusions II and III follow
(c) Only conclusions I and II follow

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(d) Only conclusion I follows

Q20. Which of the following is always true?

a) The bisectors of angles of a parallelogram form a rectangle.

b) A parallelogram is a trapezium.

c) Diagonals of a rhombus are equal and bisect each other at right angles.

(a) Only (a)
(b) Only (b)
(c) Only (a) and (b)
(d) All of (a), (b), (c)

Q21. The distance between two points on a map is 5 cm. The scale of the map is 1 : 400000. The actual distance between the two points (in km) is:

(a) 20000
(b) 20
(c) 200
(d) 2000

Q22. As per Census 2011, which language replaced Telugu as the third most spoken language in India?

(a) Gujarati
(b) Marathi
(c) Bengali
(d) Tamil

Q23. The sum of the squares of two consecutive odd natural numbers is 74. The sum of the numbers is:

(a) 24
(b) 12
(c) 28
(d) 18

Q24. Goa Liberation Day is celebrated on which of the following dates?

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

Q25. What happens when CO_2 gas is passed through the lime water?

(a) There is no change.
(b) Green colour appears.
(c) The solution turns milky.
(d) A black precipitate is formed.

Q26. Vincov-19, the first indigenous drug to treat Covid-19, has been developed by synthesizing blood serum obtained from _____ immunised with spike glycoprotein of inactivated SARS-CoV-2 virus.

(a) pigs
(b) rabbits
(c) monkeys
(d) horses

Q27. Which of the following compounds of a homologous series has the lowest boiling point?

(a) $C_4H_{10}O$
(b) C_3H_8O
(c) C_2H_6O
(d) CH_4O

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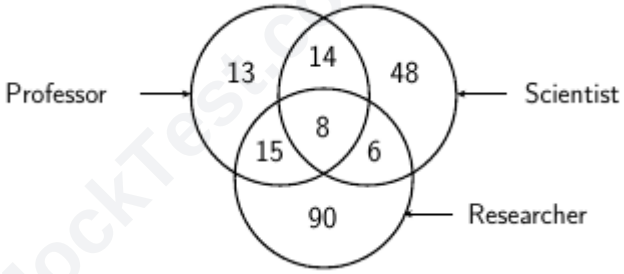
Q28. In a code language. 'now you can come' is written as 'wp ae nz rf', "you are kind' is written as 'ae dz tq', 'kind is virtue' is written as 'tq sf be'. What is the code for 'kind, you' in that code language?

(a) nz, ae
(b) nz, tq
(c) tq, dz
(d) tq, ae

Q29. A person who spends 362/3% of his monthly income is able to save Rs. 5,700 per month. His monthly expenses are:

(a) Rs. 5,300
(b) Rs. 4,300
(c) Rs. 3,300
(d) Rs. 6,300

Q30. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many people are Researchers and Scientists but Not Professors?

(a) 23
(b) 15
(c) 14
(d) 6

Q31. Three resistors of 5 Ω are connected in series, and a battery of 10 V is connected to the two end of the series combination of resistors. Calculate the current drawn from the battery.

(a) 0.57 A
(b) 0.77 A
(c) 0.87 A
(d) 0.67 A

Q32. On 27 July 2022, the Union Cabinet cleared a Rs. 1.64 lakh crore package for the revival of which of the following organisations?

(a) Bharat Sanchar Nigam Limited (BSNL)
(b) Air India
(c) Container Corporation of India Limited (CONCOR)
(d) Oil and Natural Gas Corporation Limited

Q33. Select the option that is related to the seventh number in the same way as the second number is related to the first number, the fourth number is related to the third number and the sixth number is related to the fifth number.

3 : 8 :: 7 : 16 :: 4 : 10 :: 8 : ?

(a) 22
(b) 16
(c) 12
(d) 18

Q34. Jayant started from a point 'A' and walked 15 meters towards South. He turned left and walked 20 meters. He then. turned right and walked 15 meters. He again turned right and walked 20 meters and reached a point 'B'. How far and in which direction is the point 'B' from the point 'A'?

(a) 15 meters West

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(b) 30 meters South
(c) 30 meters North
(d) 15 meters East

Q35. A reflected ray will follow the same path but in reverse direction when it passes through pole and _____.
(a) surface of mirror
(b) is parallel to the focal plane
(c) focal plane
(d) is perpendicular to the focal plane

Q36. Chitra starts driving from the resort and drives 15 km towards west and then turns left and drives 115 km. Then she turns right and drives 25 km. After that, she again tums right and drives 90 km. She finally turns right and drives 40 km to reach her home. How far is resort from her home?
(a) 25 km
(b) 50 km
(c) 30 km
(d) 35 km

Q37. A statement is given below, followed by four conclusions given in the options. Find out which conclusion is true based on the given statement.
Statement: C ≥ V < B ≥ N > Z > L
(a) C ≥ V < L
(b) B > Z > L
(c) C > B ≥ N
(d) B > L > V

Q38. If 14 : y :: 7 : 8, find the value of y,
(a) 16
(b) 18
(c) 28
(d) 56

Q39. J, K, L, M and N live on different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it is numbered 2, and so on till the topmost floor is numbered 5. K and N live on the topmost and bottommost floors, respectively. J lives on the floor immediately above L. M lives on the floor immediately above N. Who lives on the second floor?
(a) J
(b) K
(c) M
(d) L

Q40. The direction of the force acting on a current carrying conductor in the presence of a magnetic field depends on:
(a) neither the direction of the current nor the direction of the magnetic field
(b) the direction of the current alone
(c) the direction of the magnetic field alone
(d) the direction of both, the magnetic field and the current

Q41. If the radius of a sphere is halved, then the new volume will become _____ the original volume.
(a) 1/4 times
(b) 8 times
(c) 4 times
(d) 1/8 times

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Q42. Who among the following clocked 2:40:16 to pocket the men's 35 km race walk national record at the Indian Open Race Walking Competition 2022?

(a) Ram Baboo
(b) Chandan Singh
(c) Juned Khan
(d) Akshdeep Singh

Q43. Each of the digits in the number 4275913 is arranged in ascending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

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

Q44. When a round, green seeded plant is crossed with a wrinkled, yellow seeded pea plant the F1 generation results in:

(a) wrinkled and yellow seeds
(b) wrinkled and green seeds
(c) round and yellow seeds
(d) round and green seeds

Q45. Consider two circuits, A and B, each of which has 12 resistors each of resistance R_A and R_B. respectively. In each circuit the resistors are in such a way that the net resistance of each circuit is the minimum. Now a 30 V battery with negligible internal resistance is connected across each circuit separately, and the current drawn by circuit A and circuit B are 10 A and 18 A, respectively. Then R_A and R_B will be:

(a) R_A = 26 Ω and R_B = 25 Ω
(b) RA = 36 Ω and RB = 15 Ω
(c) RA = 26 Ω and RB = 20 Ω
(d) RA = 36 Ω and RB = 20 Ω

Q46. Which of the following compounds was used for the preparation of urea by Friedrich Wohler?

(a) Ammonium cyanate
(b) Carbon monoxide
(c) Methane nitrile
(d) Ammonia

Q47. Which of the following is the standard representation of quadratic equation
$(x^2 + 1)(x - 1) = (x^2 - 3)(x + 3)$?

(a) $x^2 - 3x - 4 = 0$
(b) $4x^2 - x - 6 = 0$
(c) $4x^2 - 8 = 0$
(d) $4x^2 - 4x - 8 = 0$

Q48. The sum of the digits of a two-digit number is 15. The number obtained by interchanging the digits exceeds the given number by 9. The number is:

(a) 57
(b) 27
(c) 78
(d) 98

Q49. As per Mendel's experiments with pea plants, tallness was called a 'dominant' trait compared to shortness because _____.

(a) a plant was tall regardless of whether it had one gene (allele) or two genes (alleles) for tallness
(b) in all organisms, including peas, tall individuals are more common than short individuals
(c) the symbol for the gene for tallness was 'T', while the symbol for the gene for shortness was 't'
(d) tall plants are larger in size than short plants

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Q50. Which state in India will you find the The Cathedral of Mary Help of Christians ?

(a) Bihar
(b) Karnataka
(c) Meghalaya
(d) West Bengal

Q51. Which of the following solutions may scatter light?

(a) Acidic solution
(b) Basic solution
(c) Electrolyte solution
(d) Colloidal solution

Q52. _____ is the price where the quantity the consumer purchases is equal to the quantity the producers supply.

(a) Product price
(b) Total price
(c) Equilibrium price
(d) Surplus price

Q53. How many pairs of sex chromosomes are present in humans?

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

Q54. The highest common factor of a set of coprime numbers is equal to:

(a) the highest among them
(b) 1
(c) 2
(d) the lowest among them

Q55. A circuit consists of three resistors, R1, R2 and R3, and they have the values 5 Ω, 10 Ω and 30 Ω, respectively, which have been connected to a battery of 10 V (with negligible internal resistance). Each of the resistors is in parallel with each other, The total resistance of the circuit is:

(a) 5 Ω
(b) 3 Ω
(c) 6 Ω
(d) 1 Ω

Q56. Which of the following is an insectivorous plant?

(a) Lichens
(b) Pitcher
(c) Cuscuta
(d) Mushroom

Q57. If the area of a triangle whose base measures 3 cm is 4 cm^2, then its corresponding height is:

(a) 41/3 cm
(b) 32/3 cm
(c) 22/3 cm
(d) 12/3 cm

Q58. Which of the following chemical compounds is used in the manufacture of cement?

(a) Al2O3
(b) Mg(OH)2
(c) CuO
(d) CaO

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Q59. The phenomena that links current induced in a coil and change in magnetic flux is known as:

(a) electromagnetic wave
(b) electromagnetic wave propagation
(c) electromagnetic radiation
(d) electromagnetic induction

Q60. Which of the following numbers will replace the question mark (?) in the given series?

42, 52, 63, 75, 88, ?, 117

(a) 101
(b) 100
(c) 102
(d) 103

Q61. Letters are coded as numbers/symbols as per the table given below and the conditions which follow. Refer to the codes and conditions and then select the correct code for SQUARE.

Letters	T	P	J	Q	S	U	E	R	H	A
Number / Symbol	"	6	8	%	7	@	3	9	#	1

Conditions:

(i) If there is more than 1 vowel in the word, the vowels will be coded as 4.

(ii) If a word has consonants at both ends, both the consonants will be coded as 2.

(a) 7%4494
(b) 7%4493
(c) 7%@193
(d) 7%9493

Q62. The Prarthana Samaj, which was recognised as an institution that worked for religious as well as social reform, was established in Bombay by _____ in 1867.

(a) Mahadev Govind Ranade
(b) Dr. Atma Ram Pandurang
(c) Ishwar Chandra Vidyasagar
(d) RC Bhandarkar

Q63. Through which of the following states of India does the Tropic of Cancer NOT pass?

(a) Odisha
(b) Tripura
(c) Rajasthan
(d) Madhya Pradesh

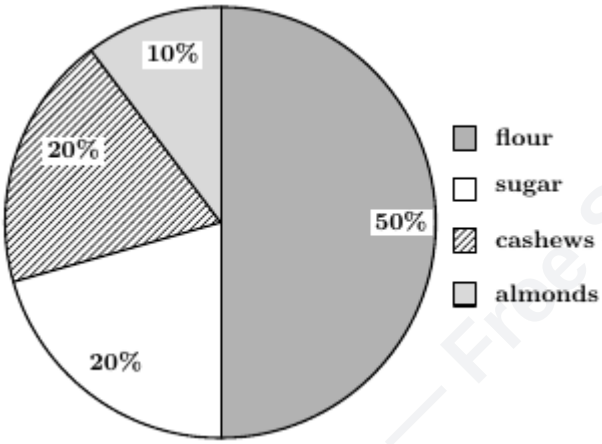
Q64. Which of the following options is the closest appro×imate value which will come in place of question mark (?) in the following equation?

$27.92 \times 4 + 3.96 \times 5 - 18 \div 2 + 1 = ?$

(a) 115
(b) 100
(c) 124
(d) 140

Q65. The percentage of all of the ingredients in a recipe is shown in the following pie-chart. Study the pie-chart and answer the question.

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If the final mixture of all these ingredients weighs twice of 3,50,000 g, then what is the difference between the weight of flour and almonds?

(a) 2,80,000 g
(b) 1,40,000 g
(c) 2,93,000 g
(d) 1,55,500 g

Q66. Which of the following numbers will replace the question mark (?) in the given series?

26, 61, 120, 209, ?, 501

(a) 298
(b) 434
(c) 334
(d) 368

Q67. Select the option that is related to the fifth number in the same way as the second number is related to the first number, the fourth number is related to the third number.

9 : 728 :: 4 : 63 :: 7 : ?

(a) 346
(b) 342
(c) 315
(d) 341

Q68. If a man was to sell an article for Rs. 840, he would lose 20%. To gain 25% he should sell it for _____.

(a) Rs. 1,300.50
(b) Rs. 1,200.50
(c) Rs. 1,312.50
(d) Rs. 1,212.50

Q69. If (25/9)^(x+1)(81/625)^(x-1)=9/25, then find the value of x.

(a) 8
(b) 4
(c) 5
(d) 6

Q70. Most ordinary gases do not show with visible light. This is because the velocities of propagation of waves of different wavelengths of visible light are _____.

(Velocity of light in vacuum is c)

(a) always much greater than c
(b) almost the same as c
(c) very much different
(d) always much less than c

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Q71. 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.

ALMOST : MLATSO :: BEGINS : GEBSNI :: CHIMPS : ?

(a) IHCSPM
(b) IHCSMP
(c) IHCPMS
(d) IHCPSM

Q72. The oldest mountain range in India is _____.

(a) Zanskar Range
(b) Dhauladhar Range
(c) Nallamala Range
(d) Aravali Range

Q73. If the position of the first and second letters in the word MOTHERLAND were interchanged, also the third and the fourth letters were interchanged, the fifth and sixth letters were interchanged and so on, which of the following would be the sixth letter from the right?

(a) R
(b) E
(c) H
(d) T

Q74. What is explicit cost?

(a) It is the only cost necessary to calculate a profit, as it clearly affects a company's profits.
(b) It is a direct payment made to others in the course of running a business, such as wage, rent and materials.
(c) It represents the loss of profit but does not represent a loss of income.
(d) Opportunity cost is the amount that a firm must give up to use a factor of production.

Q75. _____ of the Constitution of India deals with Panchayats.

(a) Part VIII
(b) Part XI
(c) Part IX
(d) Part X

Q76. Which programme was launched by the Union Government as a flagship programme to fulfil the main objectives of effective abatement of pollution, conservation and rejuvenation of River Ganga?

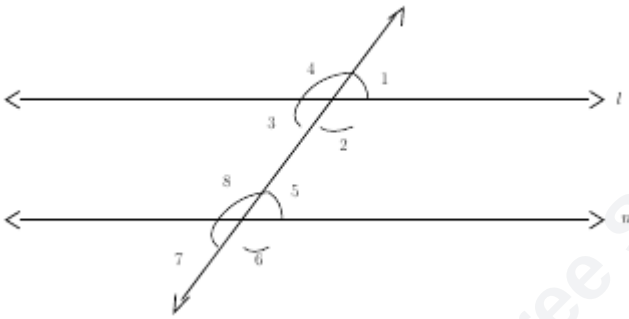
(a) Clean the Ganga Programme
(b) Water for All
(c) Ganga Action Plan
(d) Namami Gange Programme

Q77. The Godavari river rises from _____ about 80 km from the Arabian Sea at an elevation of 1,067 m.

(a) Mahabaleshwar
(b) Trimbakeshwar
(c) Satpura Range
(d) Talakaveri

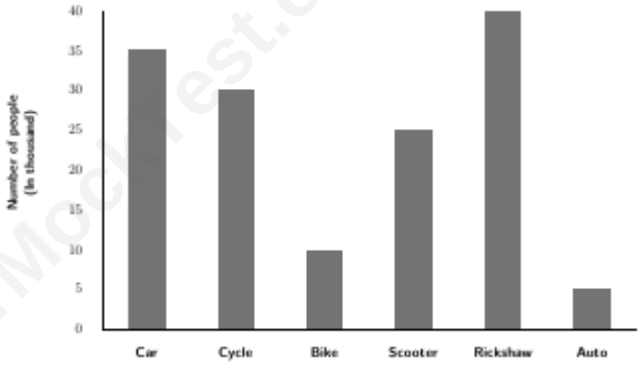
Q78. In the given figure, if l || m, then which of the following relations is not necessarily true?

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(a) angle 1 = angle 7
(b) angle 2 = angle 5
(c) angle 8 = angle 6
(d) angle 1 = angle 5

Q79. The number of people having six different types of vehicles in a city are shown in the following graph. Study the graph and answer the question.



What is the percentage increase in the people having a car as compared to the people having a scooter?

(a) 25%
(b) 35%
(c) 10%
(d) 40%

Q80. Which of the following tissues helps in tissue repair?

(a) Tendon
(b) Ligament
(c) Areolar
(d) Cartilage

Q81. Refer to the following letter, number, symbol series and answer the question.

(Left) S $ 3 & 3 P & 3 D J * M 2 F A $ Y ! 1 Z Right)

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

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

Q82. Six persons A, B, C, D, E and F are sitting in straight row facing west. D is sitting at the end of the row. B is sitting third to the left of D. A is sitting to the immediate right of B. A is an immediate neighbour of B and C. E is sitting at the first position in the row. F is sitting between A and E. Who is an immediate neighbour of A and F?

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

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Q83. The process of fermentation takes place in:

(a) Paramecium
(b) Euglena
(c) Amoeba
(d) Yeast

Q84. If '+' means '÷', '-' means '+', '×' means '-' and '÷' means '×', then, what will be the value of the following expression?
[{(48 × 28) - (5 ÷ 3)} + (3 - 4)]

(a) 5
(b) 1
(c) 2
(d) 4

Q85. A two-digit number z is exactly six times the sum of its digits and the difference of the number formed by reversing the digits of z from the original number z is 9. Then z is:

(a) 45
(b) 36
(c) 42
(d) 54

Q86. _____ are used in vermicomposting.

(a) Roundworms
(b) Flatworms
(c) Tapeworms
(d) Earthworms

Q87. In plaster of Paris:

(a) two formula units of $CaSO_4$ share two molecule of water
(b) two formula units of $CaSO_4$ share one molecule of water
(c) one formula unit of $CaSO_4$ has one molecule of water
(d) two formula units of $CaSO_4$ share half molecule of water

Q88. As of July 2022, which state government among the following implemented the Kalyana Lakshmi and Shaadi Mubarak Scheme?

(a) West Bengal
(b) Madhya Pradesh
(c) Telangana
(d) Gujarat

Q89. The LCM of two numbers is 588. Which of the following CANNOT be their HCF?

(a) 49
(b) 21
(c) 35
(d) 28

Q90. What is the value of money multiplier if the CRR (Cash Reserve Ratio) is 15%?

(a) 85
(b) 15
(c) 1500
(d) 6.67

Q91. If two pipes A and B function simultaneously, an empty tank will be filled in 20 hours. If pipe A, working alone, fills this empty tank 9 hours faster than pipe B can fill it working alone, then how many hours does it take pipe B to fill this empty tank while working alone?

(a) 42 hours

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(b) 45 hours
(c) 36 hours
(d) 39 hours

Q92. Read the statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

Limited and cautious use of plastic material can be a good strategy for its total ban movement.

Arguments:

I. An instant ban on plastic is very far from reality as people are not ready to use alternatives.

II. Paper bags can be a good alternative to plastic bags.

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

Q93. As on July 2022, how many Fundamental Duties are there in the Indian Constitution?

(a) 9
(b) 11
(c) 12
(d) 10

Q94. If the mean of a distribution is 8.73 and its median is 11, then the mode of the distribution is _____ (using empirical relation).

(a) 19.73
(b) 22
(c) 17.46
(d) 15.54

Q95. Study the given table and answer the question that follows.

The marks obtained in Mathematics by 41 students of Class X are given in the table.

Number of Marks	10-20	20-30	30-40	40-50	50-60
Number of students	8	7	6	11	9

What is the arithmetic mean of the marks obtained by these students? [Give your answer correct to 3 decimal places.]

(a) 36.463
(b) 38.675
(c) 35.225
(d) 36.745

Q96. Refer to the following letter series and answer the question.

A C P D I U V K J Q E V F

How many vowels are immediately preceded by consonants?

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

Q97. _____ was the first Indian man to win gold at Commonwealth Games 2022 held at Birmingham.

(a) Murali Sreeshankar
(b) Tejaswin Shankar
(c) Jeremy Lalrinnunga
(d) Mohit Grewal

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Q98. What is the main limitation of Mendeleev's periodic table?

(a) Mendeleev's Periodic Table contains vertical columns called groups and horizontal rows called periods.
(b) Mendeleev selected hydrogen and oxygen as they are very reactive and formed compounds with most elements.
(c) No fixed position can be given to hydrogen in the Periodic Table.
(d) Nobel gases could be placed in a new group without disturbing the existing order.

Q99. A shopkeeper marks the price of an article 10% more than the cost price. After allowing discount, he earns 5% profit. The discount percentage is:

(a) 4.54%
(b) 5.54%
(c) 3%
(d) 4%

Q100. Five friends are sitting around a circular table in a club playing cards and facing the center. W is not an immediate neighbour of either X or U. V is not an immediate neighbour of X. U is sitting to the immediate left of X. If Y is sitting between X and W, who will be sitting to immediate right of V?

(a) Y
(b) X
(c) U
(d) W

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) WBU23

According to english alphabet series

The pattern followed here is :

Hence, "Option 1" is the correct answer.

Q2. Answer: (d) parallel to principal axis

The correct answer is parallel to principal axis.

Key Points:

• There are numerous uses for concave mirrors.

• They create upright, magnified images, making them helpful for shaving and doing makeup.

• They are also employed in telescopes because they focus light to produce noticeably larger images, as well as spotlights and headlights since they project parallel light beams.

• As a result, when the incident ray is parallel to the primary axis, the image of a star can be obtained at F of a concave mirror.

Additional Information:

• A concave mirror is a sort of spherical mirror in which the reflecting surface is the inner curved surface of the sphere; hence, the

reflecting surface seems to be farther away from the incident light source in this type of mirror.

• They are also known as converging mirrors because of how they are made, which causes the incident light to be reflected inward.

• They are used to focus light.

• At every location along the curved surface of the mirror, both rules of reflection hold true.

• By connecting the mirror's curvature's centre to the point of incidence, the normal is drawn along the radius.

• Because the normal to the reflecting surface varies at each point on the mirror, the beams' convergence occurs after reflection.

Q3. Answer: (a) 2.0909...

Concept Used:

The recurring decimal is the digit after the point (0.) Which gets repeated periodically till infinity

Calculation:

According to question

23/11 can be written as:

= (22 + 1)/11

= 2 + 1/11

= 2 + 0.09090909.....

= 2.09090909.....

= 2.0909... (When digits start repeating we put the bar over the number which gets repeated periodically)

Thus, the required value is 2.0909....

Hence, the correct answer is option 1).

Q4. Answer: (d) F

From the given information:

Step 1: E travelled in the month immediately before B, who travelled in the month of October.

B	October
E	September

Here we place B with October as given and then place E before B with September.

Step 2: C travelled between the trips of E and F.

B	October
E	September
C	August
F	July

Now according to the condition we place C between E and F which means C travelled before E in August & F travelled before C in July.

Step 3: Exactly four people travelled after D's trip.

B	October
E	September
C	August
F	July
D	June

Here we place D at fifth position because four people travelled after him which means D travelled in June.

Step 4: G travelled in the month immediately before A's trip.

B	October
E	September
C	August
F	July

D	June
A	May
G	April

Lastly we have to place A and G where G travelled before A so we place A with May and G with April.

From the arrangement, we can see that F travelled in July.

Hence the correct answer is option 4)

Q5. Answer: (c) a basic salt

The correct answer is a basic salt.

Key Points:

• We know that sodium hydrogen carbonate is a basic salt because it is made when a strong base, such as NaOH, and a weak acid, such as H2CO3, neutralise one another.

• Strong heating of sodium hydrogen carbonate results in the production of sodium carbonate, water, and carbon dioxide.

• It involves the subsequent reactions:

• NaHCO_(3 +) heat → Na2CO3+H2O+CO2

• By crystallising NaHCO3, Na2CO3.10H2O is produced (washing soda).

• Washing soda is sodium carbonate, which is formed upon crystallisation as Na2CO3.10H2O.

Additional Information:

• Washing soda is a salt of carbonic acid, a substance that also yields a variety of other salts referred to as carbonates.

• In order to help other cleaning agents remove filth from garments and suspend it in the wash water, sodium carbonate softens water.

• The washing soda bonds to the minerals, making the water harder and enabling the detergent to adequately penetrate the fibres to clean the clothing.

Q6. Answer: (a) √3/(2√2(1+√3))

Shortcut Trick

Substitute standard values: cos 45° = 1/√2, sec 30° = 2/√3, and cosec 30° = 2.

Expression = (1/√2) ÷ (2/√3 + 2) = (1/√2) ÷ [(2 + 2√3)/√3].

Invert and multiply: (1/√2) × [√3 / (2(1 + √3))].

Result = √3 / [2√2(1 + √3)].

Therefore The correct answer is √3 / (2√2(1 + √3)).

Alternate Method

Given: cos 45° / (sec 30° + cosec 30°)

Trigonometric Values Used:

=> cos 45° = 1/√2

=> sec 30° = 1/cos 30° = 2/√3

=> cosec 30° = 1/sin 30° = 2

Calculations:

=> Numerator = 1/√2

=> Denominator = 2/√3 + 2 = (2 + 2√3)/√3

=> Expression = (1/√2) / [(2(1 + √3))/√3]

=> Expression = (1/√2) × (√3 / (2(1 + √3)))

=> Expression = √3 / (2√2(1 + √3))

Therefore The correct answer is √3 / (2√2(1 + √3)).

Additional Information

Standard Trigonometric Ratios

For an angle θ = 30°, sin θ = 1/2, cos θ = √3/2, and tan θ = 1/√3.

Reciprocal Identities

sec θ = 1/cos θ and cosec θ = 1/sin θ.

Rationalization

To simplify fractions with radicals in the denominator, multiply the numerator and denominator by the conjugate (e.g., √3 − 1).

Q7. Answer: (a) Chandrayaan-2

The correct answer is Chandrayaan-2.

Key Points

• Chandrayaan-2 is the second lunar mission of India after the success of Chandrayaan-1. This mission was conducted for topographical research and mineralogical studies to have a better understanding of the Moon's origin and evolution.

• Chandrayaan-2 Mission was launched from the Satish Dhawan Space on July 22, 2019, by GSLV Mk III-M1. The main aim of Chandrayaan-2 was to trace the location and abundance of lunar water on the Moon's surface.

• Highlights of Chandrayaan-2

• Chandrayaan-2 fostered the findings of Chandrayaan-1 as reported by the ISRO.

• The mission targeted the "south polar region " of the moon which was completely unexplored.

• The mission focused on the extensive mapping of the lunar surface for studying variations in its composition and tracing the Moon's origin and evolution.

• Chandrayaan-2 has been considered a challenging mission as the South Polar Region of the Moon was unexplored by any space agency before.

• Components of Chandrayaan-2: Launch Vehicle

• S200 solid rocket booster

• L110 liquid state

• C25 Upper stage

• The Chandrayaan-2 mission consisted of three main modules:

1. Lunar Orbiter

2. Vikram Lander

3. A Lunar rover named Pragyan, all these parts were developed in India.

• Significance of Chandrayaan-2

• In all the space Missions, no country has ever attempted to land a spacecraft in the polar regions of the moon. This gave India the lead in space exploration on an International level.

• Due to the moon's axis, few regions on the south pole always remain dark, especially the craters and have higher chances of containing water.

• The 2nd de-orbiting maneuver for the Chandrayaan-2 spacecraft was performed successfully on September 04, 2019, beginning at 0342 hrs IST as planned, using the onboard propulsion system. the duration of the maneuver was 9 seconds.

• On October 14, 2019, Chandrayaan-2 detected the presence of Argon-40 in the lunar exosphere.

• On July 30th, 2020 Chandrayaan-2 imaged the Sarabhai crater located on the northeast quadrant of the moon.

Additional Information

• India's 1st lunar Mission Chandrayaan-1 was launched on 22nd October 2008 from Satish Dhawan Space Center at Sriharikota, Andhra Pradesh.

• Objectives of Chandrayaan-1:

• To perform high-resolution remote sensing of the moon's surface.

• To provide a 3-dimensional atlas of the Moon.

• To conduct chemical and mineralogical studies for mapping the entire lunar surface.

• Chandrayaan-3 is a planned 3rd lunar exploration mission by the Indian Space Research Organization.

Q8. Answer: (c) 13/17

Given:

(6-3)÷[(9-6)÷{(6-4)÷(2+8/13)}]

Formula used:

BODMAS rule

Calculations:

(6-3)÷[(9-6)÷{(6-4)÷(2+8/13)}]

=> 3 ÷ [3 ÷ {2 ÷ (26+8)/13}]

=> 3 ÷ [3 ÷ {2 ÷ 34/13}]

=> 3 ÷ [3 ÷ {2 × 13/34}]

=> 3 ÷ [3 ÷ 13/17]

=> 3 ÷ [3 × 17/13]

=> 3 ÷ 51/13

=> 3 × 13/51

=> 13/17

Therefore The correct answer is option (3).

Q9. Answer: (c) 25x2 - 80x + 64

Shortcut Trick

Area of a square with side s is given by s^2.

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

Here a = 5x and b = 8.

Area = $(5x)^2 - 2 \times 5x \times 8 + 8^2 = 25x^2 - 80x + 64$.

Therefore The correct answer is $25x^2 - 80x + 64$ cm².

Alternate Method

Given:

Side of the square (s) = (5x − 8) cm

Formula Used:

Area of square = side × side = s^2

Algebraic Identity: $(a - b)^2 = a^2 - 2ab + b^2$

Calculations:

=> Area = $(5x - 8)^2$

=> Area = $(5x)^2 - 2(5x)(8) + (8)^2$

=> Area = $25x^2 - 80x + 64$

Therefore The correct answer is $25x^2 - 80x + 64$ cm².

Additional Information

Perimeter of a Square

The total boundary length of a square is 4 × side. For this case, Perimeter = 4(5x − 8) = 20x − 32 cm.

Diagonal of a Square

The distance between opposite vertices is s√2. Area can also be expressed as (Diagonal)² ÷ 2.

Square Identity

Recall that $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)(a + b) = a^2 - b^2$ for various polynomial side lengths.

Q10. Answer: (b) 5

The logic followed here is :

Given series: (Left) K B # A @ S * B Q @ R V N % & S (Right)

The element that is third from the right end is %

(Left) K B # A @ S * B Q @ R V N % & S (Right)

The element that is sixth from the left end of the given series is S

(Left) K B # A @ S * B Q @ R V N % & S (Right)

(Left) K B # A @ S * B Q @ R V N % & S (Right)

Thus, there are a total of 5 letters that are B, Q, R, V, N

Hence, the correct answer is "Option 2".

Q11. Answer: (b) (1, -2)

Shortcut Trick

For the quadratic equation $x^2 + x - 2 = 0$, find two numbers whose sum is −1 (−b/a) and product is −2 (c/a).

The numbers 1 and −2 satisfy these conditions: 1 + (−2) = −1 and 1 × (−2) = −2.

Therefore, the roots of the equation are 1 and −2.

Therefore The correct answer is (1, −2).

Alternate Method

Given:

The quadratic equation is $x^2 + x - 2 = 0$.

Formula Used:

We use the factorization method (splitting the middle term) where we split the coefficient of x into two numbers whose sum is 1 and product is −2.

Calculations:

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

=> $x(x + 2) - 1(x + 2) = 0$

=> $(x + 2)(x - 1) = 0$

Now, set each factor equal to zero:

=> $x + 2 = 0 \rightarrow x = -2$

=> $x - 1 = 0 \rightarrow x = 1$

The roots are 1 and −2.

Therefore The correct answer is (1, −2).

Additional Information

Nature of Roots

For $ax^2 + bx + c = 0$, the discriminant $D = b^2 - 4ac$ determines the nature: if $D > 0$, roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.

Sum and Product of Roots

For a quadratic equation, the Sum of roots $(\alpha + \beta) = -b/a$ and the Product of roots $(\alpha\beta) = c/a$.

Quadratic Formula

The roots can also be found using $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$.

Q12. Answer: (d) PC Mahalanobis Model

The correct answer is the PC Mahalanobis model.

Key Points

• The Second Five-Year Plan is based on the so-called Mahalanobis model. This was the USSR model Indianized by PC Mahalanobis, the founder of the Indian Statistical Institute and close aid of Nehru.

• This Model is known to have set the statistical foundation for state-directed investment and created the intellectual underpinnings of the License Raj through an elaborate input-output model.

• This Model suggested that heavy industries should be emphasized, which can lead the Indian economy to a long-term higher growth path.

• India's Second Five-Year Plan and Industrial policy Resolution 1956, which paved the way for the Development of the Public Sector and License Raj were based upon this model.

• The Second Five-Year plan, based on a Socialistic pattern, targeted an increase of 25% in National Income by Rapid Industrialization; however, achieved a target of only 20%. Further, per capita income grew by 8% only.

• During this plan Domestic Production of Industrial products was encouraged, particularly in the development of the Public Sector.

• During this Plan Period the Industry policy resolution was amended and the primary responsibility for development was left to the Public Sector.

• The Private Sector was more or less confined to the Consumer Industries only.

Additional Information

• The Harrod Domar Model is a Keynesian Model of Economic Growth in development economics, developed by F. Harrod in 1939 and Evsey Domar in 1946. This Model focused on understanding economic instability by analyzing the Dynamic nature of Capital and Investment.

• Manmohan Plan abolished licensing in all industries except a few of the 18 MRTP companies, which were free from the ceiling limit of assets. It reduced import barriers to globalizing the economy, by granting greater autonomy and making management more professional.

• Features of the Manmohan plan were,

1. Devaluation of the rupee was carried out against major Currencies by around 9 percent on 1 July 1991.

2. India's Gold holdings were pledged with the Bank of England in four tranches from 4-18 July 1991 raising around $ 400 million through this route.

• The Planning Commission of India was an Institution of the Government of India. It is a Non-Constitutional body, whose main task was to make Five-Year Plan. On 13th August 2014, the Planning Commission was abolished and replaced by the NITI Aayog, effective from Jan 1st, 2015.

• The fifth Five-Year Plan (1974-79) was also called the 'Investment Model of Planning Commission'.

• The 2 main Objectives of this Plan were

1. Poverty Eradication.

2. Attainment of Self-reliance.

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Q13. Answer: (d) 8,000

Shortcut Trick

Total additional interest percentage = Increase in Rate × Time

=> 2% × 4 years = 8%

Given that this 8% is equal to Rs. 640.

=> 100% (Principal) = (640 ÷ 8) × 100 = 80 × 100 = 8000

Therefore The correct answer is Rs. 8000.

Alternate Method

Given:

Time (T) = 4 years

Increase in Rate (R_(diff)) = 2%

Increase in Simple Interest (SI_(diff)) = Rs. 640

Formula Used:

Simple Interest (SI) = (Principal × Rate × Time) ÷ 100

Increase in Interest (SI_(diff)) = (Principal × R_(diff) × Time) ÷ 100

Calculations:

=> 640 = (Principal × 2 × 4) ÷ 100

=> 640 = (Principal × 8) ÷ 100

=> Principal × 8 = 640 × 100

=> Principal = 64000 ÷ 8

=> Principal = 8000

Therefore The correct answer is Rs. 8000.

Additional Information

Compound Interest Formula

The amount (A) in compound interest is calculated as $A = P(1 + r/100)^n$, where P is principal, r is rate, and n is time.

Difference between CI and SI

For a period of 2 years, the difference between CI and SI is given by $P(r/100)^2$.

Effective Rate of Interest

In simple interest, the effective rate for T years at R% is simply (R × T)%. For compound interest, it follows the successive percentage change rule.

Q14. Answer: (d) Article 154

The correct answer is Article 154.

Key Points

• The Indian Constitution's Article 154 addresses the State's administrative authority.

• It stipulates that the governor shall have the executive authority of the state and shall exercise such authority directly or through persons who report to him in line with this Constitution.

• Discussions of Draft Article 130 (Article 154) took place on 30 May 1949 and 16 October 1949. It gave a State's government control over its executive branch.

• By Article 154, the governor has the authority to act directly as the state's executive head or through representatives who answer to him.

• Nothing in this article shall be construed as preventing parliament or the state Legislature from establishing positions for any authority under the Governor through legislative action or from transferring to the Governor any duties granted to any other authority by any law currently in force.

• The governor will have the authority to act in the state's executive capacity, provided that they do so by the law and the Constitution.

Additional Information

• Article 124 deals with the Establishment and constitution of the supreme court. It states that there shall be a Supreme court of India constituting of a Chief Justice of India and, until Parliament by law prescribes a larger number, of not more than seven other judges.

• Article 144 of the Indian constitution advises civil and Judicial authorities to act in aid of the Supreme Court. It says that all authorities, civil and judicial, in the territory of India shall act in aid of the Supreme court.

• Article 134 with the Appellate Jurisdiction of the Supreme court in Criminal cases.

• Article 134 A deals with the Certificate for appeal to the supreme court in civil cases.

Q15. Answer: (c) Cs > Rb > K > Na > Li

The correct answer is Cs > Rb > K > Na > Li.

Key Points:

• Lithium:

• Atomic number- 3

• Symbol- Li

• Electronic configuration: 2, 1

• Sodium-

• Atomic number- 11

• Symbol- Na

• Electronic configuration: 2, 8, 1

• Potassium-

• Atomic number- 19

• Symbol- K

• Electronic configuration: 2, 8, 8, 1

• Rubidium-

• Atomic number- 37

• Symbol- Rb

• It's Electronic configuration: 2, 8, 18, 8, 1

• Caesium-

• Atomic number- 55

• Symbol- Cs

• Electronic configuration: 2, 8, 18, 18, 8, 1

• This demonstrates that, among the specified elements in a group, lithium has the smallest atomic radius and cesium has the biggest atomic radius.

Additional Information:

• The atomic radius of an element essentially serves as a gauge for atom size.

• It is commonly stated as the sum of the distances between an atom's nucleus and its outermost orbital of electrons.

• Calculating an atom's atomic radius requires the use of spectroscopic methods such as X-rays or others.

• The atomic radii of elements are shown in a regular way on the periodic table.

Q16. Answer: (d) T < A

Given statement : J < P = C, T < Q < M = J < A

Let us check the conclusion for the given options:

Option 1) A > P → False

A > J < P : we cannot conclude the relation between A and P.

Option 2) C = A → False

J < P = C so J < C and J < A : no direct relationship found between C and A.

Option 3) P > A → False

J < P and J < A : no direct relationship found between P and A.

Option 4) T < A → True

T < Q < M = J < A,

T < M = J < A if both are equal then we can use any one of them

T < M/J < A so T is smaller than A.

Hence, the correct answer is Option 4.

Q17. Answer: (b) Only conclusion I follows

The least possible venn diagram of given statement is,

Conclusions:

(I) Some monkeys are cats. → True (As there is a definite relation between Monkeys and Cats as shown above)

(II) All monkeys are rats. → False (As all rats are dogs but not all monkeys are rats)

Hence, the correct answer is "Option 2".

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Q18. Answer: (d) E

Explanation:

Step 1:

• C travelled in 2018.

• Only three people travelled between D and A.

• A travelled after D

People	Year
	2010
D	2012
	2014
	2016
C	2018
A	2020

Step 2:

• Only one person travelled between F and E.

• F travelled before E.

People	Year
F	2010
D	2012
E	2014
B	2016
C	2018
A	2020

Thus, E travelled in 2014.

Hence, the correct answer is "Option 4".

Q19. Answer: (a) Only conclusions III follows

The least possible Venn diagram of the given statement is,

Conclusions:

I. Some towels are conditioners.→ False (It is given that No conditioner is a towel)

II. No shampoo is a towel.→ False (There is no definite relation between shampoo and towels as shown above)

III. Some brushes are shampoos. → True (As all shampoos are brushes so some brushes are shampoos)

Hence, the correct answer is "Option 1".

Q20. Answer: (c) Only (a) and (b)

Shortcut Trick

1. Angle Bisectors: In a parallelogram, adjacent angles sum to 180°. Their bisectors meet at 90°, forming a rectangle. (True)

2. Trapezium: A trapezium requires at least one pair of parallel sides. A parallelogram has two, so it is always a trapezium. (True)

3. Rhombus: Diagonals of a rhombus are perpendicular bisectors but are not equal unless it is a square. (False)

Therefore The correct answer is Only (a) and (b).

Alternate Method

Given: Properties of a parallelogram, trapezium, and rhombus.

Formula/Property Used:

1. Sum of adjacent angles of a parallelogram = 180°.

2. Definition of Trapezium: A quadrilateral with at least one pair of parallel sides.

3. Rhombus diagonals bisect each other at 90° but are unequal in length.

Calculations:

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=> Statement (a): In parallelogram ABCD, angle A + angle B = 180°. Let bisectors of angle A and angle B meet at P. In ΔAPB, angle PAB + angle PBA = 1/2(angle A + angle B) = 1/2 × 180° = 90°. Therefore angle APB = 180° − 90° = 90°. Similarly, all angles of the inner quadrilateral are 90°, making it a rectangle. (True)

=> Statement (b): A trapezium is defined as a quadrilateral with at least one pair of parallel sides. Since a parallelogram has two pairs of parallel sides, it satisfies the condition. (True)

=> Statement (c): For a rhombus, diagonals bisect each other at 90°, but they are equal only if the rhombus is a square. Thus, they are not always equal. (False)

Therefore The correct answer is Only (a) and (b).

Additional Information

Properties of a Rhombus

All sides are equal, opposite angles are equal, and diagonals are perpendicular bisectors of each other.

Rectangle and Square

A rectangle is a parallelogram with four right angles. A square is a special rhombus where all angles are 90° and diagonals are equal.

Trapezium Classification

Under the inclusive definition, parallelograms, rhombuses, rectangles, and squares are all special types of trapeziums.

Q21. Answer: (b) 20

Shortcut Trick

Map distance 1 unit represents 400000 units actual distance.

Actual distance = 5 cm × 400000 = 2000000 cm.

To convert cm to km, divide by 100000 (since 1 km = 10^5 cm).

Actual distance = 2000000 ÷ 100000 = 20 km.

Therefore The correct answer is 20 km.

Alternate Method

Given:

Distance on map = 5 cm

Scale = 1 : 400000

Formula Used:

Actual Distance = Map Distance × Scale Factor

Calculations:

=> Actual distance in cm = 5 × 400000

=> Actual distance in cm = 20,00,000 cm

=> Convert cm to meters: 20,00,000 ÷ 100 = 20,000 m

=> Convert meters to km: 20,000 ÷ 1000 = 20 km

Therefore The correct answer is 20 km.

Additional Information

Representative Fraction (RF)

It is the ratio of map distance to actual distance, expressed as 1/n where both quantities are in the same units.

Unit Conversion Rule

1 km = 1,000 meters = 1,00,000 centimeters. Use this to shift decimals during map calculations.

Linear Scale

A line divided into equal parts used on maps to measure distances directly in ground units.

Q22. Answer: (b) Marathi

The correct answer is Marathi.

Key Points

• The third most spoken language of India is Marathi which has 8.30 crore speakers according to the 2011 Census data.

• It is spoken by 6.86% of the total population.

• The census of India 2011 was organized in 2 stages trials House listing and Housing Census and Population Enumeration. The population of India has been augmented by more than 181 million during the decade 2001-2011.

• As per the 2011 census population report of India is pegged at 1.21 billion, a surge of more than 181 million in the last 10 years.

• The 15th Census of India and the 7th Census of Independent India-2011 were started on 1st April 2010 with the president being

the first citizen to be enumerated, followed by the Vice President of India.

• The Slogan of the census 2011 was 'our Census, Our future'. C. Chandramouli was the Census Commissioner of India in 2011.

• Census of India 2011 was conducted in 2 stages:

• House listing and Housing Census: (April to September 2010)

• Population Enumeration (9th to 28 February 2011).

• The population of the nation as per the provisional figures of Census 2011 is 1210.19 million of which 623.7 million (51.54%) are males and 586.46 million (48.46%) are females.

• Uttar Pradesh is the most populous state in India its population is more than the population of Brazil.

Additional Information

• The second most spoken language in India by the number of speakers is Bengali which has 9.72 crore speakers. The Bengali-speaking population is 8.03% of the total population.

• According to the 2011 Census data Gujarati is the 6th most spoken language and it has 5.54 crore speakers. Also, it is estimated that 4.58% of the total population speaks this language. It is the official language of Gujarat. Also, the official language of Daman, Diu, Dadra, and Nagar Haveli is in India.

• According to the 2011 Census Tamil is the 5th most spoken language in India. it is spoken by 6.90 crore speakers, which is 5.70% of the total population. It is widely spoken in the areas of Tamil Nadu, Puducherry, and Andaman & Nicobar Islands.

Q23. Answer: (b) 12

Shortcut Trick

Average of squares ≈ 74 ÷ 2 = 37.

The perfect square nearest to 37 is 36, which is 6^2.

Since the numbers are consecutive odd natural numbers, they must be 6 − 1 = 5 and 6 + 1 = 7.

Check: $5^2 + 7^2 = 25 + 49 = 74$. (Satisfied)

Sum = 5 + 7 = 12.

Therefore The correct answer is 12.

Alternate Method

Given: Sum of squares of two consecutive odd natural numbers = 74.

Formula Used: $(a + b)^2 = a^2 + 2ab + b^2$

=> Let the two consecutive odd numbers be x and x + 2.

=> $x^2 + (x + 2)^2 = 74$

=> $x^2 + x^2 + 4x + 4 = 74$

=> $2x^2 + 4x - 70 = 0$

=> $x^2 + 2x - 35 = 0$

=> $x^2 + 7x - 5x - 35 = 0$

=> $x(x + 7) - 5(x + 7) = 0$

=> $(x - 5)(x + 7) = 0$

=> x = 5 (since it is a natural number, ignore x = −7).

=> The numbers are 5 and 5 + 2 = 7.

=> Sum = 5 + 7 = 12.

Therefore The correct answer is 12.

Additional Information

Consecutive Odd/Even Numbers

The difference between any two consecutive odd or consecutive even numbers is always 2.

Sum of First n Odd Numbers

The sum of the first n odd natural numbers is given by the formula n^2.

Quadratic Roots Nature

For a quadratic equation $ax^2 + bx + c = 0$, the sum of roots is −b/a and the product is c/a.

Q24. Answer: (a) 19 December

The correct answer is 19 December.

Key Points

• The day marks the occasion when the Indian armed forces freed Goa in 1961 from 450 years of Portuguese rule.

• The Portuguese colonized several parts of India in 1510 but by end of the 19th century Portuguese colonies in India were limited

to Goa, Daman, Diu, Dadra, Nagar Haveli, and Anjediva Island(a part of Goa).

• As India gained independence on 15th August 1947, it requested the Portuguese to cede their territories but they refused.

• Following a myriad of unsuccessful negotiations and diplomatic efforts with the Portuguese, the former Prime minister of India, Jawaharlal Nehru, decided that military intervention was their only option.

• The 36-hour military operation, conducted on December 18, 1961, was code-named 'Operation Vijay' meaning 'Operation Victory', and involved attacks by the Indian Navy, Airforce, and Army.

• The Goa liberation movement started with small-scale revolts but reached its peak between 1940 to 1960.

• During the historic moment, Indian troops reclaimed the Goan territory with little resistance, and General Manuel Antonio Vassalo e Silva signed the certificate of surrender.

• 451 years of Portuguese rule in the region officially came to end and the territory was taken back by India on December 19, 1961.

• The action incited mixed responses internationally at the time. Though many praised the move and backed India, others, including Portugal, criticized the Indian forces "invasion" of Goa.

• Now Goa Liberation Day is marked by an abundance of events and festivities in Goa.

• A torchlight procession is ignited from 3 different locations in the state, eventually all meeting at the Azad Maidan.

• This is where Tribute is made to those who lost their lives in the takeover of Goa.

Q25. Answer: (c) The solution turns milky.

The correct answer is The solution turns milky.

Key Points:

• Calcium oxide is known as quicklime or pure lime.

• As a result of its chemical characteristics and simplicity of production, it is a significant industrial chemical.

• Calcium hydroxide and water can be combined to create limewater, which can then be purified to remove any extra undissolved solids.

• Lime water is calcium hydroxide, and when carbon dioxide gas is pumped through it for a brief period of time, calcium carbonate forms and causes the limewater to turn milky.

• Following is the reaction:

• $CO2+ Ca(OH)2 => CaCO3 + H2O$

_(Additional Information:)

• Milkiness of lime water:

• When too much carbon dioxide is added to lime water, the developed milkiness disappears.

• The reason for this is calcium bicarbonate, which is colourless and water soluble, develops.

• Following is the reaction:

• $CaCO3 + H2O + CO2 => Ca(HCO3)2$.

Q26. Answer: (d) horses

The correct answer is horses.

Key Points

• CSIR-Centre for Cellular and Molecular Biology (CCMB), VINS Bioproducts, and the University of Hyderabad (UOH) has collaborated to create the drug 'Vincov-19'.

• To create this drug, the SARS-CoV-2 virus is inactivated and injected into horses.

• The antibodies that are generated through the blood serum are synthesized and then purified and turned into a drug. this drug is then injected into humans to neutralize the COVID virus.

• CSIR-Centre for Cellular and Molecular Biology (CCMB), is an Indian fundamental life science research institute based in Hyderabad.

• UNESCO'S Global Molecular and Cell Biology Network have designated CCMB as a "center of excellence." It is a leading research institute that conducts high-quality basic research and training in areas of modern biology, as well as promoting centralized national facilities for new techniques in interdisciplinary fields of biology.

• On April 1, 1977, it was established as a semi-autonomous center.

• Phase 2 clinical trials of 'Vinco-19' were conducted across multiple centers in the country involving over 200 patients and were completed in September. These trials also included testing the antidote against the Omicron variant to ensure maximum coverage against the virus and its known mutation.

• One group of patients was given VINCOV-19, along with Standard Care (SoC), and another group was given Standard of Care only. VINCOV-19 showed an excellent safety profile in the phase 2 trials. There were good and early improvements in the clinical condition of the patients administered VINCOV-19.

• VINCOV-19 contains Equine polyclonal antibodies (EpAbs) against the COVID-19 virus and comprises highly purified F(ab)2 antibody fragments that have a high neutralizing capacity against the SARS-CoV-2 virus.

• Since neutralizing antibodies could block the internalization of SARS-CoV-2 to lung cells, it was postulated that their passive administration should render maximal clinical benefits if they are applied at the early stages of the disease.

• UoH Vice-Chancellor B.J. Rao congratulated the team members for their efforts in completing phase 2 trials for VINCOV-19 and the academia and industry collaboration.

Q27. Answer: (d) CH4O

The correct answer is CH4O.

Key Points:

• We examine possible intermolecular forces that may be in play and prevent the molecules from breaking apart.

• The one with the lowest boiling point will have the weakest IMF.

• All the others have dispersion plus either dipole-dipole (C4H10O, C3H8O, C2H6O) or hydrogen bonding, whereas CH4O simply possesses dispersion forces.

• Therefore, the lowest boiling point will be for CH4O.

Additional Information:

• Methanol has the chemical structure CH4O.

• It falls under the category of alcohol because of the hydroxyl group.

• Alcohols are designated by the suffix "-al" in the IUPAC nomenclature.

• It consists of four hydrogen atoms, one oxygen atom, and one carbon atom.

• As a result, the geometric centers of methanol are carbon and oxygen.

Q28. Answer: (d) tq, ae

The given statements are:

• ‘now you can come’ is written as ‘wp ae nz rf’,

• “you are kind’ is written as ‘ae dz tq’

• ‘kind is virtue’ is written as ‘tq sf be’.

The logic followed here is:

Thus, 'Kind, You' is coded as 'tq, ae'

Hence, "Option 4" is the correct answer.

Q29. Answer: (c) Rs. 3,300

Shortcut Trick

Convert percentage to fraction: 36(2/3)% = 11/30.

Let Total Income = 30 units, then Expenditure = 11 units.

Savings = 30 − 11 = 19 units.

Given: 19 units = Rs. 5,700 => 1 unit = Rs. 300.

Monthly Expenses = 11 units = 11 × 300 = Rs. 3,300.

Therefore The correct answer is Rs. 3,300.

Alternate Method

Given:

Expenditure Percentage = 36(2/3)% = 110/3%

Monthly Savings = Rs. 5,700

Calculations:

=> Savings Percentage = 100% − 36(2/3)% = 63(1/3)%

=> 63(1/3)% = 190/3%

=> According to the question, (190/3)% of Total Income = 5,700

=> Total Income = (5,700 × 3 × 100) / 190

=> Total Income = 30 × 3 × 100 = Rs. 9,000

=> Monthly Expenses = Total Income − Savings

=> Monthly Expenses = 9,000 − 5,700 = Rs. 3,300

Therefore The correct answer is Rs. 3,300.

Additional Information

Percentage to Fraction Conversion

Common fractions like 33(1/3)% = 1/3 and 66(2/3)% = 2/3 help in faster calculations during exams.

Income, Expenditure and Savings Relation

Income = Expenditure + Savings. Always ensure the sum of percentages equals 100%.

Base Change in Percentages

If A is x% more than B, then B is [x / (100+x)] × 100 % less than A.

Q30. Answer: (d) 6

As we can clearly see that:

The people who are researchers, scientists, and professors are 8.

And the people who are Researchers and Scientists but Not Professors are 6.

Hence, "Option 4" is the correct answer.

Q31. Answer: (d) 0.67 A

The correct answer is 0.67A.

Given:

Three resistors of 5 Ω are connected in series and V=10V

Formula:

Ohm's law: V=IR

Calculations:

As the three resistors are connected in series, their equivalent resistance is:

Rs=5+5+5=15Ω

Now by applying Ohm's law we get:

V=IR

I=V/R=10/15=0.67A

Thus, the current flowing is 0.67A.

Q32. Answer: (a) Bharat Sanchar Nigam Limited (BSNL)

The correct answer is Bharat Sanchar Nigam Limited (BSNL).

Key Points

• On July 27, the Union Cabinet authorized a 1.64 lakh crore package for the rehabilitation of the state-owned telecom provider Bharat Sanchar Nigam Limited (BSNL), in yet another attempt to bring it back to life.

• The package will include the administrative allotment of 4G spectrum worth 44,993 crores, which contains a cash component worth 43,964 crores and a non-cash component worth 1.2 lakh crores spread over four years. The ambitious Bharat Net project's implementation vehicle, Bharat Broadband Network Ltd (BBNL), would also be amalgamated into BSNL.

• Bharat Sanchar Nigam Limited, also known as BSNL, is an Indian central public sector organization with its headquarters in New Delhi. The owner is the Department of Telecommunications within the Ministry of Communications of the Government of India. The Indian government formally incorporated it on October 1st, 2000.

Additional Information

• Air India

• With an 18.6% market share, Air India dominates the Indian international aviation industry.

• More than 60 foreign locations on four continents are served by Air India. As the 27th member of Star Alliance, the airline joined on July 11, 2014. The airline was started by J. R. D.

• Container Corporation of India Limited (CONCOR)

• The Container Corporation of India Ltd. (CONCOR) was established in March 1988 in accordance with the Companies Act, and it started operating in November 1989 after assuming control of the Indian Railways' previous network of seven ICDs.

• CONCOR is dedicated to offering its clients responsive, affordable, effective, and dependable logistics solutions. It aspires to be the top option for its clients. Customer satisfaction, performance, and results are the top priorities at CONCOR, which is committed to giving its clients value for their money.

• Oil and Natural Gas Corporation Limited

• The Ministry of Petroleum and Natural Gas, Government of India, is the owner of the Oil and Natural Gas Corporation (ONGC), a central public sector organization. Its main office is in New Delhi. The Indian government formed ONGC on August 14, 1956.

• It is the largest government-owned oil and gas explorer and producer in the nation and produces over 84% of India's natural gas and about 70% of its crude oil, which corresponds to around 57% of the nation's total consumption.

• The Indian government granted ONGC the Maharatna designation in November 2010.

Q33. Answer: (d) 18

Logic : First number × 2 + 2 = Second number

3 : 8 → 3 × 2 + 2 => 6 + 2 = 8

and,

7 : 16 → 7 × 2 + 2 => 14 + 2 = 16

Similarly,

4 : 10 → 4 × 2 + 2 => 8 + 2 = 10

and,

8 : ? → 8 × 2 + 2 => 16 + 2 = 18

Thus, ? can be replaced with 18

Hence, "Option 4" is the correct answer.

Q34. Answer: (b) 30 meters South

From the given information:

Step 1: Jayant started from a point ‘A’ and walked 15 meters towards South. He turned left and walked 20 meters.

Step 2: He then. turned right and walked 15 meters. He again turned right and walked 20 meters and reached a point ‘B’.

Distance from Point A to B = 15m + 15m = 30m

From the diagram, we can see that point B is 30 meters south from point point A.

Hence the correct answer is option 2).

Q35. Answer: (d) is perpendicular to the focal plane

The correct answer is perpendicular to the focal plane.

Key Points:

• The mirror surface will always be struck perpendicularly by a ray passing through the centre of curvature.

• As a result, both the angle of incidence and the angle of reflection are zero.

• As a result, the light ray will essentially go in the same direction.

• If you can extend the path to the centre of curvature, this also applies to convex mirrors.

Additional Information:

• Different kinds of images can be created by shifting the object's position in the concave mirror.

• When an object is positioned, various images are created:

• Towards infinity.

• Past the point of curvature.

• In the centre of the curve.

• Between the major focus and the centre of curvature.

• The primary emphasis.

• Between the pole and main focus.

Q36. Answer: (a) 25 km

From the given information:

Step 1: Chitra starts driving from the resort and drives 15 km towards west and then turns left and drives 115 km.

Step 2: Then she turns right and drives 25 km. After that, she again tums right and drives 90 km.

Step 3: She finally turns right and drives 40 km to reach her home.

Distance from resort to home = 115 - 90 = 25 km

From the diagram, we can see that resort is 25 km away from her home.

Hence, the correct answer is option 1).

Q37. Answer: (b) B > Z > L

Given statement: C ≥ V < B ≥ N > Z > L

Now we consider the given options:

Option 1) C ≥ V < L → False

We have C ≥ V but V < L is incorrect because there is no direct relation between V and L.

Option 2) B > Z > L → True

We have B ≥ N > Z > L

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Option 3) C > B ≥ N → False

We have B ≥ N but C > B is incorrect because we can not conclude the relation between C and B.

Option 4) B > L > V → False

We have B > L but L > V is incorrect.

Hence, the correct answer is option 2).

Q38. Answer: (a) 16

Shortcut Trick

In a proportion, the product of means equals the product of extremes.

Middle terms (means) are y and 7; Outer terms (extremes) are 14 and 8.

y = (14 × 8) ÷ 7

y = 2 × 8 = 16

Therefore The correct answer is 16.

Alternate Method

Given: 14 : y :: 7 : 8

Formula Used: a : b :: c : d => a/b = c/d

=> 14/y = 7/8

=> 7 × y = 14 × 8

=> y = (14 × 8) ÷ 7

=> y = 112 ÷ 7

=> y = 16

Therefore The correct answer is 16.

Additional Information

Fourth Proportional

If a, b, c, and d are in proportion (a:b::c:d), then d is the fourth proportional and is calculated as d = (b × c) / a.

Mean Proportional

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

Continued Proportion

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

Q39. Answer: (c) M

From the given information:

Step 1: K and N live on the topmost and bottommost floors, respectively.

We place K on top and N on bottom.

Step 2: M lives on the floor immediately above N.

Now we place M above N.

Step 3: J lives on the floor immediately above L.

Now we have to place J and L such that J is above L.

From the arrangement, we can see that M lives on second floor.

Hence, the correct answer is option 3).

Q40. Answer: (d) the direction of both, the magnetic field and the current

The correct answer is the direction of both, the magnetic field and the current.

Key Points:

• A conductor is said to generate an electric current when it moves through a magnetic field in accordance with Faraday's law of electromagnetic induction.

• The direction of the induced current is determined using Fleming's right-hand rule.

• A force perpendicular to the field's direction and the direction of the current flow is experienced by a current-carrying conductor when it is exposed to an external magnetic field.

• To determine the force operating on a current-carrying conductor in a magnetic field, Fleming's left-hand rule is utilized.

• The thumb should point in the direction of force acting on the conductor.

• When the thumb, index finger, and middle finger are all placed mutually perpendicular to one another, with the middle finger pointing in the direction of current flow and the index finger pointing in the direction of the magnetic field.

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Additional Information:

• We can see that the right-hand rule applies to generators and the left-hand rule applies to motors.

• There are two visual mnemonics called Fleming's left-hand rule and Fleming's right-hand rule (mnemonics are learning techniques or memory aids, such as an abbreviation, rhyme or mental image that helps to remember something).

• In reality, these laws are only ever applied as a handy ruse to ascertain the resultant's direction—current or thrust.

• The Lorentz Force determines the magnitude of force along this direction according to these rules.

Q41. Answer: (d) 1/8 times

Shortcut Trick

Volume of a sphere is proportional to the cube of its radius (V prop. to r^3).

If the radius is scaled by a factor of 1/2, the volume scales by $(1/2)^3$.

$(1/2)^3 = 1/8$.

Therefore The correct answer is 1/8 times.

Alternate Method

Given: Original radius = r, New radius = r/2.

Formula Used: Volume of sphere = $(4/3)\pi r^3$

=> Original Volume (V1) = $(4/3)\pi r^3$

=> New Volume (V2) = $(4/3)\pi(r/2)^3$

=> V2 = $(4/3)\pi(r^3/8)$

=> V2 = $(1/8) \times [(4/3)\pi r^3]$

=> V2 = (1/8) × V1

Therefore The correct answer is 1/8 times.

Additional Information

Surface Area Change

Surface area of a sphere is $4\pi r^2$. If the radius is halved, the area becomes $(1/2)^2 = 1/4$ of the original.

Hemisphere Volume

The volume of a hemisphere is exactly half of a sphere: $V = (2/3)\pi r^3$.

Ratio of Volumes

If the ratio of radii of two spheres is a:b, then the ratio of their volumes is $a^3:b^3$.

Q42. Answer: (c) Juned Khan

The correct answer is Juned Khan.

Key Points

• When they took first place in the ninth Indian Open Race-Walking Competition, Juned Khan of Haryana and Ramandeep Kaur of Punjab respectively rewrote the men's and women's 35km race walking National Records.

• Juned Khan, who did so in 2:40:16.00, set the previous national record.

• After 20 kilometres in the men's race, Juned Khan, 22, separated himself from Ram Baboo and Chandan Singh, lowering the national record by five minutes.

Additional Information

• Ram Baboo

• On the final day of sports activities at the National Games in this city on Tuesday, Uttar Pradesh athlete Ram Baboo set a new national record for the 35km race walk with a time of 2 hours, 36 minutes, and 34 seconds.

• The 23-year-old Ram Baboo easily defeated Haryana's Juned Khan, who finished in 2:40:51.00 here and held the national record of 2:40:16.00 set in the National Race Walking championships in Ranchi this year, in a race that was established last year and made its National Games debut this week.

• Chandan Singh

• Chandan Singh, an Indian racewalker who competes in the 20-kilometer and 20-kilometer walk races, was born on June 8, 1987.

• Akshdeep Singh

• Akshdeep Singh, a trainee at SAI Bengaluru, took home the gold medal in the men's 20-kilometre racewalk in the Khelo India University Games in 2021.

• Before heavy rain stopped the athletic competition at the 2nd Khelo India University Games at the Sree Kanteerava Stadium, Akshdeep Singh of Punjabi University won the gold medal in the men's 20km race walk and Aparna Roy of Kerala won the women's 100m hurdles.

Q43. Answer: (a) One

We arrange the given number in ascending order from left to right and then compare it with the given order:

We can see that the position value of only '2' remains unchanged.

Hence the correct answer is option 1).

Q44. Answer: (c) round and yellow seeds

The correct answer is round and yellow seeds.

Key Points:

• Following the principles of Mendelian genetics, specifically the concept of dominant and recessive traits, let's define the traits given:

• Round seeds (R) are dominant over wrinkled seeds (r).

• Yellow seeds (Y) are dominant over green seeds (y).

• A round, green-seeded plant would have the genotype RRyy.

• A wrinkled, yellow-seeded plant would have the genotype rrYy

• For simplicity, we'll assume the round, green seeded plant is (Rryy).

• When these two plants are crossed (Rryy x rrYy), the resulting F1 generation will inherit one allele from each parent for each trait.

• Possible combinations:

• The round seed trait (R) is dominant, so any offspring with at least one R allele will have round seeds.

• The yellow seed trait (Y) is also dominant, so any offspring with at least one Y allele will have yellow seeds.

• The potential combinations for the F1 generation are:

• RrYy (round, yellow)

• Rryy (round, green)

• rrYy (wrinkled, yellow)

• rryy (wrinkled, green)

• However, the dominant traits (round and yellow) will be most likely observed in the F1 generation since the cross involves dominant alleles.

• Given this cross, the F1 generation will most likely exhibit the dominant traits.

Additional Information:

• Allogamy, or cross-fertilization, is the union of gametes (sex cells) from male and female individuals of the same species.

• All animal species with separate male and female individuals as well as dioecious plants (those with male and female organs on separate individuals) require cross-fertilization.

• Many species of hermaphrodites, or organisms that generate both sperm and eggs in the same individual, have highly evolved mechanisms that assure cross-fertilization.

• In addition, many hermaphrodite species that are able to cross-fertilize are also able to self-fertilize.

Q45. Answer: (d) RA = 36 Ω and RB = 20 Ω

The correct answer is option 4) RA = 36 Ω and RB = 20 Ω

Given:

12 resistors each of resistance RA and R_B and it is having Ia=10A,Ib=18A

whose voltage is V=30V

Formula used:

Ohm's law: V=IR

Calculations:

As per the given statement in each circuit, the resistors are in such a way that the net resistance of each circuit is the minimum the resistors must be arranged in parallel. So their net resistance would be:

1/(R'a)=12*1/Ra

1/(R'b)=12*1/Rb

Thus using Ohm's law we get for circuit A:

V=IR

30=Ia*R'a

30=10*Ra/12

Ra=(12*30)/10=360/10=36Ω

Similarly for circuit B we have:

V=IR

30=Ib*R'b

30=18*Rb/12

Rb=(12*30)/18=360/18=20Ω

Therefore we have the resistances values as RA = 36 Ω and RB = 20 Ω.

Q46. Answer: (a) Ammonium cyanate

The correct answer is Ammonium cyanate.

Key Points

• Ammonium cyanate is transformed into urea during the Wöhler synthesis.

• Friedrich Wöhler first wrote about this chemistry-related process in 1828.

• It is regularly credited with serving as the foundation for contemporary organic chemistry.

Additional Information

• Friedrich Wohler produced urea for the first time.

• Potassium cyanate and ammonium sulfate are dissolved in water in an equimolecular ratio.

• Ammonium Cyanate, which has the same chemical makeup as urea, was produced as a result of this reaction.

• A gas with no smell or color is called carbon monoxide (CO).

• It can result in rapid disease and death and is created whenever fossil fuel is burned.

• The CDC collaborates with local, state, national, and other partners to track CO-related disease and death monitoring data in the United States and to increase public awareness of CO poisoning.

• Ammonia is a poisonous gas or liquid that, when concentrated, corrodes bodily tissues on contact.

• It is possible to die from ammonia exposure at large enough doses.

• Ethanenitrile, CH3CN, the smallest organic nitrile, was once known as methyl cyanide or acetonitrile and is occasionally still referred to as than nitrile.

Q47. Answer: (d) $4x^2 - 4x - 8 = 0$

Shortcut Trick

Expand both sides of the equation: (x3 − x2 + x − 1) = (x3 + 3x2 − 3x − 9).

Cancel the common x3 term from both sides: −x2 + x − 1 = 3x2 − 3x − 9.

Rearrange the terms to the right side to keep the x2 coefficient positive: 4x2 − 4x − 8 = 0.

Therefore The correct answer is 4x2 − 4x − 8 = 0.

Alternate Method

Given: (x2 + 1)(x − 1) = (x2 − 3)(x + 3)

Formula Used: Standard representation of a quadratic equation is ax2 + bx + c = 0.

=> x2(x − 1) + 1(x − 1) = x2(x + 3) − 3(x + 3)

=> x3 − x2 + x − 1 = x3 + 3x2 − 3x − 9

=> −x2 + x − 1 = 3x2 − 3x − 9 (since x3 cancels out)

=> 3x2 + x2 − 3x − x − 9 + 1 = 0

=> 4x2 − 4x − 8 = 0

Therefore The correct answer is 4x2 − 4x − 8 = 0.

Additional Information

Standard Form of Quadratic Equation

A quadratic equation is always expressed as ax2 + bx + c = 0, where a, b, and c are real numbers and a ≠ 0.

Discriminant and Roots

The nature of roots is determined by D = b2 − 4ac. If D > 0, roots are real and distinct; if D = 0, roots are real and equal.

Simplification Rule

While 4x2 − 4x − 8 = 0 is the standard representation, it can be further simplified to x2 − x − 2 = 0 by dividing the entire equation by 4.

Q48. Answer: (c) 78

Shortcut Trick

Check options for sum of digits = 15: 7+8 = 15 (Only option 3 and 4 fit, but 9+8=17).

Check the difference rule: If digits are x and y, then 10y + x − (10x + y) = 9(y − x).

Given 9(y − x) = 9 => y − x = 1.

Digits of 78: 8 − 7 = 1. Condition satisfied.

Therefore The correct answer is 78.

Alternate Method

Given: Sum of digits = 15. Interchanged number − Original number = 9.

Formula Used: Original Number = 10x + y | Interchanged Number = 10y + x

=> Let the ten's digit be x and unit's digit be y.

=> x + y = 15 ---(i)

=> (10y + x) − (10x + y) = 9

=> 9y − 9x = 9 => y − x = 1 ---(ii)

=> Adding (i) and (ii): 2y = 16 => y = 8

=> Substituting y in (i): x + 8 = 15 => x = 7

=> Number = 10(7) + 8 = 78

Therefore The correct answer is 78.

Additional Information

Difference of Reversed Numbers

The difference between a two-digit number and its reversed counterpart is always a multiple of 9, specifically 9 × |x − y|.

Sum of Reversed Numbers

The sum of a two-digit number and the number formed by reversing its digits is always a multiple of 11, specifically 11 × (x + y).

Digit Value vs Place Value

For a digit 'd' in the tens place, its face value is d, but its place value is 10 × d.

Q49. Answer: (a) a plant was tall regardless of whether it had one gene (allele) or two genes (alleles) for tallness

The correct answer is a plant was tall regardless of whether it had one gene (allele) or two genes (alleles) for tallness.

Key Points:

• The hybrid offspring generated will only acquire the dominant characteristic in the phenotype, in accordance with Mendel's first law of inheritance or law of dominance.

• Recessive traits are those that are suppressed, whereas dominant traits are those that control a trait.

• Tallness is the dominant characteristic.

• Because tallness is the dominating characteristic, a cross between a tall plant (TT) and a short pea plant (tt) produced only tall plants.

Additional Information:

• Mendel researched the inheritance of peas' height, flower colour, seed colour, and seed shape, among other seven other traits.

• For example, he initially established pea lines with tall vs. short height as two different versions of a feature.

• He bred these lines to each other and watched to see how the traits were passed down.

• He had grown these lines for generations until they were purebred, or always produced offspring that were identical to the parent.

• Mendel counted the precise number of plants that displayed each feature in addition to noting how the plants appeared in each generation.

• Surprisingly, he discovered fairly similar inheritance patterns for all seven traits he examined.

Q50. Answer: (c) Meghalaya

The correct answer is Meghalaya.

Key Points

• The Cathedral of Mary Help of Christians is a Roman Catholic church situated in Shillong's Laitumkhrah neighborhood, 3.5 kilometers from the bus terminal.

• It is also referred to as the Cathedral Catholic Church. It is Shillong's main house of worship and one of the city's most well-known tourist attractions.

• In Shillong, Meghalaya, India, there is a church called the Cathedral of Mary Help of Christians.

• It serves as the Metropolitan Archbishop of Shillong's residence and is the cathedral church of the Shillong Roman Catholic Archdiocese.

• It covers the East Khasi Hills and Ri-Bhoi districts, which contain 35 "Parishes" or church districts.

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• The main venue of worship for the more than 342,169 Catholics in the Shillong Archdiocese is the Cathedral, which was constructed more than 50 years ago.

Additional Information

• The Cathedral of Mary Help of Christians

• The Cathedral Church of Mary Help of Christians was constructed by the Germans in 1913 and is dedicated to mother Mary. The first church was destroyed by a fire accident in 1936, and this led to the creation of the current shrine, according to history.

• After the Catholic Church had been present in Northeast India for 100 years, it was given the title of a shrine in 1980.

• The main place of worship for the about 300,000 Catholic residents of Ri Bhoi and the East Khasi Hills district of Meghalaya is this church, which is part of the Shillong Roman Catholic Archdiocese.

• The church was built in the Gothic style and is perched on an emerald-colored hill. The church is surprisingly huge and is most likely the biggest in Meghalaya.

• The interiors feature stained glass windows, terracotta cross stands, and a bronze cavalry monument.

• Hubert D'Rosario, Shillong's first archbishop, is buried there. Inside the chapel, there is a variety of artwork depicting passages and scenes from the Bible as well as the biographies of many saints. It also contains an underground chapel grotto dedicated to Our Lady of Lourdes that was cut out of a mound.

Q51. Answer: (d) Colloidal solution

The correct answer is the Colloidal solution.

Key Points

• Light scatters in a variety of directions through a colloidal solution.

• As a result of the Tyndall effect.

• The Tyndall effect is a phenomenon that occurs when particles in a colloidal solution scatter light.

• The light frequency and particle density both affect how much scattering occurs.

Additional Information

• The colloidal particles in the solution prevent a light beam from passing completely through a colloid when it does so.

• The light is scattered when it strikes the colloidal particles.

• The Tyndall Effect is a light scattering phenomenon that only occurs in colloidal dispersion and does not exist in a true solution.

• This result is used to distinguish between a true solution and a colloid in a mixture.

Q52. Answer: (c) Equilibrium price

The correct answer is the Equilibrium price.

Key Points

• The only price at which consumer and producer plans align is the equilibrium price, which is attained when the quantities sought by consumers and supplied by producers, respectively, are equal. This pervasive quantity is called the equilibrium quantity.

• Any other price throws the market out of balance since there is an imbalance between the quantity asked and the quantity delivered.

• Equilibrium simply means balance. If a market's equilibrium price and quantity are present, it has no incentive to change.

• However, when a market is out of balance, economic pressures begin to accumulate and push it in the direction of the equilibrium price and quantity.

Additional Information

• Product price

• The amount that customers must pay for a good or service is known as the price. Price, then, is an offer to sell something for a specific sum of money. Here, the word "offer" means that the price is liable to alter if it turns out that there aren't enough buyers willing to pay the product's original price.

• Total price

• Total Price refers to the total amount due from the debtor under a conditional sale or hire-purchase agreement, including any payments due upon exercising a purchase option, but omitting any payments due as a fine or as compensation for a breach of the agreement.

• Surplus price

• A consumer surplus occurs when consumers pay less than they would be willing to for a commodity or service. The difference between the price a producer is ready to pay for a good and the price they actually receive in the transaction is known as a producer surplus.

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Q53. Answer: (b) 1 pair

The correct option is 1 pair.

Key Points

• A total of 46 chromosomes make up a human, including one pair of XX or XY chromosomes and 22 pairs of numbered chromosomes autosomes.

• Sex chromosomes, the 23rd pair, are different in males and females.

• In contrast to males, who have one X and one Y chromosome, females have two copies of the X chromosome.

• By size, the 22 autosomes are numbered. The sex chromosomes are X and Y, the other two chromosomes.

Additional Information

• During these cell divisions, DNA can be precisely copied thanks to chromosomes.

• Our cells' nuclei contain chromosomes, which allow DNA to be precisely copied during cell division.

• This makes sure that everything inside of us operates effectively and smoothly.

Q54. Answer: (b) 1

Shortcut Trick

By definition, coprime numbers are numbers that have no common factors other than 1.

Therefore, their Highest Common Factor (HCF) must always be 1.

Therefore The correct answer is 1.

Alternate Method

Given: A set of coprime numbers.

Formula / Definition Used:

=> Two or more numbers are said to be coprime if their only common positive divisor is 1.

=> For any two coprime numbers 'a' and 'b':

=> Factors of 'a' ∩ Factors of 'b' = {1}

=> HCF(a, b) = 1

Example:

=> Let us consider the coprime numbers 8 and 15.

=> Factors of 8 = 1, 2, 4, 8

=> Factors of 15 = 1, 3, 5, 15

=> Common factors = 1

=> Highest Common Factor (HCF) = 1

Therefore The correct answer is 1.

Additional Information

LCM of Coprime Numbers

The Least Common Multiple (LCM) of any set of coprime numbers is always equal to their product. For example, LCM of coprime numbers 'a' and 'b' = a × b.

Consecutive Numbers are Coprime

Any two consecutive integers are always coprime to each other (e.g., 14 and 15, 99 and 100). Thus, HCF of consecutive numbers is always 1.

Prime Numbers and Coprimes

All prime numbers are coprime to each other, but coprime numbers do not necessarily have to be prime numbers themselves (e.g., 8 and 9 are composite but coprime).

Q55. Answer: (b) 3 Ω

The correct answer is option 2)3 Ω

Given:

R1=5Ω,R2=10Ω,R3=30Ω are three resistors connected in parallel

Formula:

For resistances in parallel:

$1/Rp=1/R1+1/R2+1/R3$

Calculations:

$1/Rp=1/R1+1/R2+1/R3$

$1/Rp=1/5+1/10+1/30$

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1/Rp=(6+3+1)/30=10/30

Rp=30/10=3Ω

Therefore the total resistance in the circuit is 3 Ω

Q56. Answer: (b) Pitcher

The correct answer is PItcher.

Key Points

• A plant that consumes other living things is the pitcher plant.

• For food, carnivorous plants capture and eat insects like bees.

• Some of the names of insectivorous plants are pitcher plant, cobra lily, and venus flytrap.

• They are frequently known as carnivorous plants.

Additional Information

• Facts about insectivorous plants.

• In areas with low-nutrient soil, insectivorous plants can be found.

• It is deficient in nitrogen, crucial for plant growth in places like acidic bogs and rock outcrops.

• By breaking down the insects, this nitrogen is produced.

• Insectivorous plants catch insects because they need to eat insects to meet their nutritional needs because their soil is typically shallow and deficient in nutrients.

• Lichens are an entirely unique kind of organism that are neither plants nor animals.

• When it comes to lichen, most people mistakenly believe they are a form of moss.

• In reality, lichens are a hybrid of algae and a fungus.

• While the algae nourish the fungus, it also gives the algae a structure to live in.

• The family Cuscutaceae includes plants in the genus Cuscuta.

• Plant parasites include the Cuscuta genus.

• Since they are chlorophyll-deficient, they cannot manufacture their food through photosynthesis.

• Cuscuta relies on nutrients from other plants to flourish, which weakens the host plant.

• Some fungi create reproductive structures called mushrooms.

• Mushrooms resemble a plant's fruit in some ways, but instead of producing actual seeds, the mushroom instead generates millions of tiny spores called gills or pores.

Q57. Answer: (c) 22/3 cm

Shortcut Trick

Area of a triangle = 1/2 × base × height

4 = 1/2 × 3 × height

8 = 3 × height

height = 8/3 = 2(2/3) cm

Therefore The correct answer is 2(2/3) cm.

Alternate Method

Given:

Base (b) = 3 cm

Area (A) = 4 cm²

Formula Used:

Area = (1/2) × Base × Height

Calculations:

=> 4 = (1/2) × 3 × Height

=> 4 × 2 = 3 × Height

=> 8 = 3 × Height

=> Height = 8/3

=> Height = 2(2/3) cm

Therefore The correct answer is 2(2/3) cm.

Additional Information

Heron's Formula

When all three sides (a, b, c) are known: Area = √[s(s−a)(s−b)(s−c)], where s = (a+b+c)/2.

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Right-Angled Triangle

In a right-angled triangle, the base and perpendicular act as the base and height respectively.

Equilateral Triangle Area

The area of an equilateral triangle with side 'a' is given by (√3/4) × a².

Q58. Answer: (d) CaO

The correct answer is CaO.

Key Points

• Calcium oxide, also known as lime or CaO.

• Dissolves in water, it produces the compound calcium hydroxide, which is most commonly used in the production of cement.

• With the generation of a great deal of heat.

• Paste, mortar, and concrete are examples of cement-based materials, all of which have a high initial pH of 12.0 to 13.8.

Additional Information

• Gypsum, also known as the cement's "retarding agent," is a crucial ingredient that is primarily used to control the cement's setting time.

• Cement clinker can instantly condense when combined with water and release heat without the need for gypsum.

• The natural elements limestone, shale, and clay, to mention a few, are used to create cement, a fine powder-like substance.

• In a kiln, the component ingredients are heated to generate the little lumps known as "clinker," which are then crushed down while gypsum is added to create the more well-known cement powder.

Q59. Answer: (d) electromagnetic induction

The correct answer is electromagnetic induction.

Key Points

• A current can be made to flow as a result of a shifting magnetic field through a process called electromagnetic induction.

• Magnetic force, we examined the force that moving charges encounter in a magnetic field.

• By changing the magnetic field across a wire loop, electromagnetic induction creates an induced emf.

• Magnetic flux shifts when a magnet and a coil move in relation to one another, and the coil produces an electromotive force.

• This electromotive force is responsible for producing the induced current.

Additional Information

• According to Faraday's Law of Electromagnetic Induction, whenever there is a change in the magnetic field associated with the changes in the electric circuits, an emf is induced.

• The creation of an electromotive force across a conductor of electricity in a magnetic field that is changing is known as electromagnetic induction.

• Transformers and electric generators are two significant devices that rely on electromagnetic induction.

• In creating and controlling the electric current that is essential to our daily lives, both devices perform crucial roles.

• To convert kinetic energy to electrical energy, electric generators use electromagnetic induction.

Q60. Answer: (c) 102

The pattern followed in the given series is:

The difference between the terms is the increasing natural number.

Hence the correct answer is option 3)

Q61. Answer: (a) 7%4494

Given word: SQUARE

In the given word 1st condition will be applied which says, 'If there is more than 1 vowel in the word, the vowels will be coded as 4.'

Now the code for the word SQUARE becomes:

Hence, the correct answer is option 1).

Q62. Answer: (b) Dr. Atma Ram Pandurang

The correct answer is Dr Atma Ram Pandurang.

Key Points

• The Prarthana Samaj movement also referred to as the "Prayer Society," was a religious and social reform movement in Bombay, India, modelled after earlier reform movements.

• When Keshub Chandra Sen visited Maharashtra in 1863, Dadoba Pandurang and his brother Atmaram Pandurang established

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the Prarthana Samaj. It was done with the intention of converting people to monotheistic belief and worship. When Mahadev Govind Ranade joined, it became more well-known.

• The intellectuals who favoured changes to the Hindu social order were the key reformers. Its dissemination in southern India was aided by Telugu reformer and writer Kandukuri Veeresalingam.

Additional Information

• Prarthana Samaj

• The movement was started by Atmaram Panduranga, and after reformer and scholar Mahadev Govind Ranade joined it, it acquired speed and popularity.

• The Samaj was distinct from the Bengali Brahmo Samaj in that it was less extreme and approached reformist programmes with caution. It also garnered better feedback from the general population as a result.

• The group's members all identified as Hindus and did so throughout. They want internal religious reform. They weren't opposed to religion per se; rather, they were against the societal ills that were common at the time, such as child marriage, widow repression, dowry, sati, untouchability, etc.

• They also promoted monotheism and condemned the worship of idols.

• Meetings of the society were held behind closed doors out of concern for a reaction from the orthodoxy. In actuality, neither the orthodox segments of society nor Brahminical power was ever specifically assailed by the Prarthana Samaj.

• The Brahmo Samaj and the Arya Samaj of Dayananda Saraswati had a significant impact on the Samaj, although it persisted as a separate organisation.

• Along with Ranade, the Sanskrit scholar Sir Ramakrishna Gopal Bhandarkar and the political figure Sir Narayan Chandavarkar were significant Samaj members.

Q63. Answer: (a) Odisha

The correct answer is Odisha.

Key Points

• The imaginary line at 23.50 degrees north of the equator is known as the Tropic of Cancer.

• The Tropic of Cancer crosses eight Indian states: Gujarat, Rajasthan, Madhya Pradesh, Chattisgarh, Jharkhand, West Bengal, Tripura, and Mizoram.

• The State of Odisha is not a part of it.

Additional Information

• Tropic of Cancer

• The Tropic of Cancer, commonly referred to as the Northern Tropic, is the northernmost circle of latitude on Earth where the Sun can be directly overhead.

• This happens in June when the Northern Hemisphere is tilted most strongly toward the Sun.

• Additionally, it sinks to 90 degrees below the horizon at solar midnight on the December Solstice.

• The circle is presently 23.43631° north of the Equator, according to a formula that is updated regularly.

• The tilt of the earth's axis with respect to the plane of its orbit is 23 degrees and 27 minutes.

• This tilt is also known as the earth's declination.

• At noon on June 21, the sun is at 23.5° north and is parallel to the earth's surface.

• This is why a globe has a designation for the Tropic of Cancer.

Q64. Answer: (c) 124

Concept used:

BODMAS,

B = Bracket

O = of

D = Division

M = Multiplication

A = Addition

S = Substraction

Preference will be given on the basis of the Letter coming first in the word Bodmas.

Calculation:

$27.92 \times 4 + 3.96 \times 5 - 18 \div 2 + 1$

Taking appro×imation: $28 \times 4 + 4 \times 5 - 18 \div 2 + 1$

$= 112 + 20 - 9 + 1 = 124$

Hence, The Required value is 124.

Q65. Answer: (a) 2,80,000 g

Given:

Calculation:

According to the question,

Total weight of the ingredients = 2(3,50,000) = 7,00,000 g

Weight of almonds = 50% of total

Weight of flour = 10% of total

Difference between them

= (50 - 10)%

= 40% of 7,00,000

= 2,80,000 g

Hence, The Required value of weight is 2,80,000 g.

Q66. Answer: (c) 334

The logic followed here is:

The difference of difference between the terms is 6.

The pattern followed in the given series is:

Hence, the correct answer is option 3).

Q67. Answer: (b) 342

The logic followed in the given series is:

(First term)^3 - 1 = Second term

Now we apply the logic to the given series:

9 : 728 :: 4 : 63 :: 7 : ?

(9)^3 - 1 = 728

729 - 1 = 728

728 = 728

and,

9 : 728 :: 4 : 63 :: 7 : ?

(4)3 - 1 = 63

64 - 1 = 63

63 = 63

Similarly,

9 : 728 :: 4 : 63 :: 7 : ?

(7)3 - 1 = ?

343 - 1 = ?

342 = Answer

Hence, the correct answer is option 2).

Q68. Answer: (c) Rs. 1,312.50

Shortcut Trick

Selling at a 20% loss means the selling price is 80% of the cost price (CP).

80% of CP = Rs. 840

To obtain a 25% gain, the required selling price must be 125% of CP.

Required SP = (840 ÷ 80) × 125

Required SP = 10.5 × 125 = Rs. 1,312.50

Therefore The correct answer is Rs. 1,312.50.

Alternate Method

Given: First selling price (SP1) = Rs. 840, Loss = 20%, Target Gain = 25%.

Formula Used:

1. CP = [SP × 100] / [100 − Loss%]

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2. New SP = [CP × (100 + Gain%)] / 100

Calculations:

=> CP = (840 × 100) / (100 − 20)

=> CP = 84000 / 80

=> CP = Rs. 1050

=> New Selling Price = 1050 × (100 + 25) / 100

=> New Selling Price = 1050 × 125 / 100

=> New Selling Price = 1050 × 1.25

=> New Selling Price = Rs. 1,312.50

Therefore The correct answer is Rs. 1,312.50.

Additional Information

Cost Price (CP)

The price at which an article is purchased. It is the base for calculating Profit or Loss percentage.

Profit and Loss Formulas

Profit = SP − CP (when SP > CP). Loss = CP − SP (when CP > SP).

Direct Relation Shortcut

SP1 / (100 ± Gain1/Loss1) = SP2 / (100 ± Gain2/Loss2). This allows finding the new price directly without calculating CP.

Q69. Answer: (b) 4

Calculations:

(25/9)^(x+1)(81/625)^(x-1)=9/25

=> (25/9)^((x + 1))((9²)/(25²))^((x-1)) = 9/25

=> ((25^((x+1)))/(9^((x+1))))((9^(2(x-1)))/(25^(2(x-1)))) = 9/25

=> (9^(2(x-1)-(x+1)))/(25^(2(x-1)-(x+1))) = (9¹)/(25¹)

=> (9/25)^(2(x-1)-(x+1)) = (9/25)¹

If the basis are same then the powers on left side and right side are also equal

=> 2(x - 1) - (x + 1) = 1

=> 2x - 2 - x - 1= 1

=> x = 4

Hence, The Required value of x is 4.

Q70. Answer: (b) almost the same as c

The correct answer is almost the same as c.

Key Points

• Because all light moves at the same speed in a vacuum, the optical path that is followed by all of the wavelengths that comprise a given beam of light is the same. As a result, dispersion, also known as the breaking up of light, does not take place.

• Within a medium, the speed is determined by the wavelength, and as a result, the entrance pathways for light waves with distinct wavelengths diverge.

• At the exit of a rectangular block, the precise opposite of what happens inside occurs, and a light ray moves laterally without being dispersed.

• In a prism, on the other hand, the modification of the light's path direction at the exit does not cancel out the modification that occurred at the entry, which results in the rainbow effect.

Additional Information

• The speed of light in a vacuum, usually written as c, is a constant in physics that is used in many different ways.

• The exact speed of light, c, is 299,792,458 metres per second (approximately 300,000 kilometres per second; 186,000 miles per second; 671 million miles per hour).

• According to the special theory of relativity, c is the maximum speed at which conventional matter or energy (and, by extension, any information-carrying signal) may flow across space.

Q71. Answer: (a) IHCSPM

According to the English alphabets and their positional values:

The pattern followed in the given codes is:

Position of the first and third alphabets is interchanged.

Position of the fourth and sixth alphabets is interchanged.

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Similarly,

Hence the correct answer is option 1)

Q72. Answer: (d) Aravali Range

The correct answer is the Aravali Range.

Key Points

• Aravali Range

• The oldest mountain range in the Indian subcontinent is called the Aravalli.

• On the western and northern edges of the peninsular plateau is the Aravali Hills.

• The renowned hill resort of Mount Abu is situated in the Aravalli Mountains.

• The well-known Jain pilgrimage site at the Aravalli range is the Dilwara temple.

• The renowned town of Ajmer is situated in the Aravalli Valley.

• The Aravalli range contains the Haldighat pass.

• The highest mountain in the Aravalli range is Mount Gurusikhar.

Additional Information

• Zanskar Range

• The Zaskar Range is a mountain range that divides Himachal Pradesh from Tibet and Zanskar from Ladakh in the Indian states of Jammu & Kashmir and Ladakh.

• The highest point is Kamet Peak (7,756 meters), and the three most significant passes are Shipki, Lipu Lekh, and Mana.

• Dhauladhar Range

• A smaller Himalayan Mountain chain includes the Dhauladhar mountain range. North of Kangra and Mandi, in the Shivalik highlands, it rises. On its southern slope, in the Kangra Valley, is Dharamsala, the administrative center of the Kangra district and the winter capital of Himachal Pradesh. To the north of this range is Chamba.

• Nallamala Range

• The Rayalaseema region of the Indian states of Andhra Pradesh and Telangana is bordered on the east by the Nallamalas (also known as the Nallamalla Range), a portion of the Eastern Ghats. Between the rivers Krishna and Pennar, they follow a nearly north-south path that runs parallel to the Coromandel Coast for around 430 km.

Q73. Answer: (a) R

Given word: MOTHERLAND

When we apply the given condition to the word MOTHERLAND, we get:

From the newly formed word, we can see that R is the sixth letter from the right.

Hence, the correct answer is option 1).

Q74. Answer: (b) It is a direct payment made to others in the course of running a business, such as wage, rent and materials.

The correct answer is It is a direct payment made to others in the course of running a business, such as a wage, rent, and materials.

Key Points

• Contrary to implicit costs, where no actual payment is made, explicit costs are payments made directly to third parties during the process of operating a firm, such as salaries, rent, and materials.

• Explicit costs are expenses incurred by a firm that is simple to quantify and identify.

• The explicit costs of an organization, also known as accounting costs, are noted in its records (accounting ledgers) and appear as itemized expenses on the organization's financial statements, such as its balance sheet and income statement.

Additional Information Differentiate between explicit and implicit costs:

S.N.	Basis	Explicit Cost(Rs)	Implicit Cost(Rs)
(i)	Meaning	Explicit cost is the term used to describe the real payment paid to oneself for factors of production hired from outside sources.	The cost of self-supplied factors of production is referred to as implicit cost.
(ii)	Expenditure in cash or credit	These expenses are incurred, and either cash or credit is used to pay for them.	These costs are covered by self-provided factors; therefore, there is no payment in cash or on a credit basis.

(iii)	Parties involved	Owner and outsiders	Only Owner
(iv)	Examples	Paying employee wages, paying rent on rented space, paying loan interest, etc.	Interest on one's own money, landowners' rent, etc.

Q75. Answer: (c) Part IX

The correct answer is Part IX.

Key Points

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

• The management of local affairs by elected local authorities is known as local self-government.

• The 73rd Constitutional Amendment Act, passed in 1992, gave PRI constitutional protection in order to promote democracy at the local level and give it responsibility for the nation's rural development.

• The Constitution has a new section IX with 16 articles and the Eleventh Schedule thanks to the Constitution (73rd Amendment) Act of 1992.

• The Gram Sabha is envisioned in the 73rd Amendment as the cornerstone of the Panchayat Raj System, performing duties and exercising authority delegated to it by the State Legislatures.

Additional Information The following are a few sections of the Indian Constitution:

Part	Subject	Articles
Part I	The Union and its territory	Art. 1 to 4
Part III	Fundamental Rights	Art. 12 to 35
Part V	The Union	Art. 52 to 151
Part II	Citizenship	Art. 5 to 11

Q76. Answer: (d) Namami Gange Programme

The correct answer is Namami Gange Programme.

Key Points

• The Namami Gange Program is an integrated conservation mission that the Union Government approved in June 2014 as a "Flagship Program" with a financial allocation of Rs. 20,000 Crore to achieve the twin goals of effective pollution reduction and conservation and revitalization of the national River Ganga.

• A three-tier project monitoring mechanism has been developed for the Namami Gange Program, consisting of;

• high-level task committee supported nationally by NMCG and led by the Cabinet Secretary.

• A state-level committee led by the Chief Secretary with assistance from SPMG

• District Magistrate-led committee at the district level.

Additional Information

• Important aspects of the program "Namami Gange"

• The 2014-2015 budget allocated more than Rs. 20,000 crores for the following five years.

• The project's scope includes 12 rivers, 47 municipalities, and 8 states.

• By 2022, all 1,632-gram panchayats along the Ganges river would be free of open defecation.

• For this initiative, the Environment, Urban Development, Shipping, Tourism, and Rural Development Ministries are collaborating with the nodal Water Resources Ministry.

• The involvement of those who live along the river's banks in this initiative will be a top priority.

• States, urban local bodies, and Panchayati Raj institutions will be involved in this project under the auspices of the National Mission for Clean Ganga (NMCG) and State Program Management Groups (SPMGs).

Q77. Answer: (b) Trimbakeshwar

The correct answer is Trimbakeshwar.

Key Points

• The Godavari River rises in Nasik.

• It rises at a height of 1,067 m from Trimbakeshwar in Maharashtra's Nasik district, 80 kilometers from the Arabian Sea.

• From its beginning until its outflow into the Bay of Bengal, the Godavari is 1,465 kilometers long.

• Dharna joins it at the beginning on its right bank, and a short distance downstream, the Kadana joins it from the left.

Additional Information

• Along with smaller portions in Madhya Pradesh, Karnataka, and Puducherry's Union Territories, the Godavari basin spans the states of Maharashtra, Andhra Pradesh, Chhattisgarh, and Odisha.

• The river has a maximum length and width of about 995 km and 583 km, respectively, and a total area of 3,12,812 sq. km.

• Another name for the Godavari is Dakshin Ganga.

• According to mythology, River Godavari yearned to visit Lord Rama. She came here covertly from Trimbakeshwar, Nasik in Maharashtra to receive his darshan, which is to see Lord Rama. Her name is Gupt-Godavari as a result.

Q78. Answer: (b) angle 2 = angle 5

Shortcut Trick

Identify the angle relationships based on parallel lines properties:

• angle 1 = angle 7 (Alternate Exterior Angles) → Always True.

• angle 8 = angle 6 (Vertically Opposite Angles) → Always True.

• angle 1 = angle 5 (Corresponding Angles) → Always True.

• angle 2 and angle 5 are supplementary (angle 2 + angle 5 = 180°) because angle 2 = angle 6 (corresponding) and angle 5 + angle 6 = 180° (linear pair).

Thus, angle 2 = angle 5 is only true if the transversal is perpendicular.

Therefore The correct answer is angle 2 = angle 5.

Alternate Method

Given: Line l || m and a transversal line intersecting them.

Formula Used: When two parallel lines are cut by a transversal:

1. Corresponding angles are equal.

2. Alternate interior/exterior angles are equal.

3. Vertically opposite angles are equal.

4. Linear pair angles are supplementary (sum to 180°).

Calculations:

=> From the figure, angle 1 and angle 5 are corresponding angles. Since l || m, angle 1 = angle 5.

=> angle 1 and angle 7 are alternate exterior angles. Since l || m, angle 1 = angle 7.

=> angle 8 and angle 6 are vertically opposite angles. Vertically opposite angles are always equal.

=> Now, consider angle 2 and angle 5. angle 2 and angle 6 are corresponding angles, so angle 2 = angle 6.

=> angle 5 and angle 6 form a linear pair on line m, so angle 5 + angle 6 = 180°.

=> Substituting angle 6 with angle 2, we get angle 5 + angle 2 = 180°.

=> Since angle 5 and angle 2 are supplementary, they are only equal if both are 90°.

=> Therefore, the relation angle 2 = angle 5 is not necessarily true for any general transversal.

Therefore The correct answer is angle 2 = angle 5.

Additional Information

Consecutive Interior Angles

Angles on the same side of the transversal inside the parallel lines (like angle 4 and angle 5) are supplementary: angle 4 + angle 5 = 180°.

Alternate Interior Angles

Pairs of angles on opposite sides of the transversal between the two parallel lines (like angle 3 and angle 5) are always equal: angle 3 = angle 5.

Transversal Properties

If the transversal is perpendicular to the parallel lines, all eight angles will be right angles (90°).

Q79. Answer: (d) 40%

Given:

Calculation:

According to the question,

Number of people having car = 35

Number of people having scooter = 25

Difference between them = 10

Percentage by which people having cars is more than People having scooters is

= 10/25×100

= 40%

Hence, The Required value is 40%.

Q80. Answer: (c) Areolar

The correct answer is Areolar.

Key Points

• Areolar Connective Tissue

• Areolar connective tissue is a type of tissue found in the human body that links and surrounds various organs.

• The most important job of this kind of tissue is to nourish the cells.

• In addition to that, it serves as a cushion to shield the organs from external forces.

• The areolar tissue is loaded with collagen fibres, making it strong and hard.

• It resides well beneath the epidermis and is essential for maintaining the flexibility and elasticity of the skin.

• Areolar Connective Tissue has mast cells which help to keep infections away.

• How does Areolar Connective Tissue help in tissue repair?

• Areolar tissue contributes to the restoration of damaged tissue and also helps to fill empty space within organs.

• The ground substance that makes up areolar tissue is responsible for filling in all of the voids that exist between the fibres and cells.

• It is present in a wide variety of sites all over the body.

• The areolar tissue that is situated on the skin is responsible for binding the superficial layers of skin to the underlying muscles.

Additional Information

• Tendon

• The tight, dense band of fibrous tissue known as the tendon is what attaches the muscle to the bone.

• Collagen fibres are the primary structural component of tendons.

• It is responsible for transmitting the force that is generated by the contraction of muscles to the bone.

• As a result of their ability to stretch and recoil without tearing, tendons are not only robust and long-lasting, but also flexible.

• Ligament

• A ligament is a fibrous connective tissue that links one bone to another bone.

• The primary function of a ligament is to hold structures together and maintain their stability.

• Cartilage

• Your joints and bones are protected by a tough connective tissue called cartilage, which is both strong and flexible.

• Within the entirety of your body, it performs the function of a shock absorber.

Q81. Answer: (d) 3

In the given series:

There are 3 such pairs where a symbol is immediately preceded by a letter and also immediately followed by a number.

Hence, the correct answer is option 4).

Q82. Answer: (b) B

From the given information:

Step 1: D is sitting at the end of the row. B is sitting third to the left of D.

All of them face toward the west. Now we place D at the right end because we have to place B at its third left.

Step 2: A is sitting to the immediate right of B. A is an immediate neighbour of B and C.

We place A immediately right of B and then place C such that A is the immediate neighbour of B and C.

Step 3: E is sitting at the first position in the row. F is sitting between A and E.

We place E at the end and then place F at the only spot left which also satisfies the condition of F sitting between A and E.

From the arrangement, we can see that B is the immediate neighbour of A and F.

Hence, the correct answer is option 2).

Q83. Answer: (d) Yeast

The correct answer is Yeast.

Key Points

• Fermentation

• The act of breaking down carbohydrate molecules without the assistance of oxygen molecules is referred to as fermentation. This process ultimately results in the synthesis of certain alcoholic or acidic substances.

• Why Yeast is used in fermentation?

• In the process of fermentation, yeast is utilized because it possesses oxygen-independent enzymes, such as zymase, that are able to digest the carbohydrate molecules. It brings for the creation of molecules of ethanol and carbon dioxide as a byproduct.

• A microbe known as Saccharomyces cerevisiae, also known simply as yeast, is required for the fermentation process in order to make alcohol.

• Because yeast is necessary for the production of alcohol, breweries that produce beverages such as beer and whisky use yeast in their processes.

Additional Information

• Paramecium

• Paramecium also called Paramoecium, is a genus of ciliated unicellular protozoa.

• The presence of thousands of cilia all over their body is a distinguishing feature of these organisms.

• They can be found in all types of water, including brackish, salty, and fresh.

• Euglena

• One kind of euglenoid is called a euglena. The organisms known as euglenoids are single-celled organisms with flexible bodies.

• They have traits that are typical of both plants and animals.

• Euglena has plastids and does photosynthesis during the day. At night, it uses its flagellum to move around and look for food.

• They live in both freshwater and saltwater, as well as in marshes and wet soil.

• Amoeba

• Amoeba is a unicellular organisms capable of changing its shape.

• They are typically found in ponds, lakes, and rivers with slow currents.

• Sometimes, these unicellular organisms might enter the human body and cause a variety of diseases.

Q84. Answer: (a) 5

From the given information: '+' means '÷', '-' means '+', '×' means '-' and '÷' means '×'

We substitute the values in the given equation by using the BODMAS rule:

Given expression:

[{(48 × 28) - (5 ÷ 3)} + (3 - 4)]

By interchanging the operators according to the question, we get;

[{(48 - 28) + (5 × 3)} ÷ (3 + 4)]

Applying the BODMAS rule to the above expression, we get;

[{20 + 15} ÷ (3 + 4)]

[35 ÷ 7]

5 = Answer

Hence, the correct answer is option 1).

Q85. Answer: (d) 54

Shortcut Trick

Check options for the first condition: Number = 6 × Sum of digits.

(1) 45: 6 × (4+5) = 54 ≠ 45 (False)

(2) 36: 6 × (3+6) = 54 ≠ 36 (False)

(3) 42: 6 × (4+2) = 36 ≠ 42 (False)

(4) 54: 6 × (5+4) = 54 (True). Difference: 54 − 45 = 9 (True).

Therefore The correct answer is 54.

Alternate Method

Given: Original number z = 10x + y. Sum of digits = x + y. Reversed number = 10y + x.

=> According to first condition: 10x + y = 6(x + y)

=> 10x + y = 6x + 6y

=> 4x = 5y → (Eq 1)

=> According to second condition: (10x + y) − (10y + x) = 9

=> 9x − 9y = 9

=> x − y = 1 → (Eq 2)

=> From Eq 2, x = y + 1. Substitute in Eq 1: 4(y + 1) = 5y

=> 4y + 4 = 5y => y = 4

=> x = 4 + 1 = 5

=> Number z = 10(5) + 4 = 54

Therefore The correct answer is 54.

Additional Information

Digit Reversal Rule

The difference between a two-digit number and its reverse is always 9 times the difference between the digits: (10x + y) − (10y + x) = 9(x − y).

Sum of Reversed Digits

The sum of a two-digit number and its reverse is always 11 times the sum of the digits: (10x + y) + (10y + x) = 11(x + y).

Divisibility of Difference

Since the difference is 9(x − y), it is always perfectly divisible by 9.

Q86. Answer: (d) Earthworms

The correct answer is Earthworms.

Key Points

• The use of earthworms in the composting process is known as vermicomposting, which is a scientific procedure.

• They usually inhabit the soil, where they consume organic matter and excrete the material in a partially digested state.

• Earthworms consume organic waste materials and then excrete their waste in the form of "vermicasts," which are abundant in nitrates and minerals such as phosphorus, magnesium, calcium, and potassium.

• Earthworms also provide a natural fertilizer for the soil. These are added to the soil to improve its quality and function as fertilizers.

Additional Information

• Roundworms are parasites that require a host in order to survive. These parasite diseases can result in diarrhea and fever.

• Worms belonging to the phylum Platyhelminthes are known as Flatworms because their bodies are flattened. There are over 18,500 species of flatworms known.

• Tapeworms are segmented worms that are flat and can be found living in the intestines of a variety of animals. When animals consume contaminated water or graze in pastures that have these parasites, they increase their risk of becoming afflicted with the disease.

Q87. Answer: (b) two formula units of CaSO4 share one molecule of water

The correct answer is two formula units of CaSO4 share one molecule of water

Key Points

• The chemical name of plaster of Paris is calcium sulfate hemihydrate because half a molecule of water is connected to calcium sulfate,

• CaSO4.1/2H2O is the chemical formula of the plaster of Paris.

• Gypsum is the raw material used to make the plaster of Paris. Gypsum is calcium sulfate dihydrate(CaSO4.2H2O).

• Gypsum is turned into Plaster of Paris by firing it in a kiln to a temperature of about 100 degrees Celsius.

• Plaster of Paris is formed when heated gypsum loses three-fourths of its water of crystallization.

Q88. Answer: (c) Telangana

The correct answer is Telangana.

Key Points

• The Government of Telangana has a welfare programme called the Kalyana Lakshmi Scheme and Shaadi Mubarak, a cutting-edge programme for all the state's poor residents.

• The programme provides aid in the amount of Rs.1,00,116 with the goals of preventing underage marriages and helping financially struggling families with the costs of marriage.

• The beneficiaries totalled 3,90,000 as of March 2018.

• A Telangana resident girl over the age of 18 who is a member of any group and whose parents' combined yearly income does not exceed 2 lakhs is eligible for the Scheme.

Additional Information

• The Kalyana Lakshmi scheme aims to give brides from SC, ST, and minority families financial help. In accordance with the Kalyana Lakhsmi plan agreement, financial assistance will be transferred to the mother's bank account at the time of the bride's

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marriage.

• This programme, which helps decrease arranged marriages and raise female literacy, only accepts female applicants who are at least 18 years old (considered the marriageable age in India). With the Kalyana Lakshmi Scheme, women will have more power and financial freedom.

• The Telangana Shaadi Mubarak Scheme's primary goal is to offer financial support to families when their daughters get married. Through this programme, a family of a girl who is unable to afford the costs of marriage owing to their precarious financial situation will receive financial support in the amount of Rs. 100116.

• The Telangana Shaadi Mubarak scheme would empower women. Now that the Telangana government is going to provide financial aid, the girl's family no longer needs to rely on others to cover the costs of the marriage. Additionally, this plan will aid in lowering the number of child marriages.

Q89. Answer: (c) 35

Shortcut Trick

The fundamental property of numbers states that the HCF must always be a factor of the LCM.

Check divisibility of 588 by the given options:

588 ÷ 49 = 12 (Factor) | 588 ÷ 21 = 28 (Factor) | 588 ÷ 28 = 21 (Factor)

588 ÷ 35 = 16.8 (Not a factor)

Therefore The correct answer is 35.

Alternate Method

Given: LCM of two numbers = 588

Formula: LCM = HCF × (product of remaining co-prime factors)

=> This implies that LCM ÷ HCF must result in an integer.

=> Case 1: 588 ÷ 49 = 12 (Possible)

=> Case 2: 588 ÷ 21 = 28 (Possible)

=> Case 3: 588 ÷ 35 = 16.8 (Not an integer, hence Impossible)

=> Case 4: 588 ÷ 28 = 21 (Possible)

Therefore The correct answer is 35.

Additional Information

Relationship between LCM and HCF

The product of two numbers is equal to the product of their LCM and HCF. Formula: n1 × n2 = LCM × HCF.

Factor Property

The HCF of any set of numbers is always a factor of their LCM. If a number does not divide the LCM perfectly, it cannot be the HCF.

Co-prime Numbers

For two co-prime numbers, the HCF is always 1, and the LCM is simply the product of the two numbers.

Q90. Answer: (d) 6.67

The correct answer is 6.67.

Key Points

Money multiplier = 1/CRR

= 1/0.15 = 6.67

• The term "money multiplier" refers to a process in monetary economics where money is created in the economy through the generation of credit and is based on the fractional reserve banking system.

• The monetary multiplier is another name for the money multiplier. It is the utmost extent to which changes in the quantity of money deposits can alter the money supply.

• Commercial banks exhibit the money multiplier effect by accepting deposits, holding a certain amount as a reserve, and then dispersing the funds as loans to add liquidity to the economy.

• The reserve ratio, necessary reserve ratio, or cash reserve ratio refers to the amount of money that commercial banks must keep in reserve for customer withdrawals.

Additional Information

• Cash Reserve Ratio (CRR)

• CRR is a rule enforced in virtually every country by the Central Bank of that nation and is a crucial tool for monetary policy to manage the amount of money in the economy.

• Every commercial bank must uphold the CRR rate, which is the minimum percentage of cash deposits, in compliance with the Central Bank's or RBI's criteria (as stated by RBI).

• Statutory Liquidity Ratio (SLR)

• The minimal portion of deposits that a commercial bank must keep in the form of liquid cash, gold, or other securities is known as the Statutory Liquidity Ratio, or SLR. In essence, it is the minimum amount of reserves that banks must have in order to extend credit to clients.

• The RBI sets the SLR, which is a measure of control on credit expansion in India.

• Reverse Repo Rate

• The reverse repo rate is the rate at which a nation's central bank borrows money from domestic commercial banks, in this case, the Reserve Bank of India. It is a tool for monetary policy that can be used to manage the nation's money supply.

Q91. Answer: (b) 45 hours

Shortcut Trick

Use the standard work rate formula: 1/A + 1/B = 1/Ttogether.

Given Combined Time = 20 hours and Time Difference (B − A) = 9 hours.

Test Option (2): If Pipe B takes 45 hours, then Pipe A takes 45 − 9 = 36 hours.

Verify: (36 × 45) ÷ (36 + 45) = 1620 ÷ 81 = 20 hours. This matches the given combined time.

Therefore The correct answer is 45 hr.

Alternate Method

Person Days Total Work Efficiency Pipe A x − 9 x Pipe B x x − 9

Given: Combined time = 20 hours. Let time taken by Pipe B be x hours.

Formula Used: Total Work = Efficiency × Time => EfficiencyA+B = Total Work ÷ Timetogether

=> Total Work = x(x − 9)

=> EfficiencyA+B = x + (x − 9) = 2x − 9

=> Timetogether = x(x − 9) ÷ (2x − 9) = 20

=> x2 − 9x = 40x − 180

=> x2 − 49x + 180 = 0

=> (x − 45)(x − 4) = 0

=> x = 45 (Since x − 9 must be positive, x > 9)

Therefore The correct answer is 45 hr.

Additional Information

Combined Pipe Work Formula

When two pipes fill a tank in x and y hours respectively, they together fill it in (x × y) ÷ (x + y) hours.

Quadratic Shortcut in Time and Work

For equations like x2 − (Sum)x + (Product) = 0, find two numbers that sum to the middle coefficient and multiply to the constant term.

Inlet vs Outlet Pipes

Inlet pipe efficiency is taken as positive, while outlet (leak) pipe efficiency is considered negative in net calculations.

Q92. Answer: (d) Both I and II strengthen the statement.

Statement:

Limited and cautious use of plastic material can be a good strategy for its total ban movement.

Arguments:

I. An instant ban on plastic is very far from reality as people are not ready to use alternatives→ Follow → In order to initiate a ban on plastic from daily use it is very crucial to apply the changes step by step because an instant ban may result in chaos and the implementation might not be effective as targeted so the argument is correct and it strengthens the statement.

II. Paper bags can be a good alternative to plastic bags→ Follow → In the statement it is talked about the ban on plastic and in this argument, it is talked about a potential alternative to plastic bags which definitely supports the argument and thus it strengthens the statement.

So both I and II strengthen the statement.

Hence, the correct answer is option 4).

Q93. Answer: (b) 11

The correct answer is 11.

Key Points

• There are 11 fundamental obligations, including:

• Respect the Constitution, the flag, and the National Anthem.
• Embrace the principles of the freedom struggle.
• Safeguard India's integrity and sovereignty.
• When required, defend the nation and perform civic duties.
• Spirit of a group of brothers.
• Conserve a diverse culture.
• Keep the surroundings natural.
• Embrace a scientific mindset.
• Keep public property safe.
• Aim for superiority.
• All parents and guardians have a responsibility to enroll their children in school between the ages of 6 and 14.

Additional Information

• The Fundamental Duties of India are connected to the Swaran Singh Committee.
• The Swaran Singh Committee's recommendations led to the addition of 11 Fundamental Duties to the Indian Constitution.
• The Fundamental Duties are covered by Article 51A of the Indian Constitution.
• The 42nd Constitutional Amendment Act of 1976 added the Fundamental Duties to the Indian Constitution.
• The USSR provided the idea for the Indian constitution's essential obligations (Union of Soviet Socialist Republics).

Q94. Answer: (d) 15.54

Shortcut Trick

The Empirical Relationship between Mean, Median, and Mode is: Mode = 3 × Median − 2 × Mean.

Given: Median = 11 and Mean = 8.73.

Mode = 3(11) − 2(8.73) = 33 − 17.46 = 15.54.

Therefore The correct answer is 15.54.

Alternate Method

Given:

Arithmetic Mean = 8.73

Median of the distribution = 11

Formula Used:

The relationship for a moderately skewed distribution is Mode = 3 Median − 2 Mean.

Calculations:

=> Mode = 3 × 11 − 2 × 8.73

=> Mode = 33 − 17.46

=> Mode = 15.54

Therefore The correct answer is 15.54.

Additional Information

Empirical Formula for Skewed Distributions

Karl Pearson established that for moderately skewed distributions: Mean − Mode = 3 × (Mean − Median).

Symmetric Distribution

In a perfectly symmetrical distribution (like the Normal distribution), the Mean = Median = Mode.

Positively Skewed Distribution

When the tail on the right side is longer, the order is usually Mean > Median > Mode.

Negatively Skewed Distribution

When the tail on the left side is longer, the order is usually Mean < Median < Mode.

Q95. Answer: (a) 36.463

Formula used:

Mean = Total marks/number of students

Calculation:

According to data,

Total marks obtained

= 8 × (10 + 20)/2 + 7 × (20 + 30)/2 + 6 × (30 + 40)/2 + 11 × (40 + 50)/2 + 9 × (50 + 60)/2

= 8 × 15 + 7 × 25 + 6 × 35 + 11 × 45 + 9 × 55

= 120 + 175 + 210 + 495 + 495

= 1495

Arithmetic Mean

= 1495/41

= 36.463

Hence, The Required value is 36.463.

Q96. Answer: (d) 2

In the given series of letters:

There are 2 such pairs where vowels are immediately preceded by consonants.

Hence, the correct answer is option 4).

Q97. Answer: (c) Jeremy Lalrinnunga

The correct answer is Jeremy Lalrinnunga.

Key Points

• At the 2018 Commonwealth Games in Birmingham, Jeremy Lalrinnunga wrote history by winning India's second gold medal.

• The 19-year-old lifted a combined weight of 300 kg to win the top prize in the Men's 67 kg competition (140kg in snatch, 160kg in clean & jerk).

• The weightlifter broke the Commonwealth Games 2022 record with his 140 kg lift in the snatch division.

• Jeremy's first snatch effort saw him lift 136 kg to start the competition. In his second attempt at a snatch, he lifted 140 kg, breaking the previous record. Jeremy's third 143kg snatch attempt was a foul, but his 140kg attempt was sufficient to propel him to the top of the standings.

Additional Information

• Murali Sreeshankar

• Athlete Murali Sreeshankar (born 27 March 1999) represents India in the long jump competition. He currently holds the record, which was achieved in 2022 at 8.36 metres.

• His father S. Murali, a former triple jump competitor and silver medallist at the South Asian Games, is Sreeshankar's coach. Sreeshankar won the 50- and 100-meter under-10 state championships before switching to the long jump at the age of 13.

• Tejaswin Shankar

• Tejaswin Shankar, an Indian athlete who participates in the high jump event, was born on December 21, 1998. He set the 2.29-meter national high jump record in April 2018.

• Shankar was born into a Tamil household on December 21, 1998, in Delhi. He is a native of South Delhi's Saket. At the Sardar Patel Vidyalaya in New Delhi, where he attended school, he competed in cricket up until the eighth grade, when his physical education instructor suggested he switch to high jumping. He immediately began taking home prizes in interschool competitions.

• Mohit Grewal

• Indian freestyle wrestler Mohit Grewal competes in the 125 kg division. At the Commonwealth Games in Birmingham in 2022, he took home a bronze medal.

• Amarveer Dhesi of Canada eliminated him in the Semi-Finals after he defeated Alexios Kaoslidis of Cyprus in the Quarterfinals. Grewal later defeated Jamaican Aaron Johnson in the bronze medal match, which he won.

Q98. Answer: (c) No fixed position can be given to hydrogen in the Periodic Table.

The correct answer is No fixed position can be given to hydrogen in the Periodic Table.

Key Points

• Mendeleev's periodic table is a tabular organization of the elements in increasing atomic mass order, reflecting commonalities and patterns in the behavior of elements.

• Mendeleev initially grouped elements in descending order according to their atomic weight.

• Elements that have similar properties are put close to each other. In the same horizontal row are elements with similar properties.

Additional Information

• Another limitation of Mendeleev’s periodic table is elements with substantial variances in their characteristics were grouped together. For example, both hard metals such as copper and silver, and soft metals such as sodium and potassium were included.

• Hydrogen could not be placed in an appropriate position. Hydrogen's position in the periodic table is unclear. Hydrogen was classified with alkali metals in 1A, however, certain properties are similar to those of halogens. Therefore, it can also be placed in the band for halogens.

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• Isotopes, which have varying atomic masses, were not assigned a distinct location in the table.

Q99. Answer: (a) 4.54%

Shortcut Trick

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

Given: Profit (P) = 5% and Markup = 10% (i.e., MP = 110 when CP = 100).

110 ÷ 100 = (100 + 5) ÷ (100 − D).

1.1 = 105 ÷ (100 − D) => 110 − 1.1D = 105.

1.1D = 5 => D = 5 ÷ 1.1 = 4.54%.

Therefore The correct answer is 4.54%.

Alternate Method

Given: Markup % = 10%, Profit % = 5%.

Formulas: MP = CP × (100 + Markup%) ÷ 100 | SP = CP × (100 + Profit%) ÷ 100 | Discount % = (MP − SP) ÷ MP × 100.

=> Let Cost Price (CP) = 100.

=> Marked Price (MP) = 100 + 10% of 100 = 110.

=> Selling Price (SP) = 100 + 5% of 100 = 105.

=> Discount Amount = MP − SP = 110 − 105 = 5.

=> Discount % = (5 ÷ 110) × 100 = 500 ÷ 110 = 4.5454...%.

=> Discount % ≈ 4.54%.

Therefore The correct answer is 4.54%.

Additional Information

Relation between MP and CP

The formula MP/CP = (100 + Profit%)/(100 − Discount%) is a direct way to solve problems involving markup, profit, and discount.

Markup Percentage

Markup % = [(MP − CP) ÷ CP] × 100. It is the percentage by which the cost price is increased to set the marked price.

Q100. Answer: (c) U

From the given information:

Step 1: U is sitting to the immediate left of X.

Step 2: Y is sitting between X and W

Now we place V at the only spot left,

From the arrangement we can see that, U is sitting at the immediate right of V.

Hence, the correct answer is option 3).

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