RRB Group D Previous Year Paper (Held on: 17 Sept 2022 Shift 1)

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

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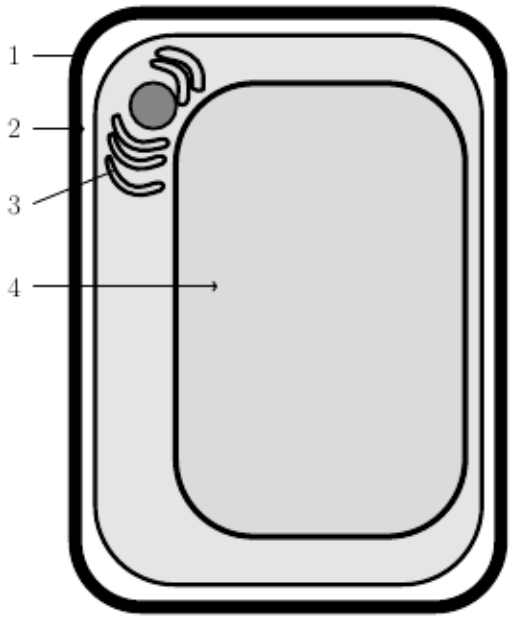
Q1. Which of the following reactions is NOT an example of neutralisation reaction?

(a) $H_3PO_4 + 3KOH \rightarrow K_3PO_4 + 3H_2O$
(b) $CaO + H_2O \rightarrow Ca(OH)_2$
(c) $HNO_3 + KOH \rightarrow KNO_3 + H_2O$
(d) $Ca(OH)_2 + H_2CO_3 \rightarrow CaCO_3 + 2H_2O$

Q2. An amount of Rs. 1,344 is divided among three persons in the ratio of 3 : 4 : 5. The difference between the largest and the smallest shares in the distribution is:

(a) Rs. 260
(b) Rs. 236
(c) Rs. 248
(d) Rs. 224

Q3. Where can we find waste products in a plant cell shown in the following figure?



(a) Region shown by arrow 1
(b) Region shown by arrow 4
(c) Region shown by arrow 3
(d) Region shown by arrow 2

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Q4. Avina has tuitions for six subjects - Maths, English, Computer Science, Physics, Biology and Chemistry, each on a different day of a week from Monday and ending on Saturday of the same week, but not necessarily in this order.

Only three subject tuitions are scheduled between Computer Science and Physics tuitions. Only Chemistry tuition is scheduled between Maths and English tuitions. Biology tuition is on Monday. Physics tuition is on the day immediately after the Maths tuition which is on Friday. Which subject's tuition is scheduled on Wednesday?

(a) Physics
(b) Biology
(c) Chemistry
(d) English

Q5. From the numbers 367, 489, 514, 632 and 728, if 2 is added to the first digit of each of the numbers, how many new numbers will be thus formed whose sum of all digits will be divisible by three?

(Example- 697- First digit = 6, second digit = 9 and third digit = 7)

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

Q6. In a triad the middle element has:

(a) atomic mass equal to the of sum of the first and third elements
(b) double the atomic mass of the first element
(c) double the atomic mass of the third element
(d) average atomic mass of the first and third elements

Q7. In which of the following infections does the virus go to the immune system and damages its function?

(a) Cancer
(b) Malaria
(c) HIV-AIDS
(d) Typhoid

Q8. An astronaut from the moon's surface will observe the sky as:

(a) blue
(b) white
(c) black
(d) red

Q9. Which of the following terms is used for the expression 'C' in the consumption function?

(a) Average propensity to consume
(b) Autonomous Consumption
(c) Marginal propensity to consume
(d) Induced consumption

Q10. 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.

28 : 2 :: 126 : 4 :: 65 : ?

(a) 7
(b) 3
(c) 5
(d) 6

Q11. Which of the following enzymes in the saliva breaks down starch which is a complex molecule to give simple sugar?

(a) Salivary trypsin
(b) Salivary pepsin
(c) Salivary amylase
(d) Salivary lipase

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Q12. Which of the following statements is INCORRECT?

a) Methanoic acid is secreted by Nettle plant leaves.

b) Acetic acid is found in vinegar.

c) Tooth decay starts when mouth pH is lower than 5.5.

d) Bacteria present in the mouth produces base by degradation of the remaining food particles present in the mouth.

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

Q13. The value of $\sqrt{(1+((1-\tan A)/(1-\cot A))^2)}$ is :

(a) cot A
(b) tan A
(c) cos A
(d) sec A

Q14. Which of the following numbers will replace the question mark (?) in the given series?

48, 52, 26, 30, 15, ?

(a) 18
(b) 17
(c) 19
(d) 20

Q15. Express 0.5323323... in the form p/q, where p and q are integers and $q \neq 0$.

(a) 5323/9990
(b) 2661/4990
(c) 2659/4995
(d) 5333/9990

Q16. The sum of the present ages of Ram, Nikhil and Aswin is 111 years. Ten years ago, the ratio of their ages was 2 : 3 : 4. What is the present age (in years) of Nikhil?

(a) 16
(b) 28
(c) 37
(d) 44

Q17. Most popularly celebrated in Maharashtra and Gujarat, the Parsi New Year is known as _____ and marks the beginning of the Iranian calendar.

(a) Navreh
(b) Bestu Varas
(c) Nowruz
(d) Losoong

Q18. Five runners are standing in a straight row facing the east. Runner K is standing at the first position and M is at the end position. L is standing to the immediate left of N, and N is standing to the immediate left of M. P is standing third to the left of M. Who is standing to the immediate left of P?

(a) M
(b) L
(c) K
(d) N

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Q19. The state of Rajasthan regained its lost greenery due to which canal?

(a) Sirhind Canal
(b) Munak Canal
(c) Agra Canal
(d) Indira Gandhi Canal

Q20. Which of the following components are necessary for photosynthesis?

(a) Oxygen, water, sunlight and chlorophyll
(b) Carbon dioxide, water, sunlight and oxygen
(c) Carbon dioxide, water, sunlight and chlorophyll
(d) Carbon dioxide, water, Oxygen and chlorophyll

Q21. If the volume of a solid cube is 216 cm^3, then its total surface area (in cm^2) is _____.

(a) 216
(b) 38
(c) 36
(d) 6

Q22. Deomali Peak is in which of the following states of India?

(a) Odisha
(b) Rajasthan
(c) Himachal Pradesh
(d) Karnataka

Q23. Which of the following numbers will replace the question mark (?) in the given series?

17, 19, 21, 19, 25, 19, ?

(a) 29
(b) 30
(c) 27
(d) 32

Q24. The smallest 1-digit number to be added to the 6-digit number 234492 so that it is completely divisible by 11 is:

(a) 7
(b) 6
(c) 4
(d) 5

Q25. In a triangle PQR, angle P = 30° and the straight line UV is drawn parallel to QR, intersecting PQ at S and PR at T. Which of the following is always true?

a) PS/PQ=PT/PR

b) ST = QR/2

c) The triangle PST is similar to the triangle PQR.

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

Q26. The Vikram Sarabhai Journalism Award is given in the field of _____.

(a) Atomic Energy Research
(b) Medical Science Research
(c) Health and Physical Education Research
(d) Space Science, Technology and Research

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Q27. Dialysis is the procedure done to remove the waste products from the blood when the normal functioning of kidneys is affected. The steps of dialysis are given below but not in the proper order. Which option shows the correct sequence of these steps?

a) Line to vein

b) Patient's blood passed through a tank with dialysing fluid

c) Line from artery

d) Waste products from the blood pass into dialysing fluid

e) Dialysing fluid has same osmotic pressure as blood except the wastes

(a) c---b---d---a---e
(b) c---b---e---d---a
(c) a---c---d---b---e
(d) a---b---c---d---e

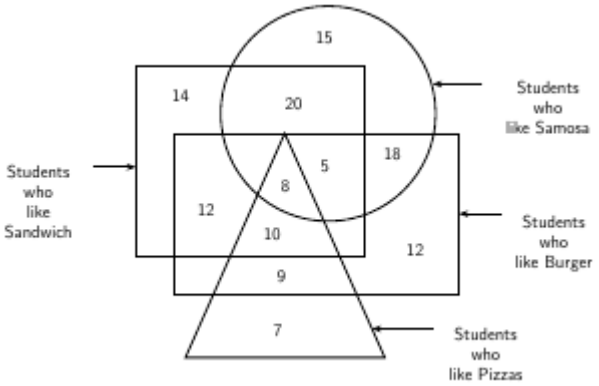
Q28. As of March 2022, who is the Union Minister of Rural Development & Panchayati Raj?

(a) Mansukh L Mandaviya
(b) Giriraj Singh
(c) Dharmendra Pradhan
(d) Pralhad Joshi

Q29. The speed of a bus increases by 4 km/h after every two hours. If the bus covers a distance of 80 km in the first two hours, then the total distance covered by the bus in 10 hours will be:

(a) 470 km
(b) 440 km
(c) 460 km
(d) 480 km

Q30. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of students surveyed regarding types of snacks they like to have in the college canteen.



How many students like both Samosa and Burger?

(a) 23
(b) 31
(c) 18
(d) 13

Q31. Select the option that is related to the fifth number in the same way as the fourth number is related to the third number and the second number is related to the first number.

17 : 38 :: 23 : 50 :: 12 : ?

(a) 28
(b) 35
(c) 33
(d) 39

Q32. if '+' means '-', '-' means '÷', '×' means '+', '÷' means '×', what will come in place of the question mark (?) in the following equation?

2 - 4 × 25 + 13 ÷ 2 = ?

(a) -0.5
(b) -1
(c) 0.5
(d) 3

Q33. Ashish sold a cow to Bipin for Rs. 5,000 by losing 20%. Bipin sold it to Kasim at that price which would have given Ashish a profit of 15%. What is Bipin's gain in this transaction?

(a) Rs. 1,250.00
(b) Rs. 2,187.50
(c) Rs. 937.50
(d) Rs. 2,100.00

Q34. Refer to the following letter, number, symbol series and answer the question that follows.

(Left) 4 # O $ 5 T F 8 % U 2 P A & F Ø 3 @ T 4 ¥ I # H (Right)

How many such symbols are there in the above series each of which is immediately followed by a vowel and also immediately preceded by a number?

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

Q35. If each of the letters in the word MIRACLE is arranged in alphabetical order, then how many letters are there in the English alphabetical series between the letter which is third from the left and the one which is third from the right in the new arrangement?

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

Q36. If 16 : y :: y : 25, find the positive value of y.

(a) 15
(b) 10
(c) 18
(d) 20

Q37. The value of x in the proportion equation 5 :12 :: 9 : x is:

(a) 21.6
(b) 21.4
(c) 20.6
(d) 20.4

Q38. Six boxes, A, B, C, P, U and V, are kept one over the other, but not necessarily in the same order. B is the top-most box, and C is immediately below B. There are only two boxes between B and V. There are only three boxes between P and C. There is only one box below U. Which box is kept immediately below U?

(a) V
(b) A
(c) C
(d) P

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Q39. Which of the following Articles of the Indian Constitution deals with the separation of judiciary from the executive?

(a) 53
(b) 50
(c) 52
(d) 51

Q40. 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: A > C = B, M > N > O > P > Q = A

(a) O < B
(b) B < M
(c) N < C
(d) C > N

Q41. Amongst six girls-A, C, F, H, J and K, each has a different height. They are standing in the ascending order of their heights, shortest in the front and tallest at the back. C is at the beginning of the queue. There is only one person taller than F. H is immediately taller than A. Both C and H are shorter than K. There is only one other person between A and C. If H and F are at the fourth and the fifth places from the start of the queue, respectively in the queue, then who is second from the beginning of the queue?

(a) J
(b) A
(c) K
(d) C

Q42. In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/Symbols	**2**	**@**	**9**	**5**	**$**	**&**	**3**	**%**	**#**	**7**	**•**	**4**	**8**	**6**
Code	T	F	A	J	L	E	W	Q	D	P	R	B	U	S

Conditions:

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

(ii) If the first element is an odd number and the last is an even number, the first and the last elements are to be coded as ©

(iii) If both the second and the third elements are perfect squares, the third element is to be coded as the code for the second element.

Question: 7 % 9 # 2

(a) Q©AD©
(b) ©D©QA
(c) ©AD©Q
(d) ©QAD©

Q43. The ages of Ram and Sita are in the ratio 5 : 8. Three years later the sum of their ages will be 58 years. The present age of Ram is:

(a) 21 years
(b) 22 years
(c) 20 years
(d) 25 years

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Q44. If the curved surface area of a right circular cylinder is 880 cm^2 and the diameter of its base is 7 cm, then the height (in cm) the cylinder is _____.

Take $\pi = 22/7$.

(a) 28
(b) 14
(c) 40
(d) 20

Q45. In this question, a group of numbers symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number /symbol	**•**	**2**	**@**	**5**	**^**	**•**	**7**	**#**	**%**	**9**	**4**
Letter code	J	P	A	F	D	N	R	K	M	Z	B

Conditions:

(i) If both first and fourth elements are even numbers, the third element is to be coded as the code for the third element

(ii) If both second and third elements are perfect squares, the third element is to be coded as the code for the second element

Which one of the following would be the code for %94#2?

(a) MBZKP
(b) MZZKP
(c) MZBKP
(d) MBZPK

Q46. As per the report of Stockholm International Peace Research Institute (SIPRI) titled 'Trends in International Arms Transfers, 2021', India is the world's _____ arms importer globally.

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

Q47. The value of 20 - [12 - {14 - (12 - 16- 10)}] is :

(a) 20
(b) 10
(c) 16
(d) 8

Q48. In the given letter-cluster pairs, the first letter-cluster is related to the second letter cluster following a certain logic. Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

TSRA : ZIHG

OLEV : EVOL

(a) CRVF : VEIX
(b) KVRA : ZIEQ
(c) JPMN : ONKQ
(d) ARNI : RMIZ

Q49. The discriminant of a quadratic equation is 0. The quadratic equation has:

(a) no real roots
(b) two distinct real roots
(c) three distinct real roots
(d) two equal real roots

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Q50. A group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/symbol	**#**	**•**	**•**	**8**	**@**	**6**	**5**	**2**	**%**	**4**	**3**	**&**	**7**	**9**
Code Letter	D	L	F	A	H	M	Q	N	C	X	W	G	T	R

Conditions:

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

(ii) If the first element is an odd number and the last element is an even number, the first and last elements are to be coded as ©.

(iii) If both the second and third elements are perfect squares, the third element is to be coded as the code for the second element.

What will be the code for 3 & % 4 6 ?

(a) WGCXM
(b) ©GCX©
(c) ©GCX#
(d) WQLT©

Q51. The ratio of 9^(3.5) : 3^5 is the same as:

(a) 1 : 7
(b) 9 : 1
(c) 1 : 14
(d) 7 : 1

Q52. The functional group which has more than one oxygen atom is:

(a) Alcohol
(b) Aldehyde
(c) carboxylic acid
(d) Ketone

Q53. Which river of Rajasthan had dried up but revived with efforts of the villagers assisted by Tarun Bharat Sangh, an NGO?

(a) Luni River
(b) Arvari River
(c) Saraswati River
(d) Bhagirathi River

Q54. AD is the altitude of an isosceles triangle ABC in which AB = AC. Which of the following is true for AD?

(a) AD bisects angle C
(b) AD bisects angle B
(c) AD does not bisect angle A
(d) AD bisects angle A

Q55. If 5^(x + y) = 125 and 5^(x - y) = 3125, then the value of y is:

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

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Q56. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

MSN15, QWR18, UAV21, YEZ24,?

(a) CID27
(b) DBC27
(c) DNS31
(d) CJL31

Q57. Why should we human beings reduce our dependence on petroleum products?

(a) Petroleum needs to be refined
(b) Petroleum needs to be imported
(c) Petroleum is very expensive
(d) Amount of petroleum is finite

Q58. What was the historic contribution of the community of Amrita Devi Bishnoi in Rajasthan in the 1700s?

(a) They dug several ponds to capture rainwater and stopped desertification of the region.
(b) They planted thousands of Khejri trees and stopped desertification of the region.
(c) They set up the first wildlife sanctuary to protect deer from hunters.
(d) They laid down their lives to stop the cutting down of trees growing in their region.

Q59. The Board of Control for Cricket in India (BCCI) has finalised a Central Contracts list for the 2022-23 season for Indian cricketers. Which of the following senior players has lost the Grade A status in 2022?

(a) Virat Kohli
(b) Chateshwar Pujara
(c) Rohit Sharma
(d) Jasprit Bumrah

Q60. What is the quadratic equation whose roots are 2 and -1/2 ?

(a) $2x^2 - 3x - 4 = 0$
(b) $2x^2 - 3x - 1 = 0$
(c) $2x^2 - 3x - 2 = 0$
(d) $2x^2 - 3x - 3 = 0$

Q61. The limit of 'Shishu' loan that is granted under Micro Units Development & Refinance Agency (MUDRA) is _____.

(a) Rs. 50,000 to Rs. 5 lakh
(b) up to Rs. 50,000
(c) Rs. 5 lakh to Rs. 10 lakh
(d) up to Rs. 50 lakh

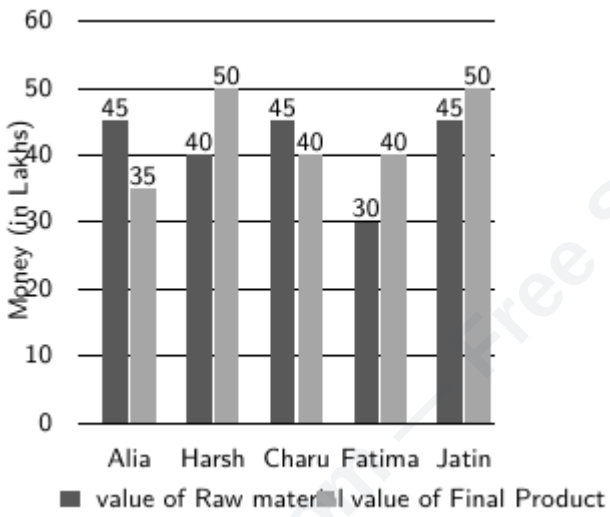
Q62. If '+' means '-', '-' means '×', '×' means '÷', '÷' means '+', what will come in place of the question mark (?) in the following equation?

17 ÷ 3 - 2 + 12 × 4 = ?

(a) 21
(b) 20
(c) 18
(d) 15

Q63. The value of raw material and the value of final products manufactured by five people are shown in the following graph. Study the graph and answer the question.

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Which manufacturer among the following has the maximum percentage increase in the value of final product as compared to the value of raw material, and by how much (approx.)?

(a) Harsh, 33%
(b) Fatima, 25%
(c) Fatima, 33%
(d) Harsh, 25%

Q64. The British introduced the concept of _____ in 1850, which significantly influenced the structure of the Indian economy

(a) waterways
(b) airways
(c) roadways
(d) railways

Q65. Find the smallest natural number that can be divided by the first five 2-digit positive even numbers without leaving a remainder.

(a) 5560
(b) 5120
(c) 5340
(d) 5040

Q66. The mode of 5, 18, 6, 7, 6, 2, 3, 4, 24, 2, 7, 21, 2, 81 is:

(a) 6
(b) 7
(c) 81
(d) 2

Q67. Eight boxes, J, K, L, M, N, O, P and Q, are kept in a vertical pattern, one over the other but not necessarily in the same order). L is placed at the bottommost position. Q is at the third place from the top and N is just below J. Only two boxes are placed between Q and M. K is placed somewhere between M and N and O is just below Q. Which box is placed at the second position from the bottom?

(a) N
(b) M
(c) J
(d) P

Q68. Ramadan is the _____ month of the Islamic calendar and the holy month of fasting.

(a) ninth
(b) eighth
(c) seventh

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(d) tenth

Q69. If x-1/x = 5, then the value of x^4+1/(x^4) is:

(a) 727
(b) 827
(c) 927
(d) 627

Q70. Six actors are sitting in a line facing the north. A is sitting at the first position, and G is sitting third to the right of A. H is sitting to the immediate right of G. F is sitting second to the right of A. L is sitting to the immediate right of A. S is sitting at the end of the line. Who is sitting to the immediate right of L?

(a) H
(b) F
(c) S
(d) G

Q71. Which of the following is NOT a constitutional body of the Government of India?

(a) Comptroller and Auditor General
(b) Election Commission
(c) NITI Aayog
(d) Union Public Service Commission

Q72. A wholesaler sells a tin of oil at Rs. 540 and bears a loss of 10%. Now, if he decides to sell another tin of oil with same cost at Rs. 696, his profit percentage in the sale of second tin will be equal to:

(a) 15%
(b) 18%
(c) 16%
(d) 12%

Q73. Which of the following goals does NASA hope to achieve by launching the HelioSwarm research mission?

(a) Improving the understanding of the dynamics of the Sun
(b) Improving the understanding of MARS
(c) Improving the understanding of Ionosphere
(d) Understanding the intense seasonal episodes of Pluto

Q74. How many molecules of hydrogen sulphide are required to balance the given chemical equation? $SO_2 + H_2S \rightarrow 3S + 2H_2O$

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

Q75. Suppose a human hair is 30.0 μm thick. If Reshmi uses a concave mirror of focal length 25 cm and obtains an image of the hair of 60 cm thickness, then the hair should be placed in front of the mirror at:

(a) 60 cm
(b) 50 cm
(c) 40 cm
(d) 25 cm

Q76. Which of the following groups in the Modern Periodic Table have NO metallic element?

(a) 17
(b) 15
(c) 16
(d) 14

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Q77. As of August 2022, under which Mission has the Government of India subsumed the Child Protection Services Scheme of 2017?

(a) Poshan
(b) Bachpan
(c) Vatsalya
(d) Indradhanush

Q78. A needle is placed at a distance 2.5f from the pole of a convex mirror of focal length f. The linear magnification is:

(a) 2/7
(b) 3/7
(c) 1/7
(d) 4/7

Q79. 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 cashews are jaggery.
2. No food is jaggery.
3. Some walnuts are food.

Conclusions:

I. Some walnuts are cashews.
II. Some walnuts are jaggery.
III. No food is cashew.

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

Q80. The magnitude of force acting on the arms of an armature is maximum when the length of the arms is _____.

(a) at an angle of 45° to the magnetic field
(b) perpendicular to the magnetic field
(c) parallel to the magnetic field
(d) at an angle of 60° to the magnetic field

Q81. Two wires are of the same length and the same resistance, but the ratio of their cross-sectional areas is 1 : 8. The ratio of their resistivities will be:

(a) 1 : 8
(b) 3 : 8
(c) 8 : 1
(d) 8 : 3

Q82. Ajay starts from his office and drives 3 km towards the east. He then takes a right tum, drives 4 km, tums left, and drives 5 km. He then takes a left turn and drives 3 km and stops at a shop. Which direction should he drive now in order to reach his office from that shop? (All turns are 90° turns only)

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

Q83. A commutator is used to change the direction of current in the coil of _____.

(a) AC generator only
(b) DC generator only
(c) DC Motor Only

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(d) DC motor and DC generator both

Q84. Read the given statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

India still needs gender equality programmes to make people aware about this.

Arguments:

I. People still believe boys are better than girls.

II. Gender discrimination has vanished from our society.

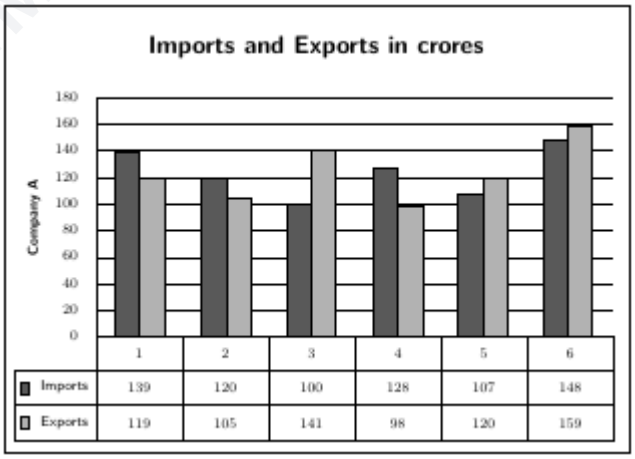
(a) II weakens while I strengthens the statement.
(b) Both I and II strengthen the statement.
(c) Both I and II weaken the statement.
(d) I weakens while II strengthens the statement.

Q85. Smaller particles scatter the light of ____ and __ colour the most; on the other hand, larger particles scatter the light of __ and ____ colour the most.

(a) red, orange; green, yellow
(b) violet, blue; red, orange
(c) violet, blue; green, yellow
(d) red, orange; violet, blue

Q86. The given bar graph shows the exports and imports of Company A over a period of time. Study the bar graph and answer the question that follows.

The numbers 1 to 6 in the graph represent the years from 2001 to 2006.



	1	2	3	4	5	6
Imports	139	120	100	128	107	148
Exports	119	105	141	98	120	159

For how many years are the exports at least 10% higher than the imports?

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

Q87. A number is increased by 30% and then decreased by 40%. The net increase or decrease percentage is:

(a) 22% decrease
(b) 32% increase
(c) 44% decrease
(d) 34% increase

Q88. Answer the question asked on the basis of the letter, number and symbol series given below.

(Left) E 5 % H V 7 8 L M # @ A 6 3 F & S 4 Z (Right)

How many such letters are there in the above series, which are immediately preceded by a letter and immediately followed by a number?

(a) 2
(b) 1

(c) 0
(d) 3

Q89. In India, the Integrated Wastelands Development Programme (IWDP) has been under implementation since _____.
(a) 2001-02
(b) 1991-92
(c) 1989-90
(d) 1994-95

Q90. Who among the following was appointed the head coach of Indian Cricket Team in November 2021?
(a) VVS Laxman
(b) Anil Kumble
(c) Sachin Tendulkar
(d) Rahul Dravid

Q91. Which of the following metals is the least reactive, as per the reactivity series of metals?
(a) Lead
(b) Zinc
(c) Magnesium
(d) Iron

Q92. Refer to the following letter series and answer the question that follows.
(Left) E B Y T F R D C S W E R F V Y H N E C S R F C A R W (Right)
If every odd placed letter in the above series is dropped, which letter would appear at the seventh place from the left?
(a) V
(b) Y
(c) F
(d) H

Q93. When was Tamil declared a classical language of India?
(a) 2007
(b) 2005
(c) 2004
(d) 2006

Q94. What are the main products in the process of neutralisation reaction?
(a) CO_2 and salt
(b) H_2O and salt
(c) O_2 and salt
(d) N_2 and salt

Q95. In March 2022, the Union Cabinet, chaired by Prime Minister Narendra Modi, has extended the Pradhan Mantri Garib Kalyan Anna Yojana till which period?
(a) September 2022
(b) September 2024
(c) September 2023
(d) September 2025

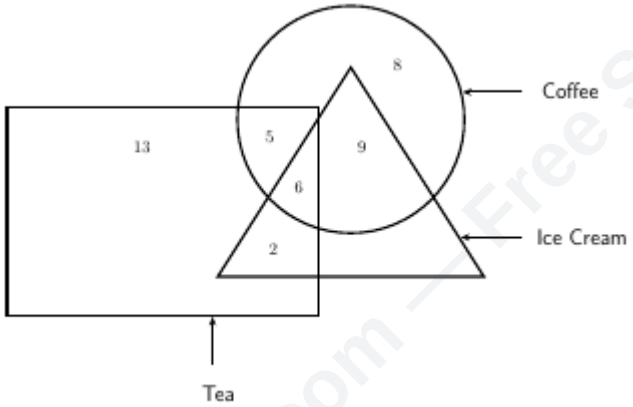
Q96. If three resistors of 3 Ω, 2 Ω and 6 Ω are connected in series combination with a 9 V battery, then the potential difference across the 6 Ω resistor will be:
(a) 2.4 V
(b) 1.6 V
(c) 9 V

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(d) 4.9 V

Q97. Study the given diagram carefully and answer the question that follows.

The numbers in different sections indicate the number of people who have coffee, tea, and ice cream.



How many people have all three i.e. Ice cream, Tea as well as Coffee?

(a) 2
(b) 5
(c) 6
(d) 9

Q98. At present, a man is 50 years old and his daughter is 22 years old. The man will be twice as old as his daughter after _____ years.

(a) 6
(b) 5
(c) 18
(d) 9

Q99. The first 'Home Rule League' was founded by _____.

(a) Bipin Chandra Pal
(b) Surendranath Tagore
(c) Chandra Shekhar Azad
(d) Bal Gangadhar Tilak

Q100. Consider two wires of the same material, but the ratio of their cross-sectional areas is 2 : 5 and the ratio of their lengths is 7 : 5. If the same amount of current is flowing through them when they are connected to two batteries with voltages V1 and V2, respectively, then V1 : V2 is:

(a) 7 : 5
(b) 7 : 2
(c) 2 : 5
(d) 2 : 7

ANSWER KEY

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

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

SOLUTIONS

Q1. Answer: (b) CaO + H2O → Ca(OH)2

The correct answer is CaO + H2O → Ca(OH)2.

Key Points

• Neutralization Reaction:

• It is a chemical reaction in which an acid and base react together to form salt and water as products.

• Example of the neutralization reaction.

• Ca(OH)2 + H2CO3 → CaCO3 + 2H2O

• H3PO4 + 3KOH → K3PO4 + 3H2O

• HNO3 + KOH → KNO3 + H2O

• The reaction between calcium oxide (CaO) and water (H2O) to form calcium hydroxide (Ca(OH)2) is an example of a combination reaction and not a neutralisation reaction.

Additional Information

• Other types of Chemical Reactions:

• Decomposition reaction: The opposite of a combination reaction, a complex molecule breaks down to make simpler ones. Such reactions are represented by equations of the following form: AB → A + B.

• Precipitation reaction: Two solutions of soluble salts are mixed resulting in an insoluble solid (precipitate) forming. Such reactions are represented by equations of the following form: A + Soluble salt B → Precipitate + soluble salt C.

• Combination reaction: It is a reaction where two or more elements or compounds combine to form a single compound. Such reactions are represented by equations of the following form: X + Y → XY.

• Combustion reaction: Oxygen combines with a compound to form carbon dioxide and water. These reactions are exothermic, meaning they give off heat. Such reactions are represented by equations of the following form: A + O2 → H2O + CO2.

• Displacement reaction: One element takes place with another element in the compound. Such reactions are represented by equations of the following form: A + BC → AC + B.

Q2. Answer: (d) Rs. 224

Shortcut Trick

Total ratio units = 3 + 4 + 5 = 12 units.

Total amount = Rs. 1,344.

Difference between largest (5) and smallest (3) = 5 − 3 = 2 units.

Required Difference = (1344 ÷ 12) × 2 = 112 × 2 = Rs. 224.

Therefore The correct answer is Rs. 224.

Alternate Method

Given: Total amount = Rs. 1,344; Ratio = 3 : 4 : 5.

Let the shares be 3x, 4x, and 5x.

=> 3x + 4x + 5x = 1344

=> 12x = 1344

=> x = 1344 ÷ 12 = 112

=> Largest share = 5 × 112 = Rs. 560

=> Smallest share = 3 × 112 = Rs. 336

=> Difference = 560 − 336 = Rs. 224

Therefore The correct answer is Rs. 224.

Additional Information

Ratio Division Rule

To divide a quantity A in the ratio a:b:c, the shares are [a/(a+b+c)]×A, [b/(a+b+c)]×A, and [c/(a+b+c)]×A.

Compound Ratio

The compound ratio of (a : b) and (c : d) is (ac : bd), obtained by multiplying the corresponding terms.

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Mean Proportional

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

Q3. Answer: (b) Region shown by arrow 4

The correct answer is Region shown by arrow 4.

Key Points

• The vacuole, indicated by arrow 4, is the largest organelle in most plant cells.

• It is responsible for the storage of water and a variety of chemicals including nutrients, proteins, and waste products.

• The vacuole also maintains osmotic balance, provides structural support, and is involved in the degradation of waste materials.

Additional Information

• Chloroplasts:

• Chloroplasts are specialized organelles within plant cells that conduct photosynthesis.

• Cell Wall:

• The cell wall provides mechanical strength, structural support, and protection against mechanical stress and infection.

• Plasma Membrane:

• Typically beneath the cell wall, the plasma membrane controls the movement of substances into and out of the cell.

Q4. Answer: (d) English

Given: Avina has tuitions for six subjects - Maths, English, Computer Science, Physics, Biology and Chemistry.

Each on a different day of a week from Monday and ending on Saturday of the same week.

1) Biology tuition is on Monday.

2) Only three subject tuitions are scheduled between Computer Science and Physics tuitions.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	
Thursday	
Friday	
Saturday	Physics

3) Physics tuition is on the day immediately after the Maths tuition which is on Friday.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	
Thursday	
Friday	Maths
Saturday	Physics

4) Only Chemistry tuition is scheduled between Maths and English tuitions.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	English
Thursday	Chemistry
Friday	Maths
Saturday	Physics

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So, 'English' subject's tuition is scheduled on Wednesday.

Hence, the correct answer is "Option 4".

Q5. Answer: (a) Two

The solution is in Hindi. Read it online.

Q6. Answer: (d) average atomic mass of the first and third elements

The correct answer is average atomic mass of the first and third elements.

Key Points

• Dobereiner's law of triads:

• Dobereiner's law of triads states that when elements are arranged in the order of increasing atomic masses, the atomic mass of the middle element of the triad is approximately the average of the atomic masses of the other two elements.

• Example:

• In the triad of Lithium, Sodium, and Potassium, the atomic mass of Lithium is 7 and the atomic mass of Potassium is 39.

• The average of masses of Lithium and Potassium gives the atomic mass of Sodium 23.

Additional Information

• Newland's law of octaves:

• It states that when elements are arranged in order to increase atomic masses, every eighth element has properties similar to the first.

• Mendeleev's law:

• The law states that the physical and chemical properties of the elements are the periodic function of their atomic masses.

Q7. Answer: (c) HIV-AIDS

The correct answer is HIV-AIDS.

Key Points

• Human immunodeficiency virus (HIV) is a virus that attacks a part of the immune system and damages its function.

• AIDS is a late stage of HIV infection.

• This virus targets white blood cells called CD4 (T cells).

• They are needed to fight off infections and other diseases.

• Low levels of CD4 cells make it harder for the body to stop or control infections and diseases.

Important Points

• HIV is most commonly spread through:

• Sexual contact with an HIV-infected person, especially vaginal or anal sex.

• Transfer of HIV from a mother to child during pregnancy, childbirth, or breastfeeding.

• HIV-contaminated needle.

Additional Information

Bacteria	**Cholera, Leprosy, Tuberculosis, Plague, Syphilis.**
Fungus	Ringworm, Candidiasis, Cryptococcosis, Aspergillosis, Histoplasmosis.
Water	Diarrhea, Dysentery, Amebiasis, Hepatitis, Gastroenteritis.

Q8. Answer: (c) black

The correct answer is Black.

Concept:

• Light scattering occurs when a parallel beam of light passes through a gas and a portion of it appears in directions other than the incident direction.

• This is referred to as light scattering.

• The basic idea behind light scattering is that light is absorbed by molecules and then re-radiated in different directions.

• Red light scatters the least, while violet light scatters the most.

• Scattering of light causes the blue colour of sky and the reddening of the Sun at sunrise and sunset.

Explanation:

• The scattering of sunlight from the atmosphere causes the sky to appear blue on Earth.

• When we look at the sky, scattered light enters our eyes. It appears blue because the colour blue is present in greater proportion

in sunlight, so blue colour is scattered the most. As a result, light appears blue.

• Since the moon has no atmosphere, there are no particles to scatter sunlight.

• This allows the astronaut to see the true emptiness of space, which appears black.

Q9. Answer: (b) Autonomous Consumption

The correct answer is Autonomous Consumption.

Key Points

• C in the consumption function represents consumption that does not depend on current income levels.

• This type of consumption is known as Autonomous Consumption.

• Autonomous Consumption is the part of consumption expenditure that would occur even if the consumer had zero income.

• It is a key component in the Keynesian consumption function, which is expressed as C = C + cY, where c is the marginal propensity to consume and Y is the income.

Additional Information

Term	Description
Autonomous Consumption	The level of consumption that would still occur even if a consumer had no income.
Marginal Propensity to Consume (MPC)	The fraction of additional income that is spent on consumption.
Average Propensity to Consume (APC)	The ratio of total consumption to total income.
Induced Consumption	Consumption that varies with the level of income.

Q10. Answer: (b) 3

The logic followed here is:

Logic: $(2\text{nd number} + 1)^3 + 1 = 1\text{st number}$.

Now,

For, 28 : 2

$\Rightarrow (2 + 1)^3 + 1 = 3^3 + 1 = 27 + 1 = 28$.

For, 126 : 4

$\Rightarrow (4 + 1)^3 + 1 = 5^3 + 1 = 125 + 1 = 126$.

Similarly, for 65 : ?

$\Rightarrow (2\text{nd number} + 1)^3 + 1 = 65$.

$\Rightarrow (2\text{nd number} + 1)^3 = 65 - 1$.

$\Rightarrow 2\text{nd number} + 1 = \sqrt[3]{64}$.

$\Rightarrow 2\text{nd number} + 1 = 4$.

$\Rightarrow 2\text{nd number} = 4 - 1$.

$\Rightarrow 2\text{nd number} = 3$.

Hence, the correct answer is "Option 2".

Q11. Answer: (c) Salivary amylase

The correct answer is Salivary Amylase.

Key Points

• Starch is a complex carbohydrate that needs to be broken down into simple sugars for the body to use it as energy.

• Amylase is the enzyme responsible for breaking down starch into simple sugars like glucose and maltose.

• The majority of amylase in your body is produced by the salivary glands and pancreas.

Additional Information

• Pepsin is an enzyme produced in the stomach.

• It breaks down proteins into amino acids.

• Trypsin is an enzyme produced in the pancreas.

• It breaks down proteins into smaller peptides.

• Lipase is an enzyme that breaks down fats into fatty acids and glycerol.

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Q12. Answer: (d) d

The correct answer is option 4.

Key Points

• Methanoic acid is indeed secreted by Nettle plant leaves. It is one of the substances that cause the stinging sensation when a person comes into contact with the nettles. Hence, Statement 1 is correct.

• Acetic acid is the main component of vinegar, contributing to its characteristic sour taste and pungent smell. Therefore, Statement 2 is correct.

• Tooth decay is known to begin when the pH in the mouth drops below 5.5. At this acidity level, the enamel on the teeth begins to demineralize, leading to decay. Thus, Statement 3 is correct.

• Bacteria in the mouth typically produce acid from the fermentation of food particles, not base. This acid contributes to tooth decay by lowering the pH of the mouth. Consequently, Statement 4 is incorrect.

Additional Information

• The acidity produced by bacterial action on food particles in the mouth is a key factor in the development of tooth decay and dental cavities.

• Regular dental hygiene, such as brushing and flossing, can help to remove food particles and reduce the bacterial population in the mouth, thus lowering the risk of tooth decay.

• Fluoride treatments and the use of fluoridated toothpaste can help to remineralize and strengthen tooth enamel, making it more resistant to acid attack.

Q13. Answer: (d) sec A

Shortcut Trick

Simplify the ratio (1 − tan A) / (1 − cot A) by using the property cot A = 1/tan A.

(1 − tan A) / (1 − 1/tan A) = (1 − tan A) / [(tan A − 1) / tan A] = −tan A.

Substituting this back: $\sqrt{(1 + (-\tan A)^2)} = \sqrt{(1 + \tan^2 A)}$.

Using the trigonometric identity: $1 + \tan^2 A = \sec^2 A$.

Therefore The correct answer is sec A.

Alternate Method

Given: The expression $\sqrt{(1 + ((1 - \tan A) / (1 - \cot A))^2)}$.

Formula Used: $1 + \tan^2 A = \sec^2 A$ and $\cot A = 1/\tan A$.

Calculations:

=> Let X = (1 − tan A) / (1 − cot A)

=> X = (1 − tan A) / (1 − 1/tan A)

=> X = (1 − tan A) / [(tan A − 1) / tan A]

=> X = [tan A × (1 − tan A)] / [−(1 − tan A)]

=> X = −tan A

=> Value = $\sqrt{(1 + X^2)}$

=> Value = $\sqrt{(1 + (-\tan A)^2)}$

=> Value = $\sqrt{(1 + \tan^2 A)}$

=> Value = $\sqrt{\sec^2 A} = \sec A$

Therefore The correct answer is sec A.

Additional Information

Fundamental Trigonometric Identities

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

Reciprocal Relations

Key ratios: tan A = sin A/cos A, cot A = cos A/sin A, sec A = 1/cos A, and cosec A = 1/sin A.

Complementary Angles

Relations: sin(90° − A) = cos A, tan(90° − A) = cot A, and sec(90° − A) = cosec A.

Q14. Answer: (c) 19

The logic followed here is:

So, '19' will replace the question mark in the given series.

Hence, the correct answer is "Option 3".

Q15. Answer: (c) 2659/4995

Shortcut Trick

To convert a mixed recurring decimal to a fraction: Numerator = (Full number) − (Non-recurring part).

Denominator = (Write 9 for each repeating digit) followed by (Write 0 for each non-repeating digit after decimal).

Numerator = 5323 − 5 = 5318.

Denominator = 9990 (3 digits repeat, 1 digit does not).

Fraction = 5318/9990 = 2659/4995.

Therefore The correct answer is 2659/4995.

Alternate Method

Given: x = 0.5323323...

Formula Used: Basic algebraic method for rationalizing recurring decimals.

=> Let x = 0.5323323... — (Eq. 1)

=> Multiply (Eq. 1) by 10: 10x = 5.323323... — (Eq. 2)

=> Multiply (Eq. 1) by 10000: 10000x = 5323.323323... — (Eq. 3)

=> Subtract (Eq. 2) from (Eq. 3): 10000x − 10x = 5323.323... − 5.323...

=> 9990x = 5318

=> x = 5318/9990

=> x = 2659/4995 (Dividing by 2)

Therefore The correct answer is 2659/4995.

Additional Information

Pure Recurring Decimal

A decimal in which all digits after the decimal point repeat, e.g., $0.\overline{3} = 3/9 = 1/3$.

Mixed Recurring Decimal

A decimal in which some digits do not repeat and some repeat, e.g., $0.1\overline{6} = (16-1)/90 = 15/90 = 1/6$.

Rational Number Property

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

Q16. Answer: (c) 37

Shortcut Trick

Sum of ages 10 years ago = 111 − (3 × 10) = 81 years.

Ratio of ages 10 years ago = 2 : 3 : 4 (Total units = 9).

Value of 9 units = 81 => 1 unit = 9 years.

Nikhil's age 10 years ago = 3 units × 9 = 27 years.

Nikhil's present age = 27 + 10 = 37 years.

Therefore The correct answer is 37 years.

Alternate Method

Given: Present sum = 111 years. Ratio (R:N:A) 10 years ago = 2 : 3 : 4.

Formula Used: Sum of ages (T years ago) = Present Sum − (n × T)

=> Sum 10 years ago = 111 − (10 + 10 + 10) = 81 years.

=> Let ages 10 years ago be 2x, 3x, and 4x.

=> 2x + 3x + 4x = 81

=> 9x = 81 => x = 9.

=> Nikhil's age 10 years ago = 3x = 3 × 9 = 27 years.

=> Nikhil's present age = 27 + 10 = 37 years.

Therefore The correct answer is 37 years.

Additional Information

Age Sum Property

If the sum of ages of 'n' persons is 'S' at present, then 'T' years ago, the sum was S − (n × T).

Ratio Application

To find a specific person's share from a total sum using a ratio a:b:c, use: Share = [Ratio Part / Total Ratio Sum] × Total Value.

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Q17. Answer: (c) Nowruz

The correct answer is Nowruz.

Key Points

• The festival of Navroz (or Nowruz) is celebrated as the New Year by the Parsi community.

• Parsis follow Zoroastrianism, which was founded in ancient Persia (now Iran).

• Navroz, or Nowruz, means "new day" and it marks the first day of the Persian calendar.

• It usually falls on March 21, symbolizing the renewal of nature and life.

• The festival is marked by feasting, praying, and meeting family and friends.

Additional Information

• Buddhist:

• The New Year in the Buddhist tradition varies depending on the country and tradition.

• For example, in Theravada countries, the New Year is celebrated for three days from the first full moon day in April.

• Sindhi:

• The Sindhi New Year is celebrated on the second day of the lunar month Cheti, which usually falls in late March or early April, and is known as Cheti Chand.

• It is celebrated in honor of the birth of the Sindhi patron saint Jhulelal.

• Jainism:

• The Jain New Year starts right after Diwali, one of the most important festivals in India, and it generally falls in late October or early November.

• It marks the anniversary of the attainment of moksha (liberation) by Mahavira, the last of the Jain Tirthankaras.

• Jainism is an ancient Indian religion emphasizing non-violence and asceticism.

Q18. Answer: (c) K

Given: Five runners are standing in a straight row facing the east.

1) Runner K is standing at the first position and M is at the end position.

2) P is standing third to the left of M.

3) L is standing to the immediate left of N, and N is standing to the immediate left of M.

So, 'K' is standing to the immediate left of P.

Hence, the correct answer is "Option 3".

Q19. Answer: (d) Indira Gandhi Canal

The correct answer is Indira Gandhi Canal.

Key Points

• Indira Gandhi Canal is the longest in India.

• It begins at Harike Barrage in Harike, a few kilometers below the confluence of the Sutlej and Beas rivers in the Indian state of Punjab, and ends at irrigation facilities in the Thar Desert in the northwest of the state of Rajasthan.

• Previously known as the Rajasthan Canal, it was renamed Indira Gandhi Canal on 2 November 1984 after the assassination of Prime Minister Indira Gandhi.

• The state receives much water from the rivers of Punjab, from the Western Yamuna Canal in Haryana and the Agra Canal in Uttar Pradesh, and from the Sabarmati and Narmada Sagar projects in Gujarat and Madhya Pradesh, respectively.

• Desert land in northwestern and western Rajasthan is irrigated by the Indira Gandhi Canal (formerly called the Rajasthan Canal), which carries water some 400 miles (640 km) from the Beas and Sutlej rivers in Punjab.

• Rajasthan shares the Bhakra Nangal project with Punjab and Haryana and the Chambal Valley project with Madhya Pradesh; both are used to supply water for irrigation and drinking purposes.

• Rajasthan regained its lost greenery due to it.

Q20. Answer: (c) Carbon dioxide, water, sunlight and chlorophyll

The correct answer is Carbon dioxide, water, sunlight, and chlorophyll.

Key Points

• Photosynthesis:

• The process by which plants make their own food in the presence of sunlight, carbon dioxide present in air, water, minerals, and chlorophyll present in leaves is termed photosynthesis.

• Components which are necessary for photosynthesis are Carbon dioxide, water, sunlight and chlorophyll.

• Carbon dioxide from air is taken in through the tiny pores present on the surface of the leaves.

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• These pores are surrounded by ‘guard cells’. Such pores are called stomata.

Water and minerals are transported to the leaves by the vessels which run like pipes throughout the root, the stem, the branches, and the leaves.

• They form a continuous path or passage for the nutrients to reach the leaf.

• The leaves have a green pigment called chlorophyll. It helps leaves to capture the energy of the sunlight.

• This energy is used to synthesize (prepare) food from carbon dioxide and water.

• Since the synthesis of food occurs in the presence of sunlight, it is called photosynthesis (Photo: light; synthesis: to combine).

So we find that chlorophyll, sunlight, carbon dioxide, and water are necessary to carry out the process of photosynthesis.

• Thus, the sun is the ultimate source of energy for all living organisms.

• Besides leaves, photosynthesis also takes place in other green parts of the plant in green stems and green branches.

• The desert plants have the scale or spine-like leaves to reduce the loss of water by transpiration. These plants have green stems which carry out photosynthesis.

• During photosynthesis, chlorophyll-containing cells of leaves, in the presence of sunlight, use carbon dioxide and water to synthesize carbohydrates. The carbohydrates ultimately get converted into starch.

• The leaves other than green also have chlorophyll. A large amount of red, brown, and other pigments mask the green color. Photosynthesis takes place in these leaves also.

-

Q21. Answer: (a) 216

Shortcut Trick

Side of the cube (a) = $\sqrt[3]{}$Volume = $\sqrt[3]{216}$ = 6 cm.

Total Surface Area (TSA) = $6 \times a^2 = 6 \times 6^2$.

TSA = $6 \times 36 = 216$ cm².

Therefore The correct answer is 216 cm².

Alternate Method

Given: Volume of the solid cube = 216 cm³.

Formula Used:

1. Volume of a cube = a^3 (where a is the side length).

2. Total Surface Area (TSA) of a cube = $6a^2$.

Calculations:

=> $a^3 = 216$

=> $a = \sqrt[3]{216}$

=> a = 6 cm

=> Total Surface Area = $6 \times (6)^2$

=> Total Surface Area = 6×36

=> Total Surface Area = 216 cm²

Therefore The correct answer is 216 cm².

Additional Information

Lateral Surface Area of Cube

It is the area of the 4 vertical faces only: LSA = $4a^2$.

Diagonal of a Cube

The longest rod that can be placed inside a cube of side a is $d = a\sqrt{3}$.

Properties of a Cube

A cube has 6 faces (all squares), 12 edges, and 8 vertices.

Q22. Answer: (a) Odisha

The correct answer is Odisha.

Key Points

• The Deomali (1672m) mountain peak is situated on the Eastern Ghat in Odisha.

• It is the highest peak of Odisha.

• Deomali is a mountain peak in the Chandragiri-Pottangi subrange of the Eastern Ghats.

• It is located near Koraput town in the Koraput district of southern Odisha, India.

Additional Information

Highest Peak	Height(m)	State
Mount k2	8611	POK (India)
Kanchenjunga	8586	Sikkim
Nanda Devi	7817	Uttarakhand
Saltoro	7742	Jammu and Kashmir
Kangto	7090	Arunachal Pradesh
Reo Purgil	6816	Himachal Pradesh
Saramati	3841	Nagaland
Sandakphu	3636	West Bengal
Khayang	3114	Manipur
Anaimudi	2695	Kerala
Doda Beta	2636	Tamil Nadu

Q23. Answer: (a) 29

The logic followed here is:

So, '29' will replace the question mark in the given series.

Hence, the correct answer is "Option 1".

Q24. Answer: (b) 6

Shortcut Trick

Sum of odd place digits = 2 + 4 + 9 = 15

Sum of even place digits = 3 + 4 + 2 = 9

Difference = 15 − 9 = 6

To make the number divisible by 11, the difference must be 0 or a multiple of 11.

Required number to add = 11 − 6 = 5 (Wait, check logic: adding to the number changes the digits). If we add 6 to 234492, we get 234498. Sum of even places becomes 3 + 4 + 8 = 15. Difference = 15 − 15 = 0.

Therefore The correct answer is 6.

Alternate Method

Given: Number = 234492

Divisibility Rule of 11: The difference between the sum of digits at odd positions and the sum of digits at even positions must be 0 or divisible by 11.

=> Let the number to be added be x.

=> The new number is 234492 + x. Since x is a 1-digit number, only the units digit changes (unless there is a carry-over).

=> Units digit becomes 2 + x. This is an even position digit (counting from left: 1st=2, 2nd=3, 3rd=4, 4th=4, 5th=9, 6th=2+x).

=> Sum of digits at even positions = 3 + 4 + (2 + x) = 9 + x.

=> Sum of digits at odd positions = 2 + 4 + 9 = 15.

=> For divisibility by 11: |15 − (9 + x)| = 0 or multiple of 11.

=> 15 − 9 − x = 0

=> 6 − x = 0

=> x = 6

Therefore The correct answer is 6.

Additional Information

Divisibility by 11

A number is divisible by 11 if the absolute difference between the sum of its odd-positioned digits and even-positioned digits is either 0 or a multiple of 11.

Divisibility by 9

A number is divisible by 9 if the sum of all its digits is divisible by 9.

Divisibility by 8

A number is divisible by 8 if the last three digits of the number are divisible by 8.

Q25. Answer: (b) Only (a) and (c)

Shortcut Trick

According to Thales Theorem (Basic Proportionality Theorem), if a line is drawn parallel to one side of a triangle, it divides the other two sides in the same ratio. Thus, PS/PQ = PT/PR is always true. Furthermore, since ST || QR, the corresponding angles are equal, making ΔPST ~ ΔPQR by AA similarity. The statement ST = QR/2 is only true if S and T are midpoints, which is not always given.

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

Alternate Method

Given: In ΔPQR, angle P = 30° and ST || QR (where S is on PQ and T is on PR).

Formula Used: Basic Proportionality Theorem (BPT) and AA Similarity Criterion.

=> In ΔPQR, since ST || QR, by Thales Theorem: PS/SQ = PT/TR.

=> By adding 1 to both sides of the reciprocal ratio: (SQ/PS) + 1 = (TR/PT) + 1.

=> (SQ + PS)/PS = (TR + PT)/PT => PQ/PS = PR/PT.

=> Taking the reciprocal: PS/PQ = PT/PR. (Statement a is always true).

=> In ΔPST and ΔPQR, angle P = angle P (Common angle).

=> angle PST = angle PQR (Corresponding angles as ST || QR).

=> Therefore ΔPST ~ ΔPQR by AA similarity. (Statement c is always true).

=> From similarity, ST/QR = PS/PQ. The condition ST = QR/2 only occurs if PS = PQ/2 (S is the midpoint).

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

Additional Information

Basic Proportionality Theorem (Thales Theorem)

If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

AA Similarity Criterion

If two angles of one triangle are respectively equal to two angles of another triangle, then the two triangles are similar.

Midpoint Theorem

The line segment joining the midpoints of two sides of a triangle is parallel to the third side and is equal to half of the third side.

Q26. Answer: (d) Space Science, Technology and Research

The correct answer is Space Science, Technology and Research.

Key Points

• The Vikram Sarabhai Journalism Award is awarded to recognize outstanding journalistic work in the field of space science, technology, and research.

• It is named after Dr. Vikram Sarabhai, who is widely regarded as the father of the Indian space program.

• The award aims to encourage and acknowledge comprehensive and objective reporting in space science.

• Recipients of this award are honored for their significant contribution to the dissemination of information about space activities to the public.

Additional Information

• Dr. Vikram Sarabhai was an Indian scientist and innovator widely regarded as the pioneer of the Indian space program.

• He was instrumental in establishing the Indian Space Research Organisation (ISRO) in 1969.

• Sarabhai emphasized the importance of space technology in a nation's development and was a key figure in the development of education and research in space science in India.

• His efforts in the development of the Thumba Equatorial Rocket Launching Station (TERLS), the first rocket launching station in India, were significant.

Q27. Answer: (b) c---b---e---d---a

The correct answer is c---b---e---d---a.

Key Points

• The first step in dialysis involves taking blood from the patient's artery to lead it into the dialysis machine.

• In the second step, this blood is passed through a tank containing a dialysing fluid, which is carefully balanced to have the same osmotic pressure as the patient's blood except for the waste products.

• The third step ensures that the dialysing fluid has the correct osmotic pressure, facilitating the transfer of waste products from

the blood into the fluid, without removing substances the body needs.

• In the fourth step, the actual exchange occurs where waste products from the blood pass into the dialysing fluid, effectively cleaning the blood.

• The final step involves returning the cleaned blood to the patient's body through a vein.

Therefore, the sequence c---b---e---d---a correctly outlines the process of dialysis from taking blood from an artery to returning it via a vein, with the cleaning process in between. Hence, Statement 2 is correct.

For Additional Information: Consider the below statements and identify the correct answer. Statement - I : Anhydrous sodium carbonate is used in soda-acid fire extinguishers. Statement - II : Anhydrous sodium carbonate is dissolved in water and recrystallized to get washing soda crystals containing 10 molecules of water of crystallisation The Correct Answer is option 4.

• Anhydrous sodium carbonate (Na_2CO_3) is the anhydrous or water-free form of sodium carbonate.

• It is a, crystalline powder with various industrial uses.

• Hydrated Form: Washing Soda: Washing soda (sodium carbonate decahydrate, $Na_2CO_3 \cdot 10H_2O$) is the hydrated form of sodium carbonate. It contains 10 molecules of water of crystallization. Washing soda is commonly used for laundry purposes, water softening, and cleaning.

Additional Information Applications:

• Soda-Acid Fire Extinguishers: Anhydrous sodium carbonate is not typically used in soda-acid fire extinguishers; this role is traditionally filled by substances like sodium bicarbonate (baking soda). When mixed with water, it reacts with sulfuric acid (present in the extinguisher) to produce carbon dioxide gas. The released CO_2 helps suppress fires by displacing oxygen and cooling the flames.

• Glass and Ceramics Industry: Anhydrous sodium carbonate is a crucial component in glass and ceramic production. It acts as a flux, lowering the melting point of silica (SiO_2) and aiding in the fusion of raw materials.

• Chemical Manufacturing: It serves as a precursor for various chemicals, including sodium bicarbonate (baking soda), sodium silicates, and sodium percarbonate (used in laundry detergents).

• Water Softening: Anhydrous sodium carbonate is used in water treatment to soften hard water. It reacts with calcium and magnesium ions (which cause hardness) to form insoluble carbonates, which can be removed.

• pH Regulation: In laboratories and industrial processes, it adjusts pH levels due to its alkaline nature.

• Textile Industry: It aids in dyeing and fixing colors in fabrics.

Q28. Answer: (b) Giriraj Singh

Key Points

• Giriraj Singh was the Union Minister of Rural Development & Panchayati Raj as of March 2022.

• This ministry is crucial for implementing schemes and policies aimed at enhancing rural infrastructure, livelihood, and governance.

• The Ministry plays a pivotal role in empowering Panchayati Raj Institutions (PRIs) to become instruments of socio-economic transformation in rural India.

• Giriraj Singh has been known for his advocacy for rural development and has been involved in numerous initiatives aimed at the upliftment of rural areas.

Additional Information

Option	Details
Mansukh L Mandaviya	Union Minister of Health and Family Welfare, Chemicals and Fertilizers.
Dharmendra Pradhan	Union Minister for Education and Skill Development and Entrepreneurship.
Pralhad Joshi	Union Minister of Parliamentary Affairs, Coal and Mines.

Q29. Answer: (d) 480 km

Shortcut Trick

Distance is covered in 5 blocks of 2 hours each.

Distances: 80, 88, 96, 104, 112 (as speed increases by 4 kmph, distance in 2h increases by 8 km).

This is an Arithmetic Progression (AP): Sum = $n/2 \times (a + l) = 5/2 \times (80 + 112)$.

Sum = $2.5 \times 192 = 480$ km.

Therefore The correct answer is 480 km.

Alternate Method

Given: Initial distance in 2 hours = 80 km; Speed increase = 4 kmph every 2 hours; Total time = 10 hours.

=> Initial speed = Distance ÷ Time = 80 ÷ 2 = 40 km/h.

=> Total 10 hours contains 5 intervals of 2 hours each.

=> Distance in 1^(st) 2 hours = 40 × 2 = 80 km.

=> Distance in 2^(nd) 2 hours = (40 + 4) × 2 = 44 × 2 = 88 km.

=> Distance in 3^(rd) 2 hours = (44 + 4) × 2 = 48 × 2 = 96 km.

=> Distance in 4^(th) 2 hours = (48 + 4) × 2 = 52 × 2 = 104 km.

=> Distance in 5^(th) 2 hours = (52 + 4) × 2 = 56 × 2 = 112 km.

=> Total distance = 80 + 88 + 96 + 104 + 112 = 480 km.

Therefore The correct answer is 480 km.

Additional Information

Arithmetic Progression (AP) in Speed

When speed increases by a fixed amount over fixed time intervals, the distances covered in those intervals form an AP. The common difference (d) for distance is (increase in speed × interval time).

Sum of AP Formula

$S_n = n/2 [2a + (n − 1)d]$ where n is the number of intervals, a is the first term, and d is the common difference.

Average Speed for AP

For an AP, the average speed (or distance) is simply the middle term if n is odd, or the average of the two middle terms if n is even.

Q30. Answer: (b) 31

According to the given Venn diagram:

The shaded area shows the "total number of students like both Samosa and Burger".

So, the total number of students like both Samosa and Burger = 8 + 5 + 18 = 31.

Hence, the correct answer is "Option 2".

Q31. Answer: (a) 28

The logic followed here is:

Logic: (1st number × 2) + 4 = 2nd number.

Now,

For, 17 : 38

=> (17 × 2) + 4 = 34 + 4 = 38.

For, 23 : 50

=> (23 × 2) + 4 = 46 + 4 = 50.

Similarly, for 12 : ?

=> (12 × 2) + 4 = 24 + 4 = 28.

Hence, the correct answer is "Option 1".

Q32. Answer: (a) -0.5

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	÷	•	×

Given Equation: 2 - 4 × 25 + 13 ÷ 2 = ?

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

New Equation: 2 ÷ 4 + 25 - 13 × 2 = ?

Applying the BODMAS Rule:

→ 2 ÷ 4 + 25 - 13 × 2 = ?

→ 0.5 + 25 - 13 × 2 = ?

→ 0.5 + 25 - 26 = ?

→ 25.5 - 26 = -0.5.

Hence, the correct answer is "Option 1".

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Q33. Answer: (b) Rs. 2,187.50

Shortcut Trick

Ashish CP = 5000 ÷ 0.8 = 6250.

Ashish Target SP (Bipin Selling Price) = 6250 × 1.15 = 7187.5.

Bipin Gain = 7187.5 − 5000 = 2187.5.

Therefore The correct answer is Rs. 2,187.50.

Alternate Method

Given: Ashish Selling Price (SP_A) = Rs. 5,000 | Ashish Loss = 20% | Ashish Target Profit = 15%.

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

=> Ashish Cost Price = 5000 × 100 ÷ 80 = Rs. 6,250.

=> Price at which Ashish would have 15% profit = 6250 × (115 ÷ 100) = Rs. 7,187.50.

=> Since Bipin sold the cow to Kasim at this price, Bipin Selling Price = Rs. 7,187.50.

=> Bipin Cost Price = Ashish Selling Price = Rs. 5,000.

=> Bipin Gain = 7187.50 − 5000 = Rs. 2,187.50.

Therefore The correct answer is Rs. 2,187.50.

Additional Information

Chain Transactions

In a chain of sales, the Selling Price of the first person becomes the Cost Price for the second person.

Profit and Loss Percentage

Profit or Loss is always calculated on the Cost Price (CP) unless stated otherwise in the problem.

Q34. Answer: (b) 3

Given Series: (Left) 4 # O $ 5 T F 8 % U 2 P A & F Ø 3 @ T 4 ¥ I # H (Right)

Symbols immediately followed by a vowel and also immediately preceded by a number.

So, the pattern needed is: Number - Symbol - Vowel

Now,

So, there are 'Three' pairs i.e.: '4#O, 8%U, 4¥I'.

Hence, the correct answer is "Option 2".

Q35. Answer: (c) Six

Given word: 'MIRACLE'

After arranged in alphabetical order:

Alphabets	**M**	**I**	**R**	**A**	**C**	**L**	**E**
Alphabetical order	A	C	E	I	L	M	R

After arranged in alphabetical order,

Third alphabet from the left end is: E,

Third alphabet from the right end is: L,

Now,

there are 6 letters between E and L.

E	**F**	**G**	**H**	**I**	**J**	**K**	**L**

Hence, the correct answer is "Option 3".

Q36. Answer: (d) 20

Shortcut Trick

For a mean proportional relationship a : b :: b : c, the middle term is given by b = √(a × c).

Here, y is the mean proportional between 16 and 25.

=> y = √(16 × 25)

=> y = 4 × 5 = 20

Therefore The correct answer is 20.

Alternate Method

Given:

The proportion is 16 : y :: y : 25.

Formula Used:

In a proportion a : b :: c : d, the product of extremes is equal to the product of means (=> a × d = b × c).

Calculations:

=> 16 / y = y / 25

=> y × y = 16 × 25

=> $y^2 = 400$

=> y = √400

=> y = 20

Therefore The correct answer is 20.

Additional Information

Mean Proportional

If three quantities a, b, c are in continued proportion, then a/b = b/c, where b is the mean proportional and $b^2 = ac$.

Third Proportional

In the continued proportion a : b :: b : c, the term c is called the third proportional to a and b, calculated as $c = b^2/a$.

Fourth Proportional

In a proportion a : b :: c : d, the term d is the fourth proportional, calculated as d = (b × c) / a.

Q37. Answer: (a) 21.6

Shortcut Trick

In a proportion a : b :: c : d, the product of extremes equals the product of means.

Product of extremes (5 × x) = Product of means (12 × 9)

5x = 108

x = 108 ÷ 5 = 21.6

Therefore The correct answer is 21.6.

Alternate Method

Given: 5 : 12 :: 9 : x

Formula Used: a/b = c/d

=> 5 / 12 = 9 / x

=> 5 × x = 9 × 12

=> 5x = 108

=> x = 108 ÷ 5

=> x = 21.6

Therefore The correct answer is 21.6.

Additional Information

Fourth Proportional

If a, b, and c are three numbers, then the fourth proportional d is calculated as d = (b × c) ÷ a.

Mean Proportional

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

Third Proportional

For two numbers a and b, the third proportional c is such that a : b :: b : c, which means $c = b^2 \div a$.

Q38. Answer: (d) P

Given: Six boxes A, B, C, P, U, and V are kept one over the other, but not necessarily in the same order.

1) B is the top-most box, and C is immediately below B.

2) There are only two boxes between B and V.

B
C
V

3) There are only three boxes between P and C.

4) There is only one box below U.

And, A will place on the remaining space.

B
C
A
V
U
P

After arranging the boxes, the box immediately below U is P.

Hence, the correct answer is "Option 4".

Q39. Answer: (b) 50

The correct answer is Article 50.

Key Points

• Article 50 of the Indian Constitution is part of the Directive Principles of State Policy. It aims to separate the judiciary from the executive in the public services of the State to ensure independence.

• This separation is crucial for upholding the integrity of the judiciary and avoiding any influence or bias from the executive branch of the government.

• The objective is to maintain the rule of law and ensure a fair and impartial judicial process for all citizens.

• Article 50 is not enforceable by courts, as it is a directive principle, but it guides the governance of the country to establish a system where the judiciary operates independently of the executive branch.

Additional Information

Option	Details
Article 53	Specifies the executive power of the Union vested in the President and exercised directly or through officers subordinate to him.
Article 52	Establishes the office of the President of India as the head of the Executive of the Union.
Article 51	Deals with the promotion of international peace and security, encouraging respect for international law, and treaty obligations.

Q40. Answer: (b) B < M

Given Statement: A > C = B, M > N > O > P > Q = A

After arranging the equation: M > N > O > P > Q = A > C = B

Now,

Conclusions:

Option 1: O < B → False (O > P > Q = A > C = B It gives O > B)

Option 2: B < M → True (M > N > O > P > Q = A > C = B It gives M > B)

Option 3: N < C → False (M > N > O > P > Q = A > C It gives N > C)

Option 4: C > N → False (M > N > O > P > Q = A > C It gives N > C)

Hence, the correct answer is "Option 2".

Q41. Answer: (a) J

Given: Six girls A, C, F, H, J, and K, each has a different height. They are standing in ascending order of their heights, shortest in the front and tallest at the back.

1) C is at the beginning of the queue.

C < < < < < __

2) There is only one person taller than F.

C < < < < F <

3) H is immediately taller than A.

4) There is only one other person between A and C.

C < < A < H < F <

5) Both C and H are shorter than K.

C < __ < A < H < F < K

And, J will place on the remaining space.

C < J < A < H < F < K

Hence, the girl who is second from the beginning of the queue is J.

Hence, the correct answer is "Option 1".

Q42. Answer: (d) ©QAD©

Given:

Number/Symbols	2	@	9	5	$	&	3	%	#	7	•	4	8	6
Code	T	F	A	J	L	E	W	Q	D	P	R	B	U	S

Conditions	Coded As
First element is a symbol and the last is a number	Codes for these two (the first and the last elements) are to be interchanged
First element is an odd number and the last an even number	First and last elements are to be coded as ©
Second and Third elements are perfect squares	Third element is to be coded as the code for the second element

Now, the group of numbers and symbols is: '7 % 9 # 2'

Here, Here, Second conditions followed in the given group,

So, codes of the First and Last elements will be coded as ©.

Then, the code for '7 % 9 # 2' is → '© Q A D ©'.

Hence, the correct answer is "Option 4".

Q43. Answer: (c) 20 years

Shortcut Trick

Ratio of Ram to Sita = 5 : 8. Sum of ratio parts = 13.

Total sum 3 years later = 58 years. Current sum = 58 − (3 × 2) = 52 years.

Value of 13 units = 52 years → 1 unit = 4 years.

Ram's present age = 5 × 4 = 20 years.

Therefore The correct answer is 20 years.

Alternate Method

Given: Present ratio = 5 : 8. Sum after 3 years = 58.

=> Let Ram's age be 5x and Sita's age be 8x.

=> (5x + 3) + (8x + 3) = 58

=> 13x + 6 = 58

=> 13x = 52

=> x = 4

=> Ram's present age = 5 × 4 = 20

Therefore The correct answer is 20 years.

Additional Information

Ratio and Proportion

When ages are given in a ratio a : b, they can be represented as ax and bx where x is a common multiplier.

Sum of Ages in Future/Past

If there are 'n' people, their total sum of ages after 't' years increases by (n × t) years.

Age Difference Property

The difference between the ages of two people remains constant throughout their lives, regardless of how many years pass.

Q44. Answer: (c) 40

Shortcut Trick

Curved Surface Area (CSA) of cylinder = π × d × h

Given: CSA = 880 cm² and Diameter (d) = 7 cm

880 = (22/7) × 7 × h

880 = 22 × h => h = 880 ÷ 22 = 40 cm

Therefore The correct answer is 40 cm.

Alternate Method

Given:

Curved Surface Area (CSA) = 880 cm²

Diameter (d) = 7 cm => Radius (r) = 7/2 = 3.5 cm

Formula Used:

CSA of Cylinder = 2πrh

Calculations:

=> 880 = 2 × (22/7) × (7/2) × h

=> 880 = 22 × h

=> h = 880 ÷ 22

=> h = 40 cm

Therefore The correct answer is 40 cm.

Additional Information

Total Surface Area of Cylinder

It is the sum of the curved surface area and the areas of the two circular bases: TSA = 2πr(h + r).

Volume of Cylinder

The space occupied by the cylinder is calculated as: Volume = πr²h.

Base Area and Perimeter

Base Area = πr² and Base Circumference (Perimeter) = 2πr.

Q45. Answer: (b) MZZKP

Given:

Number/ symbol	**•**	**2**	**@**	**5**	**^**	**•**	**7**	**#**	**%**	**9**	**4**
Letter code	J	P	A	F	D	N	R	K	M	Z	B

Conditions	**Coded As**
Both First and fourth elements are even numbers	Third element is to be coded as the code for the third element
Both second and third elements are perfect squares	Third element is to be coded as the code for the second element

Now, the group of numbers and symbols is: '%94#2'

Here, Here, Second conditions followed in the given group,

So, Third element is to be coded as the code for the second element.

Then, the code for '%94#2' is → 'MZZKP'.

Hence, the correct answer is "Option 2".

Q46. Answer: (a) second largest

The correct answer is second largest.

Key Points

• India was ranked as the second-largest arms importer globally according to the SIPRI report titled 'Trends in International Arms Transfers, 2021'.

• This position indicates India's significant reliance on foreign sources for its military hardware.

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• The country's vast imports are driven by its needs to modernize its military forces and enhance its defense capabilities.

• Major suppliers to India include countries like Russia, France, and the United States, highlighting a diversified source of imports.

• The report underscores the global arms trade dynamics and how nations prioritize defense and security through arms imports and exports.

Additional Information

Keyword	Description
SIPRI	The Stockholm International Peace Research Institute is an independent international institute dedicated to research into conflict, armaments, arms control, and disarmament.
Arms Import	The procurement of military hardware and technology from foreign manufacturers or governments.
Defense Modernization	The process of updating and enhancing the military capabilities of a country's armed forces.
Global Arms Trade	The international sale and distribution of arms and military technology, involving both imports and exports among countries.
Arms Control	Measures applied internationally to regulate and limit the production, stockpiling, proliferation, and usage of weapons, especially weapons of mass destruction.

Q47. Answer: (c) 16

Shortcut Trick

Apply the V-BODMAS rule to solve the expression step-by-step from inside to outside:

Vinculum (Bar): 16 − 10 = 6

Round Brackets: 12 − 6 = 6

Curly & Square Brackets: 14 − 6 = 8 → 12 − 8 = 4

Final Subtraction: 20 − 4 = 16

Therefore The correct answer is 16.

Alternate Method

Given:

Expression = 20 − [12 − {14 − (12 − 16 − 10)}]

Concept Used:

V-BODMAS Rule (Vinculum, Brackets, Of, Division, Multiplication, Addition, Subtraction)

Order of solving brackets: Bar → () → {} → []

Calculation:

=> 20 − [12 − {14 − (12 − 16 − 10)}]

=> 20 − [12 − {14 − (12 − 6)}]

=> 20 − [12 − {14 − 6}]

=> 20 − [12 − 8]

=> 20 − 4

=> 16

Therefore The correct answer is 16.

Additional Information

V-BODMAS Rule

V stands for Vinculum or Bar bracket. It acts as an overarching group. Even if operations like subtraction and multiplication are present under it, they are strictly resolved first.

Order of Brackets

Evaluate nested brackets in the exact order: Vinculum (Bar) → Parentheses () → Braces {} → Square Brackets [].

Signs in Simplification

When a negative sign precedes a bracket, the sign of each term inside the bracket mathematically flips when the bracket is removed or resolved.

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Q48. Answer: (d) ARNI : RMIZ

The logic followed here is:

For, TSRA : ZIHG

For, OLEV : EVOL

Similarly, for Option 4) ARNI : RMIZ

Hence, the correct answer is "Option 4".

Q49. Answer: (d) two equal real roots

Shortcut Trick

For any quadratic equation ax2 + bx + c = 0, the nature of roots depends purely on the Discriminant (D).

Condition: If D = 0, the roots are always real and equal.

Therefore The correct answer is two equal real roots.

Alternate Method

Given:

The discriminant of a quadratic equation is 0.

Concept Used:

For a standard quadratic equation ax2 + bx + c = 0, the roots are calculated using the quadratic formula:

=> x = (−b ± √D) / 2a

Where D = b2 − 4ac is the discriminant.

Calculation:

=> Substitute D = 0 into the quadratic formula.

=> x = (−b ± √0) / 2a

=> x = (−b ± 0) / 2a

=> x = −b / 2a

=> Since the ± part evaluates to zero, both roots of the equation result in the exact same value.

=> Therefore, the quadratic equation yields two identical real roots.

Therefore The correct answer is two equal real roots.

Additional Information

Nature of Roots (D = b2 − 4ac)

=> If D > 0: The quadratic equation has two distinct real roots.=> If D = 0: The quadratic equation has two equal real roots.=> If D < 0: The quadratic equation has no real roots (roots are complex/imaginary).

Sum and Product of Roots

For roots α and β of ax2 + bx + c = 0:Sum of roots (α + β) = −b / aProduct of roots (α × β) = c / a

Graphical Representation (Parabola)

When D = 0, the graph of the quadratic polynomial touches the x-axis exactly at one point (−b/2a, 0), indicating a perfect square.

Q50. Answer: (b) ©GCX©

Given:

Number/symbol	**#**	**•**	**•**	**8**	**@**	**6**	**5**	**2**	**%**	**4**	**3**	**&**	**7**	**9**
Code Letter	D	L	F	A	H	M	Q	N	C	X	W	G	T	R

Conditions	**Coded As**
First element is a symbol and the last is a number	Codes for these two (the first and the last elements) are to be interchanged
First element is an odd number and the last an even number	First and last elements are to be coded as ©
Second and Third elements are perfect squares	Third element is to be coded as the code for the second element

Now, the group of numbers and symbols is: '3 & % 4 6'

Here, Here, Second conditions followed in the given group,

So, codes of the First and Last elements will be coded as ©.

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Then, the code for '3 & % 4 6' is → '© G C X ©'.

Hence, the correct answer is "Option 2".

Q51. Answer: (b) 9 : 1

Given:

9^(3.5) : 3^5

Formula used:

9 = 3², so 9^(3.5) = (3²)^(3.5)

Then, use the property of exponents (a^m)ⁿ = a^(m×n)

Calculation:

=> 9^(3.5) = 3^7

=> The ratio becomes 3^7 : 3^5

=> The ratio simplifies to 3^(7-5) = 3²

=> 3² = 9

Therefore The ratio is 9:1, and the correct answer is option (2).

Q52. Answer: (c) carboxylic acid

The correct answer is carboxylic acid.

Key Points

• Carboxylic acids contain a carboxyl group (–COOH), which includes two oxygen atoms: one in a hydroxyl group and the other in a carbonyl group.

• Carboxylic acids are more acidic than alcohols, aldehydes, and ketones due to the presence of this functional group.

• The presence of two oxygen atoms in carboxylic acids increases their ability to form hydrogen bonds, making them more soluble in water compared to other organic compounds with similar molecular weights.

• Carboxylic acids are commonly found in biological systems and are important in various chemical industries.

Additional Information

Option	Details
Alcohol	Contains one hydroxyl (-OH) group. Alcohols vary in reactivity and properties based on the attachment of the hydroxyl group.
Aldehyde	Contains a carbonyl group (C=O) at the end of a carbon chain, making it highly reactive in nucleophilic addition reactions.
Ketone	Features a carbonyl group (C=O) located within the carbon chain. Ketones are important in various chemical syntheses and biological processes.

Q53. Answer: (b) Arvari River

The correct answer is Arvari River.

Key Points

• Revival of Arvari River: The Arvari River, which had dried up, was successfully revived through the efforts of local villagers and the NGO Tarun Bharat Sangh.

• Community Effort: The revival process was a community-led initiative, demonstrating the power of collective action in environmental conservation.

• Water Management Techniques: Traditional water harvesting techniques were employed, including the construction of johads (small earthen check dams) to recharge groundwater.

• Impact on Livelihood: The revival of the river led to improved agricultural practices, increased water availability for irrigation, and enhanced biodiversity in the region.

Additional Information

Option	Details
Luni River	A seasonal river in Rajasthan, known for its saline nature in the lower reaches.
Saraswati River	A mythological river mentioned in ancient Indian texts, believed to have existed in the past.

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Bhagirathi River	One of the source streams of the Ganges, originating from the Gangotri Glacier in Uttarakhand.

Q54. Answer: (d) AD bisects angle A

Shortcut Trick

In an isosceles triangle, the altitude drawn from the vertex between the equal sides to the base acts as both the median and the angle bisector.

Since AB = AC, the altitude AD is drawn to the base BC.

By the properties of symmetry in an isosceles triangle, AD must bisect the vertex angle A.

Therefore The correct answer is AD bisects angle A.

Alternate Method

Given: In Δ ABC, AB = AC and AD is the altitude (AD perpendicular to BC).

Formula Used: RHS (Right angle-Hypotenuse-Side) Congruence Rule and CPCT (Corresponding Parts of Congruent Triangles).

In Δ ABD and Δ ACD:

=> AB = AC (Given)

=> AD = AD (Common side)

=> angle ADB = angle ADC = 90° (Since AD is the altitude)

=> Δ ABD ~= Δ ACD (By RHS congruence rule)

=> angle BAD = angle CAD (By CPCT)

=> Since the angles are equal, AD bisects angle A.

Therefore The correct answer is AD bisects angle A.

Additional Information

Isosceles Triangle Properties

In an isosceles triangle, the altitude to the base is also the median (bisects the base) and the angle bisector of the vertex angle.

RHS Congruence Rule

Two right-angled triangles are congruent if the hypotenuse and one side of one triangle are equal to the hypotenuse and the corresponding side of the other triangle.

Base Angles Theorem

The angles opposite to the equal sides of an isosceles triangle are always equal (angle B = angle C when AB = AC).

Q55. Answer: (d) -1

Given:

5x + y = 125

5x - y = 3125

Calculation:

We have,

5x + y = 125

=> $5x + y = 5^3$

=> x + y = 3 ---(1)

5x - y = 3125

=> 5x - y = 5^5

=> x - y = 5 ---(2)

Now, Add equation (1) and (2)

x + y + x - y = 3 + 5

=> 2x = 8

=> x = 4

From equation (1),

y = 3 - x = 3 - 4 = -1

Therefore The correct answer is option (4).

Q56. Answer: (a) CID27

The logic followed here is:

So, 'CID27' will replace the question mark in the given series.

Hence, the correct answer is "Option 1".

Q57. Answer: (d) Amount of petroleum is finite

The correct answer is Amount of petroleum is finite.

Key Points

• Petroleum is a non-renewable resource, meaning it cannot be replenished naturally at the rate we consume it.

• The extraction and burning of petroleum products release significant amounts of greenhouse gases, contributing to climate change.

• Dependence on petroleum makes economies vulnerable to price fluctuations and supply disruptions.

• Reducing reliance on petroleum can promote the development and adoption of cleaner, sustainable energy sources.

Additional Information

Keyword	Information
Petroleum	A naturally occurring liquid found beneath the Earth's surface that can be refined into fuel.
Uses	Beyond fuel, petroleum is a raw material for many chemical products including pharmaceuticals, solvents, fertilizers, pesticides, and plastics.
Global Reserves	The amount of proven petroleum reserves can affect global markets and economies.
Environmental Impact	Extraction and use of petroleum have significant environmental impacts, including oil spills and air pollution.
Alternatives	Renewable energy sources such as wind, solar, and hydroelectric power offer sustainable alternatives to petroleum.

Q58. Answer: (d) They laid down their lives to stop the cutting down of trees growing in their region.

The correct answer is They laid down their lives to stop the cutting down of trees growing in their region.

Key Points

• The Bishnoi community of Rajasthan, led by Amrita Devi Bishnoi, is known for their commitment to protecting trees and wildlife.

• In 1730, the Maharaja of Jodhpur sent soldiers to cut down trees in the region for a new palace. Amrita Devi and her community opposed the cutting of trees, as they considered them sacred.

• Amrita Devi Bishnoi and 362 other members of her community sacrificed their lives to protect the trees by hugging them, a method that is now known as "Chipko Movement" in modern environmental campaigns.

• This event is one of the earliest examples of non-violent environmental protest in India and has inspired generations to protect nature.

Additional Information

• The Bishnoi sect was founded by Guru Jambheshwar in 1485 in the Marwar (Jodhpur) region of Rajasthan, with a strong emphasis on environmental preservation as a key religious tenet.

• They follow 29 principles (Bish-noi translates to Twenty-nine), many of which are directly related to flora and fauna conservation, such as prohibition against cutting trees and killing animals.

• The legacy of Amrita Devi Bishnoi and her community's sacrifice led to the creation of the Amrita Devi Bishnoi Wildlife Protection Award by the Government of India, for significant contributions in the field of wildlife protection.

• The Bishnoi villages are known for their rich biodiversity, and they often serve as oases in the desert landscape, demonstrating the environmental benefits of their practices.

Q59. Answer: (b) Chateshwar Pujara

The correct answer is Cheteshwar Pujara.

Key Points

• Grade A status in BCCI contracts represents a high level of remuneration and benefits for the players included.

• Cheteshwar Pujara is known for his solid technique and has been a key player in India's Test match setup.

• The central contracts list is updated annually by the BCCI, reflecting players' performances and potential contributions to the team.

• Players losing Grade A status might be due to various factors including form, fitness, and team composition needs.

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Additional Information

Term	Description
BCCI	The Board of Control for Cricket in India is the governing body for cricket in India, responsible for the operation and development of cricket, selection of players, and umpiring standards.
Central Contracts	A system of contracts given to national players, categorizing them into different grades based on their importance and contribution to the team.
Grade A	One of the highest levels of contracts awarded to players, indicating their critical role and value to the national team.
Test Cricket	The longest form of the sport of cricket, Test matches are considered the game's highest standard.

Q60. Answer: (c) $2x^2 - 3x - 2 = 0$

Shortcut Trick

A quadratic equation with roots α and β is given by $x^2 - (\alpha + \beta)x + \alpha\beta = 0$.

Sum of roots $(\alpha + \beta) = 2 - 1/2 = 3/2$.

Product of roots $(\alpha\beta) = 2 \times (-1/2) = -1$.

Equation → $x^2 - (3/2)x + (-1) = 0 \Rightarrow 2x^2 - 3x - 2 = 0$.

Therefore The correct answer is $2x^2 - 3x - 2 = 0$.

Alternate Method

Given: The roots of the required quadratic equation are 2 and −1/2.

Formula Used: For any quadratic equation $ax^2 + bx + c = 0$, the equation can be expressed as: $x^2 -$ (Sum of roots)x + (Product of roots) = 0.

=> Sum of roots $(\alpha + \beta) = 2 + (-1/2)$

=> Sum of roots $= (4 - 1) / 2 = 3/2$

=> Product of roots $(\alpha \times \beta) = 2 \times (-1/2) = -1$

=> Equation: $x^2 - (3/2)x + (-1) = 0$

=> Multiply the entire equation by 2 to clear the fraction:

=> $2(x^2) - 2(3x/2) - 2(1) = 0$

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

Therefore The correct answer is $2x^2 - 3x - 2 = 0$.

Additional Information

Relationship between Roots and Coefficients

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

Nature of Roots

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.

Quadratic Formula

Roots can be found using the formula $x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$.

Q61. Answer: (b) up to Rs. 50,000

The correct answer is up to Rs. 50,000.

Key Points

• The Shishu loan under MUDRA is designed for entrepreneurs who are in the earliest stage of starting a business.

• It offers loans up to Rs. 50,000 to help small businesses get off the ground.

• This category is part of the broader MUDRA scheme, which also includes Kishore and Tarun for higher loan amounts.

• The aim is to provide financial support to micro-enterprises and individuals to promote entrepreneurship.

Additional Information

• The Micro Units Development & Refinance Agency (MUDRA) was launched by the Government of India in 2015.

• MUDRA provides refinancing support to banks and microfinance institutions to encourage them to finance micro units.

• The scheme supports a wide range of sectors, including manufacturing, trading, and services.

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• It categorizes loans into three products: Shishu (up to Rs. 50,000), Kishore (from Rs. 50,001 to Rs. 5 lakh), and Tarun (from Rs. 5,00,001 to Rs. 10 lakh).

• The initiative aims to boost the small enterprise sector, which is a significant employment generator and contributes to the economic growth of the country.

Q62. Answer: (b) 20

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	•	×	÷	•

Given Equation: 17 ÷ 3 - 2 + 12 × 4 = ?

Now replacing the signs using the decoded meanings:

New Equation: 17 + 3 × 2 - 12 ÷ 4 = ?

Applying the BODMAS Rule, we first perform the division and multiplication:

→ 17 + 3 × 2 - 12 ÷ 4 = ?

→ 17 + 3 × 2 - 3 = ?

→ 17 + 6 - 3 = ?

→ 23 - 3 = 20.

Hence, the correct answer is "Option 2".

Q63. Answer: (c) Fatima, 33%

Formula Used:

Percentage Increase = (Final Value - Initial Value)/(Initial Value) × 100

Calculation:

For Fatima:

=> Percentage Increase for Fatima = (40 - 30) / 30 × 100 = 33.33%

For Harsh:

=> Percentage Increase for Harsh = (50 - 40) / 40 × 100 = 25%

Therefore Fatima has the maximum percentage increase in the value of the final product as compared to the value of raw material by approximately 33%.

Q64. Answer: (d) railways

The correct answer is railways.

Key Points

• The British introduced the concept of railways in India in 1850 to improve the transportation system and facilitate the movement of goods and people across the vast country.

• The first passenger train journey took place on April 16, 1853, covering a distance of 34 kilometers from Bombay (now Mumbai) to Thane.

• Railways played a crucial role in the economic development of India, but they were also designed to serve the colonial interests, including the control of resources and military mobility.

• The introduction of railways significantly influenced the structure of the Indian economy by integrating markets, promoting trade, and encouraging the commercialization of agriculture.

Additional Information

• The Indian Railways is one of the world's largest railway networks, with thousands of stations and over a hundred thousand kilometers of track.

• It plays a vital role in the social and economic development of the country, connecting remote and rural areas with urban centers.

• Over the years, the Indian Railways has undergone significant modernization, including the introduction of high-speed trains and digital ticketing systems.

• The sector has also been a significant employer, providing jobs to millions of people across various capacities.

Q65. Answer: (d) 5040

Shortcut Trick

Identify the first five 2-digit even numbers: 10, 12, 14, 16, 18.

The smallest number divisible by all is their LCM.

LCM(10, 12, 14, 16, 18) = $2^4 \times 3^2 \times 5 \times 7$.

Calculation: $16 \times 9 \times 5 \times 7 = 80 \times 63 = 5040$.

Therefore The correct answer is 5040.

Alternate Method

Given: The numbers are the first five 2-digit positive even numbers.

Formula: Smallest number divisible by a set of numbers = Least Common Multiple (LCM).

Step-by-step prime factorization:

=> $10 = 2 \times 5$

=> $12 = 2^2 \times 3$

=> $14 = 2 \times 7$

=> $16 = 2^4$

=> $18 = 2 \times 3^2$

=> LCM = Highest power of all prime factors present

=> LCM = $2^4 \times 3^2 \times 5^1 \times 7^1$

=> LCM = $16 \times 9 \times 5 \times 7$

=> LCM = $144 \times 35 = 5040$

Therefore The correct answer is 5040.

Additional Information

Definition of LCM

The Least Common Multiple of two or more numbers is the smallest number that is a multiple of each of the numbers.

Relationship between HCF and LCM

For any two positive integers a and b, HCF(a, b) × LCM(a, b) = a × b.

Even Number Sequence

The set of positive even numbers follows an Arithmetic Progression with a common difference of 2.

Q66. Answer: (d) 2

Shortcut Trick

Identify the most frequent observation in the given data set.

Observation 2 appears 3 times.

Observation 6 appears 2 times.

Observation 7 appears 2 times.

Since 2 has the highest frequency, it is the mode.

Therefore The correct answer is 2.

Alternate Method

Given Data: 5, 18, 6, 7, 6, 2, 3, 4, 24, 2, 7, 21, 2, 81

Formula Used: Mode = The value that occurs most frequently in a data set.

=> Total number of observations = 14

=> Frequency of 2 = 3

=> Frequency of 6 = 2

=> Frequency of 7 = 2

=> Frequency of 3, 4, 5, 18, 21, 24, 81 = 1 each

=> The observation with the maximum frequency (3) is 2.

Therefore The correct answer is 2.

Additional Information

Measures of Central Tendency

These include Mean (average), Median (middle value), and Mode (most frequent value). They summarize a data set with a single representative value.

Empirical Relationship

For a moderately skewed distribution: Mode = 3 × Median − 2 × Mean.

Types of Mode

A data set can be unimodal (one mode), bimodal (two modes), or multimodal (more than two modes). If no value repeats, there is no mode.

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Q67. Answer: (d) P

Given: Eight boxes, J, K, L, M, N, O, P and Q, are kept in a vertical pattern.

1) L is placed at the bottommost position.

2) Q is at the third place from the top.

Sr.	Box
1	
2	
3	Q
4	
5	
6	
7	
8	L

3) Only two boxes are placed between Q and M.

4) O is just below Q.

Sr.	Box
1	
2	
3	Q
4	O
5	
6	M
7	
8	L

5) K is placed somewhere between M and N.

6) N is just below J.

And, P will placed at the remaining position.

Sr.	Box
1	J
2	N
3	Q
4	O
5	K
6	M
7	P
8	L

So, the box 'P' is placed at the second position from the bottom.

Hence, the correct answer is "Option 4".

Q68. Answer: (a) ninth

The correct answer is ninth.

Key Points

• Ramadan is the ninth month of the Islamic lunar calendar.
• It is considered the holiest month, during which Muslims fast from dawn to sunset.
• The fasting during Ramadan is one of the Five Pillars of Islam, which are the foundation of Muslim life.
• The fast is meant to bring the faithful closer to God and to remind them of the suffering of those less fortunate.
• Ramadan concludes with the celebration of Eid al-Fitr, a festive day when the fast is broken.

Additional Information

• The Islamic calendar is a lunar calendar consisting of 12 months in a year of 354 or 355 days.
• Ramadan's timing changes every year because the Islamic calendar is lunar, so it moves approximately 11 days earlier each year in the Gregorian calendar.
• Fasting during Ramadan is not only abstaining from food and drink but also includes refraining from smoking, sexual relations, and sinful behavior.
• The night of Laylat al-Qadr, which falls during the last ten days of Ramadan, is considered the most sacred night, believed to be the night when the Quran was first revealed to Prophet Muhammad.

Q69. Answer: (a) 727

Shortcut Trick

If $x - 1/x = k$, then $x^2 + 1/x^2 = k^2 + 2$.

If $x^2 + 1/x^2 = m$, then $x^4 + 1/x^4 = m^2 - 2$.

Given $k = 5 \rightarrow x^2 + 1/x^2 = 5^2 + 2 = 27$.

Then $m = 27 \rightarrow x^4 + 1/x^4 = 27^2 - 2 = 729 - 2 = 727$.

Therefore The correct answer is 727.

Alternate Method

Given: $x - 1/x = 5$

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

Squaring both sides of the given equation:

$\Rightarrow (x - 1/x)^2 = 5^2$

$\Rightarrow x^2 + (1/x)^2 - 2 \times x \times (1/x) = 25$

$\Rightarrow x^2 + 1/x^2 - 2 = 25$

$\Rightarrow x^2 + 1/x^2 = 27$

Squaring both sides again to find the fourth power:

$\Rightarrow (x^2 + 1/x^2)^2 = 27^2$

$\Rightarrow (x^2)^2 + (1/x^2)^2 + 2 \times x^2 \times (1/x^2) = 729$

$\Rightarrow x^4 + 1/x^4 + 2 = 729$

$\Rightarrow x^4 + 1/x^4 = 729 - 2$

$\Rightarrow x^4 + 1/x^4 = 727$

Therefore The correct answer is 727.

Additional Information

Square Algebraic Identities

If $x + 1/x = k$, then $x^2 + 1/x^2 = k^2 - 2$. If $x - 1/x = k$, then $x^2 + 1/x^2 = k^2 + 2$.

Cube Algebraic Identities

If $x + 1/x = k$, then $x^3 + 1/x^3 = k^3 - 3k$. If $x - 1/x = k$, then $x^3 - 1/x^3 = k^3 + 3k$.

Relationship between (x+1/x) and (x−1/x)

$(x + 1/x)^2 - (x - 1/x)^2 = 4$. This is useful for switching between addition and subtraction forms.

Q70. Answer: (b) F

Given: Six actors are sitting in a line facing the north.

1) A is sitting at the first position, and G is sitting third to the right of A.

2) H is sitting to the immediate right of G.

3) F is sitting second to the right of A.

4) L is sitting to the immediate right of A.

5) S is sitting at the end of the line.

So, 'F' is sitting to the immediate right of L.

Hence, the correct answer is "Option 2".

Q71. Answer: (c) NITI Aayog

The correct answer is NITI Aayog.

Key Points

• NITI Aayog is not a constitutional body; it was formed via an executive resolution and serves as the policy think tank of the Government of India, providing both directional and policy inputs.

• Comptroller and Auditor General of India (CAG), Election Commission, and Union Public Service Commission (UPSC) are established by the Constitution of India, making them constitutional bodies.

• NITI Aayog was established in 2015, replacing the Planning Commission, an institution that was part of the Government of India for over six decades.

• The main role of the NITI Aayog is to foster cooperative federalism through structured support initiatives and mechanisms with the States on a continuous basis, recognizing that strong States make a strong nation.

Additional Information

Option	Details
Comptroller and Auditor General	Responsible for auditing all receipts and expenditure of the Government of India and the state governments, including those of bodies and authorities substantially financed by the government.
Election Commission	Constitutional authority responsible for administering election processes in India. Ensures free and fair elections in the country.
Union Public Service Commission	India's premier central recruiting agency for public servants. It is responsible for appointments to and examinations for All India services and group A & B of Central services.

Q72. Answer: (c) 16%

Shortcut Trick

Loss of 10% means 90% of Cost Price (CP) = Rs. 540.

Ratio of Selling Prices to percentages: 540 => 90%.

Unitary method: 1 => 90 ÷ 540 = 1/6%.

For New Selling Price Rs. 696: 696 => 696 × (1/6)% = 116%.

Profit percentage = 116% − 100% = 16%.

Therefore The correct answer is 16%.

Alternate Method

Given: First SP = Rs. 540, Loss = 10%, Second SP = Rs. 696.

Formulas: CP = [SP × 100] ÷ [100 − Loss%], Profit% = [(SP − CP) ÷ CP] × 100.

=> Cost Price (CP) = (540 × 100) ÷ (100 − 10) = (540 × 100) ÷ 90 = 6 × 100 = Rs. 600.

=> New Profit = New SP − CP = 696 − 600 = Rs. 96.

=> Profit Percentage = (96 ÷ 600) × 100 = 16%.

Therefore The correct answer is 16%.

Additional Information

Relationship between SP, CP, and Profit/Loss

Profit occurs when Selling Price is greater than Cost Price. Loss occurs when Cost Price is greater than Selling Price.

Base for Percentage Calculation

Both Profit% and Loss% are always calculated on the Cost Price unless specified otherwise in the problem.

Q73. Answer: (a) Improving the understanding of the dynamics of the Sun

The correct answer is Improving the understanding of the dynamics of the Sun.

Key Points

• The HelioSwarm mission aims to provide unprecedented insights into the Sun's dynamics, specifically focusing on the turbulent nature of solar wind and its effects on space weather.

• It involves the deployment of a swarm of spacecraft to study the solar wind in three dimensions, which is crucial for understanding space weather patterns that can affect Earth and human technology.

• The mission seeks to improve predictions of space weather events, which can disrupt satellite communications, GPS systems, and power grids on Earth.

• Understanding the Sun's dynamics is also vital for the safety of astronauts in future manned missions to the Moon, Mars, and

beyond, as solar radiation poses a significant risk.

Additional Information

• The HelioSwarm mission is part of NASA's initiative to enhance our understanding of the Sun and how it influences the space environment surrounding Earth.

• This mission is unique because it uses multiple spacecraft to form a "swarm" that can collect data from various points within the solar wind simultaneously.

• The knowledge gained from HelioSwarm will contribute to our overall understanding of stellar processes and could inform the study of other stars and their planetary systems.

• By studying the Sun's behavior and its impact on space weather, the mission supports efforts to protect technology and astronauts from the adverse effects of solar activity.

Q74. Answer: (c) Two

The correct answer is Two.

Key Points

• The chemical equation given is $SO2 + H2S \rightarrow 3S + 2H2O$.

• To balance the equation, we need equal numbers of atoms of each element on both sides.

• By adding two molecules of hydrogen sulphide (H2S), we balance the sulphur (S) atoms: 1 from SO2 and 2 from 2H2S gives a total of 3 sulphur atoms on both sides.

• This also balances the hydrogen (H) atoms: 2 hydrogen atoms from each H2S molecule make a total of 4, which matches the 4 hydrogen atoms in 2H2O.

• Therefore, two molecules of H2S are required to balance the given chemical equation.

Additional Information

Hydrogen sulphide (H2S) is a colorless, poisonous, flammable gas that smells like rotten eggs. It is produced by the bacterial breakdown of organic matter in the absence of oxygen, such as in swamps and sewers; it also occurs in volcanic gases, natural gas, and some well waters. Being heavier than air, it tends to accumulate at the bottom of poorly ventilated spaces. Hydrogen sulphide is used in the manufacture of chemicals, in metallurgy, and as a nuisance odor in rotten egg bombs, but it is hazardous and can be lethal in high concentrations.

Q75. Answer: (d) 25 cm

Concept:

Concave Mirror:

• A concave mirror is a spherical mirror with a reflecting surface that curves inward.

• A concave mirror's focal length (f) is the distance between the mirror's surface and the focal point.

• Mirror formula: $1/f = 1/v + 1/u$

• Where, f = focal length, v = image distance, u = object distance.

• Magnification (M) is the ratio of the height of the image (h_i) to the height of the object (h_o).

• Magnification formula: $M = h_i/h_o = -v/u$

Calculation:

Given,

Object height, $h_o = 30$ μm

Image height, $h_i = 60$ cm

Focal length, f = 25 cm

Magnification, $M = h_i/h_o$

Magnification, $M = (60 \times 10^4 \text{ μm})/(30 \text{ μm})$

$\Rightarrow M = 20000$

We know, $M = -v/u$

$\Rightarrow 20000 = -v/u$

$\Rightarrow v = -2000u$

Using mirror formula, $1/f = 1/v + 1/u$

$\Rightarrow 1/25 = 1/(-20000u) + 1/u$

$\Rightarrow 1/25 = (1 - 20000)/20000u$

$\Rightarrow 1/25 = (-19999)/20000u$

$\Rightarrow 20000u = -19999 \times 25$

$\Rightarrow u = -(19999 \times 25)/20000$

=> u = -24.9875 ≈ -25 cm

Therefore The hair should be placed in front of the mirror at 25 cm.

Q76. Answer: (a) 17

The correct answer is Group 17.

Key Points

• Group 17 elements are known as the halogens and are non-metals.

• These elements include fluorine, chlorine, bromine, iodine, and astatine.

• Halogens are highly reactive, especially with alkali metals and alkaline earth metals, forming a wide range of salts.

• They exist in various physical states: fluorine and chlorine are gases, bromine is a liquid, and iodine and astatine are solids at room temperature.

• The reactivity of halogens decreases down the group, with fluorine being the most reactive.

Additional Information

The Modern Periodic Table, also known as the Long Form of the Periodic Table, is a widely accepted arrangement of the chemical elements, ordered by their atomic number, electron configuration, and recurring chemical properties. Elements are presented in order of increasing atomic number. The table has been expanded and refined over time, reflecting new discoveries in the nature of chemical behavior and the discovery of new elements, making it a crucial tool for scientists across various disciplines.

Q77. Answer: (c) Vatsalya

The correct answer is Vatsalya.

Key Points

• Child Protection Services Scheme was subsumed under Mission Vatsalya to provide a more consolidated and strengthened framework for child protection.

• Mission Vatsalya aims to offer a supportive environment for children in need of care and protection, children in conflict with law, and other vulnerable children.

• This mission focuses on delivering services through institutional and non-institutional care and ensuring the holistic development of children.

• It represents a significant step towards ensuring that children have access to social protection, health, nutrition, education, and legal support.

Additional Information

Option	Details
Poshan	Focuses on improving nutritional outcomes for children, pregnant women, and lactating mothers.
Bachpan	Not a government scheme as of the latest information available.
Indradhanush	Aims to immunize all children under the age of 2 years, as well as all pregnant women, against seven vaccine-preventable diseases.

Q78. Answer: (a) 2/7

Concept:

Linear Magnification in Convex Mirror:

• Linear magnification (m) is defined as the ratio of the height of the image (h_i) to the height of the object (h_o).

• For mirrors, magnification can also be expressed in terms of the object distance (u) and the image distance (v) using the formula:

• Formula: m = h_i/h_o = v/u

• For a convex mirror, the object distance (u) is negative, the focal length (f) is positive, and the image distance (v) can be found using the mirror formula:

• Mirror formula: 1/f = 1/v + 1/u

• The magnification formula in terms of the focal length (f) and object distance (u) is: m = f/(f - u)

Calculation:

Given,

Object distance, u = -2.5f

Focal length, f

Using the magnification formula for the convex mirror,

=> m = f/(f - (-2.5f))

=> m = f/(f + 2.5f)

=> m = f/3.5f

=> m = 1/3.5

=> m = 2/7

Therefore The linear magnification is 2/7.

Q79. Answer: (a) Only conclusion III follows

Given Statements:

1. All cashews are jaggery.

2. No food is jaggery.

3. Some walnuts are food.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some walnuts are cashews - False (Because, No definite relation given between walnuts and cashews, So, it can be possible only).

II. Some walnuts are jaggery - False (Because, No definite relation given between walnuts and jaggery, So, it can be possible only).

III. No food is cashew - True (Because, All the jaggery are jaggery and No food is jaggery, this implies No food is cashew).

So, Only conclusion III follows.

Hence, the correct answer is "Option 1".

Q80. Answer: (b) perpendicular to the magnetic field

The correct answer is perpendicular to the magnetic field

Key Points

The force acting on a current-carrying conductor in a magnetic field is given by the Lorentz force equation:

F=BILsin(θ),where:

• F is the force

• B is the magnetic field strength

• I is the current

• L is the length of the conductor

• θ is the angle between the conductor and the magnetic field

To maximize the force, we need to maximize the sine function, sin(θ). The sine function reaches its maximum value of 1 when θ=90?.

Therefore, the force is maximum when the length of the arms is perpendicular to the magnetic field.

Q81. Answer: (a) 1 : 8

The correct answer is 1 : 8.

Key Points

• The resistance (R) of a wire is given by the formula R = ρ(L/A), where ρ is the resistivity, L is the length, and A is the cross-sectional area.

• Since both wires have the same length and resistance, we can set up a ratio for their resistivities based on their cross-sectional areas.

• The ratio of their cross-sectional areas is 1 : 8, implying one wire has a cross-sectional area 8 times larger than the other.

• Given that resistance is inversely proportional to the area (A), the wire with the larger area will have a lower resistivity if all other factors are constant. However, since their resistances are the same and lengths are equal, the only way to balance the equation is if their resistivities are directly proportional to their areas, resulting in the ratio of resistivities being ρ = R(A/L)

• ρ prop. to Area ; A1:A2=1:8 ; => ρ1:ρ2=1:8

Additional Information

Resistivity is a fundamental property of materials that quantifies how strongly a material opposes the flow of electric current. A low resistivity indicates a material that readily allows the flow of electric current. Resistivity is specific to each material and influences how it is used in electrical and electronic applications. For example:

• Copper has a low resistivity, making it an excellent choice for electrical wiring.

• Rubber, on the other hand, has a high resistivity, which makes it an effective insulator.

• The resistivity of materials can be affected by temperature; in most metals, resistivity increases with temperature.

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• Semiconductors have resistivities that fall between those of conductors and insulators, which can be altered by doping with impurities and changes in temperature.

Q82. Answer: (c) North-west

Given:

Ajay starts from his office and drives 3 km towards the east.

He then takes a right tum, drives 4 km,

tums left, and drives 5 km.

He then takes a left turn and drives 3 km and stops at a shop.

So, He should drive in 'North-West' direction to reach his office from that shop.

Hence, the correct answer is "Option 3".

Q83. Answer: (d) DC motor and DC generator both

The correct answer is DC motor and DC generator both.

Key Points

• A commutator is an electrical switch that periodically reverses the current direction between the rotor and the external circuit in a motor or generator.

• It is used in DC motors to provide a direct current by switching the direction of the current in the motor coil as it rotates, ensuring smooth operation.

• In DC generators, commutators convert the AC (alternating current) induced in the generator's coil into a unidirectional current (DC).

• Commutators help in maintaining a constant direction of current in the external circuit, which is crucial for the functionality of DC machines.

Additional Information

• The design of a commutator is specific to the requirements of each motor or generator, including the number of segments, material composition, and size.

• Brushes made of carbon or graphite are used in conjunction with the commutator to maintain electrical contact as the commutator rotates.

• Over time, commutators and brushes may wear down due to friction and require maintenance or replacement to ensure optimal performance of the DC machine.

• The invention of the commutator is a pivotal development in the history of electrical engineering, enabling the practical use of electric motors and generators in industry and transportation.

Q84. Answer: (a) II weakens while I strengthens the statement.

Given:

Statement:

India still needs gender equality programmes to make people aware about this.

Now,

Arguments:

I. People still believe boys are better than girls - True (This argument supports the need for gender equality programmes as it highlights ongoing gender bias).

II. Gender discrimination has vanished from our society - False (This argument contradicts the statement by claiming that there is no longer a need for awareness programs, as it suggests gender discrimination no longer exists).

So, I strengthens the statement because it reflects the persistence of gender bias, necessitating awareness programs. II weakens the statement by incorrectly asserting that gender discrimination is no longer an issue.

Therefore, the correct answer is "Option 1" - II weakens while I strengthens the statement.

Q85. Answer: (b) violet, blue; red, orange

The correct answer is violet, blue; red, orange.

Key Points

• Rayleigh scattering is a phenomenon that describes the scattering of light by particles much smaller than the wavelength of the light.

• Violet and blue light have shorter wavelengths and are scattered more by smaller particles in the atmosphere, which is why the sky appears blue during the day.

• Red and orange light, having longer wavelengths, are less scattered by smaller particles but are more affected by larger particles in the atmosphere, contributing to the red and orange hues of sunrises and sunsets.

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• This scattering principle is crucial in understanding the color of the sky and various atmospheric phenomena.

Additional Information

Rayleigh scattering is named after the British physicist Lord Rayleigh, who first described it in the 1870s. It is a fundamental concept in atmospheric physics, optics, and various branches of physics and engineering. Rayleigh scattering is responsible not only for the color of the sky but also contributes to the optical phenomena observed in other transparent media. It plays a significant role in the propagation of electromagnetic waves, including radio waves, through the Earth's atmosphere.

Q86. Answer: (a) 2

Formula Used:

Exports at least 10% higher than imports mean (Exports - Imports)/Imports × 100 > 10%

Calculation:

There are three years when export. is higher than imports: 2003, 2005, 2006

For 2003, Exports vs. Imports: (141 - 100)/100 × 100 = 41% [> 10%]

For 2005, Exports vs. Imports: (120 - 107)/107 × 100 = 12.15% [> 10%]

For 2006, Exports vs. Imports: (159 - 148)/148 × 100 = 7.43% [< 10%]

Therefore For 2 years, the exports were at least 10% higher than the imports.

Q87. Answer: (a) 22% decrease

Shortcut Trick

Net Change % = x + y + (x × y)/100

Here, increase (x) = +30 and decrease (y) = −40

Net % = 30 − 40 + (30 × −40)/100 = −10 − 12 = −22%

Negative sign indicates a decrease.

Therefore The correct answer is 22% decrease.

Alternate Method

Given: Initial increase = 30%, Subsequent decrease = 40%.

Formula: Final Value = Initial Value × (100 + x)/100 × (100 + y)/100

=> Let the initial number be 100.

=> After 30% increase: 100 + (30% of 100) = 130.

=> After 40% decrease: 130 − (40% of 130) = 130 − 52 = 78.

=> Net decrease = 100 − 78 = 22.

=> Net decrease % = (22/100) × 100 = 22%.

Therefore The correct answer is 22% decrease.

Additional Information

Successive Percentage Change

When a value is changed by a% and then b%, the effective change is (a + b + ab/100)%. Use positive for increase and negative for decrease.

Multiplier Method

For multiple changes, multiply the factors: Final = Initial × f1 × f2, where f = (1 ± r/100).

Percentage Base Change

If a value increases by r%, it must decrease by [r/(100+r)] × 100% to return to the original value.

Q88. Answer: (b) 1

Given Series: (Left) E 5 % H V 7 8 L M # @ A 6 3 F & S 4 Z (Right)

Letters immediately preceded by a letter and immediately followed by a number,

So, the pattern needed is: Letter - Letter - Number

Now,

So, there are 'One' pairs i.e.: 'HV7'.

Hence, the correct answer is "Option 2".

Q89. Answer: (c) 1989-90

The correct answer is 1989-90.

Key Points

• The Integrated Wastelands Development Programme (IWDP) was launched in 1989-90 in India.

• Its main objective is to reclaim wastelands in the country through various developmental measures including afforestation.
• IWDP aims to improve the socio-economic conditions of the people living in these areas.
• It employs a watershed management approach to optimize the use of natural resources like soil and water.
• The programme is implemented on a project basis, with projects typically spanning 4 to 5 years.

Additional Information

Programme Feature	Description
Focus Area	Development of wastelands and degraded lands through an integrated approach.
Implementation	Implemented by the Ministry of Rural Development, Government of India.
Techniques Used	Includes afforestation, agroforestry, soil conservation, and water harvesting.
Beneficiaries	Targets rural communities, especially the poor, by enhancing their livelihood opportunities.
Impact	Improves ecological balance, increases the productivity of the land, and reduces soil erosion.

Q90. Answer: (d) Rahul Dravid

The correct answer is Rahul Dravid.

Key Points

• Rahul Dravid was appointed as the head coach of the Indian Cricket Team in November 2021, succeeding Ravi Shastri.
• Dravid, also known as "The Wall", has been a pivotal figure in Indian cricket, having played for India with great distinction before transitioning to coaching roles.
• Before taking on the role of head coach for the senior team, Dravid was the head of the National Cricket Academy (NCA) in Bengaluru, India, where he played a significant role in grooming young talents.
• His appointment was well-received, given his vast experience and the respect he commands in the cricketing community.

Additional Information

Option	Details
VVS Laxman	Former Indian cricketer, known for his elegant batting. Currently involved in cricket commentary and coaching roles.
Anil Kumble	Former head coach of the Indian Cricket Team and one of the greatest bowlers in cricket history.
Sachin Tendulkar	Regarded as one of the greatest batsmen ever, Sachin has taken up various roles post-retirement, including mentoring and charity work.

Q91. Answer: (a) Lead

The correct answer is Lead.

Key Points

• Reactivity Series: The reactivity series is a list of metals arranged in order of decreasing reactivity. It helps in determining which metal will displace another in a single displacement reaction.
• Lead's Position: Among the given options, lead is placed lower in the reactivity series, indicating it is less reactive compared to zinc, magnesium, and iron.
• Displacement Reactions: More reactive metals can displace less reactive metals from their compounds. Since lead is less reactive, it is less likely to displace others in such reactions.
• Corrosion Resistance: Due to its lower reactivity, lead is more resistant to corrosion compared to the other metals listed.

Additional Information

Option	Details
Zinc	Zinc is more reactive than lead and is often used for galvanizing iron to protect it from rust.

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Magnesium	Magnesium is very reactive, capable of displacing hydrogen from water, a property not shared with lead.
Iron	Iron is more reactive than lead but less so than magnesium and zinc, commonly used in construction due to its strength.

Q92. Answer: (a) V

Given letter series: (Left) E B Y T F R D C S W E R F V Y H N E C S R F C A R W (Right)

Now, If every odd placed letter in the above series is dropped then:

(Left) B T R C W R V H E S F A W (Right)

So, the seventh place from the left after dropped each odd placed letter in the above series is: V.

Hence, the correct answer is "Option 1".

Q93. Answer: (c) 2004

The correct answer is 2004.

Key Points

• Tamil was declared a classical language of India in the year 2004.

• This recognition was given by the Government of India, acknowledging Tamil's rich heritage and long history.

• The status of a classical language in India is awarded to languages that have a rich literary tradition and ancient heritage.

• Tamil is one of the oldest languages in the world, with a history that dates back over 2000 years.

Additional Information

Feature	Description
Language Family	Tamil belongs to the Dravidian language family, predominant in southern India and northeastern Sri Lanka.
Written Records	The earliest period of Tamil literature, Sangam literature, dates back from ca. 300 BCE to 300 CE.
Official Status	Tamil is an official language in the Indian state of Tamil Nadu, the Union Territory of Puducherry, and in Sri Lanka and Singapore.
Classical Language Benefits	Recognition as a classical language comes with several benefits including financial grants for research and preservation of the language's heritage.
UNESCO Recognition	Tamil has been designated as a "Classical Language" by UNESCO, highlighting its cultural importance and historical significance.

Q94. Answer: (b) H2O and salt

The correct answer is H2O and salt.

Key Points

• Neutralisation is a chemical reaction in which an acid and a base react quantitatively with each other.

• In a neutralisation reaction, the hydrogen ions (H^+) from the acid combine with the hydroxide ions (OH^-) from the base to form water (H2O).

• The other product of a neutralisation reaction is a salt, which is formed from the cation of the base and the anion of the acid.

• This type of reaction is important in many processes, such as the manufacturing of various chemicals, wastewater treatment, and the neutralisation of stomach acid.

Additional Information

• Acids are substances that release hydrogen ions (H^+) when dissolved in water.

• Bases are substances that release hydroxide ions (OH^-) when dissolved in water.

• The pH scale is used to measure the acidity or alkalinity of a solution, with 7 being neutral, values below 7 acidic, and values above 7 alkaline.

• Salts are ionic compounds composed of cations (positively charged ions) and anions (negatively charged ions) that result from neutralisation reactions.

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Q95. Answer: (a) September 2022

The correct answer is Thu Sep 01 2022.

Key Points

• The Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) is an initiative by the Government of India aimed at providing free food grains to the poor and needy.

• It was initially launched in March 2020 as part of the government's response to the economic impact of the COVID-19 pandemic.

• The scheme aims to ensure sufficient food for the most vulnerable sections of society by providing them with free ration.

• Under this scheme, eligible families are provided with additional food grains free of cost, over and above their regular entitlements under the National Food Security Act.

• The extension of the scheme is a part of the government's efforts to support the population facing hardship due to the pandemic and economic challenges.

Additional Information

Key Initiative	Description
National Food Security Act (NFSA)	Aims to provide subsidized food grains to approximately two-thirds of India's 1.2 billion people.
Direct Benefit Transfer (DBT)	A scheme under which subsidies are directly transferred to the bank accounts of beneficiaries, reducing leakage and improving efficiency.
Aatmanirbhar Bharat Abhiyan	A campaign by the Government of India aiming for economic self-reliance and promoting local businesses, products, and supply chains.
Jan Dhan Yojana	A financial inclusion program of the Government of India that aims to expand affordable access to financial services such as bank accounts, remittances, credit, insurance, and pensions.
MGNREGA	The Mahatma Gandhi National Rural Employment Guarantee Act aims to enhance livelihood security in rural areas by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

Q96. Answer: (d) 4.9 V

The correct answer is 4.9 V.

Key Points

• The total resistance in a series circuit is the sum of all resistances. Therefore, for the given resistors of 3Ω, 2Ω, and 6Ω, the total resistance (R_(total)) is 3 + 2 + 6 = 11Ω.

• The total current (I) in the circuit can be calculated using Ohm's Law, V = IR, where V is the total voltage of the battery. For a 9V battery, I = V / R_(total) = 9V / 11Ω ≈ 0.818 A.

• To find the potential difference (V) across a specific resistor in a series circuit, use the formula V = IR, where I is the current through the resistor, and R is the resistance of the resistor.

• For the 6Ω resistor, the potential difference V = I * R = 0.818 A * 6Ω ≈ 4.9 V.

Additional Information

• Ohm’s Law states that the current flowing through a conductor between two points is directly proportional to the voltage across the two points, introduced by the German physicist Georg Simon Ohm.

• Series circuits are characterized by having only one path through which the current can flow. This means the same current flows through all components in the series.

• Parallel circuits provide multiple paths for current to flow. Unlike in series circuits, components connected in parallel experience the same voltage.

• Resistors are components used in electrical circuits to limit or regulate the flow of electrical current. They can be used to adjust signal levels, divide voltages, bias active elements, and terminate transmission lines, among other uses.

Q97. Answer: (c) 6

According to the given Venn diagram:

The shaded area shows the "total number of people have all three i.e. Ice cream, Tea as well as Coffee".

So, the total number of people have all three i.e. Ice cream, Tea as well as Coffee = 6.

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Hence, the correct answer is "Option 3".

Q98. Answer: (a) 6

Shortcut Trick

Age difference remains constant: 50 − 22 = 28 years.

When man is twice the daughter's age, the ratio is 2 : 1.

Difference in ratio parts (2 − 1) = 1 unit → 28 years.

Daughter's age then = 1 unit × 28 = 28 years.

Years required = 28 − 22 = 6 years.

Therefore The correct answer is 6 years.

Alternate Method

Given:

Present age of man = 50 years

Present age of daughter = 22 years

Let the required time be x years.

=> 50 + x = 2 × (22 + x)

=> 50 + x = 44 + 2x

=> 2x − x = 50 − 44

=> x = 6

Therefore The correct answer is 6 years.

Additional Information

Constant Age Difference

The difference between the ages of two people always remains the same, regardless of how many years pass.

Age Ratio Problems

If the ratio of ages changes from a:b to c:d after x years, use the concept that (a × k + x) / (b × k + x) = c / d.

Sum of Ages

If the current sum of ages is S, then after n years, the sum of ages of two people will be S + 2n.

Q99. Answer: (d) Bal Gangadhar Tilak

The correct answer is Bal Gangadhar Tilak.

Key Points

• Bal Gangadhar Tilak founded the first Home Rule League in April 1916, aiming at attaining self-governance for India within the British Empire.

• His league worked through constitutional methods to achieve its goals, focusing on areas like Maharashtra (excluding Bombay), Karnataka, Central Provinces, and Berar.

• Annie Besant launched another Home Rule League in September 1916, which covered the rest of India, working in parallel with Tilak's league.

• The Home Rule Movement significantly contributed to the nationalistic fervor in India, leading to a stronger demand for self-rule.

Additional Information

Option	Details
1) Bipin Chandra Pal	A prominent freedom fighter, part of the Lal-Bal-Pal trio, known for his role in the Swadeshi movement.
2) Surendranath Tagore	This option seems to be a mix-up. Surendranath Banerjee was a key figure in the Indian National Movement, not Tagore.
3) Chandra Shekhar Azad	Was a revolutionary who reorganised the Hindustan Republican Association under its new name of Hindustan Socialist Republican Association (HSRA) after the death of its founder, Ram Prasad Bismil.

Q100. Answer: (b) 7 : 2

The correct answer is 7: 2

Key Points

• The resistance (R) of a wire is directly proportional to its length (L) and inversely proportional to its cross-sectional area (A), as

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given by the formula R = ρ(L/A), where ρ is the resistivity of the material.

• Given the ratio of their lengths is 7 : 5 and the ratio of their cross-sectional areas is 2 : 5, the resistance ratio can be calculated using the formula for resistance.

• Since the same current flows through both wires when connected to two batteries, the voltage across each wire can be determined using Ohm's law, V = IR, where I is the current and R is the resistance.

• The ratio of voltages V1 : V2 will be directly proportional to the ratio of their resistances, which can be derived from their given dimensions.

Additional Information

Ohm's Law is a fundamental principle in physics that describes the relationship between voltage, current, and resistance in electrical circuits. It states that the current through a conductor between two points is directly proportional to the voltage across the two points and inversely proportional to the resistance between them. This law is a key concept in electrical and electronic engineering, forming the basis for analyzing and designing electrical circuits.

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