RRB Group D Previous Year Paper (Held on: 22 Aug 2022 Shift 1)

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

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Scan the QR code or click the link to open it.

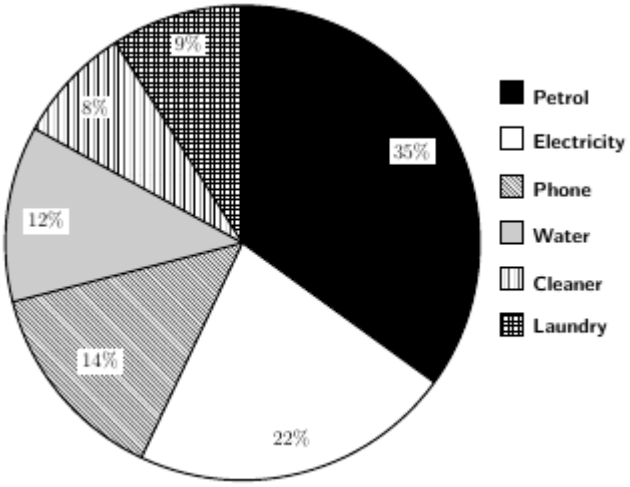
1 question is in Hindi and not printed here. Each one links to the online version, where you can read it.

CBT

Q1. In today's scenario, which change seen in human attitude has helped in decreasing the production of non-biodegradable waste to some extent?

(a) Use and throw attitude
(b) Use of Plastic in Packaging
(c) Use of jute bags
(d) Improvement in lifestyle

Q2. The following chart shows the percentage of expenditure of Mr. Kumar on various heads in a month. The total monthly expenditure of the house is Rs. 1,12,000 (Rupees One lac twelve thousand only). Study the chart and answer the question.



What is the total expenditure of Mr. Kumar on Petrol and Water taken together during this month?

(a) Rs. 52220
(b) Rs. 54440
(c) Rs. 52640
(d) Rs. 51600

Q3. Find the value of $2\sec^2 A + 4\operatorname{cosec}^2 A - 2\tan^2 A - 4\cot^2 A$.

(a) 2
(b) 6
(c) 8
(d) 4

Q4. The resistance of a conductor is NOT dependent on:

(a) area of cross section of the conductor
(b) current flowing through the conductor
(c) temperature of the conductor
(d) length of the conductor

Q5. Which of the following characterstic is associated with desert?

(a) Alluvial fan
(b) Moraines
(c) Tarn pools
(d) Barchans

Q6. A potential difference of 5 V when applied across a conductor produces a current of 2.5 mA. The resistance of the conductor (in Ω) is:

(a) 2000
(b) 200
(c) 2
(d) 20

Q7. 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	**7**	**8**	**5**	**&**	**6**	**%**	**2**
Codes	S	D	M	U	T	L	A

Conditions:

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

(ii) If the second element is a symbol and the fifth element is an even number, the codes for these two (the second and the fifth elements) are to be interchanged.

(iii) If the third element is a number and the fourth element is a symbol, both these elements (the third and the fourth elements) are to be coded as Y.

Question: 7 6 & 5 8 % 6 2

(a) ATYYDLTS
(b) ATUMDLTS
(c) ADUMTLTS
(d) STUMDLTA

Q8. Seven boxes, P, Q, R, S, T, U and V, are kept one over the other but not necessarily in the same order. R is kept just below T. V is kept just above Q, which is just above S. Only three boxes are between V and U. V is the topmost box. Which is the correct position of Box P?

(a) Immediately below U
(b) Immediately above Q
(c) Second box from the top
(d) Immediately below S

Q9. Mahesh started from a point facing towards the west, turned left and walked for X m, then turned right and walked for 22 m, then turned left and walked for 11 m, and then turned left again and walked for 22 m. He is exactly 21 m away from the starting point. What is the value of X which was covered in the first leg of his journey?

(All turns are 90 degree turns only)

(a) 12 m
(b) 21 m
(c) 10 m
(d) 11 m

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Q10. Alcohols react with sodium leading to the evolution of which of the following gases?

(a) Carbon dioxide
(b) No evolution of Gas
(c) Oxygen
(d) Hydrogen

Q11. The magnification 'm' produced by a convex lens when the object is placed at a distance 2f from the lens is given by:

(a) m = +1
(b) m = -1
(c) m = -2
(d) m = +2

Q12. Which of the following represents the closest approximate value that should come in place of the question mark (?) in the following equation?

(√360 + 12 ÷ 6 × 3 - √170) ÷ 2 = ?

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

Q13. Starting from a point X, Shekhar walks 70 m towards the north. Then, he takes a left turn and walks 150 m. Then, he takes a left turn and walks 70 m. Finally, he takes a left turn and walks 90 m to reach point Y. How far and in which direction is point X from point Y?

(All turns are 90 degree turns only)

(a) 50 m, West
(b) 60 m, West
(c) 60 m, East
(d) 50 m, South

Q14. A student scored 80/80 marks in term 1 and 75/90 marks in term 2. What will be his percentage of final score, if the weightage given to the terms is 40% and 60%, respectively. (correct to the nearest integer)

(a) 85%
(b) 90%
(c) 95%
(d) 70%

Q15. Which two signs should be interchanged to make the given equation correct?

28 - 28 ÷ 14 + 7 × 2 = 16

(a) × and -
(b) • and ÷
(c) × and ÷
(d) • and -

Q16. A blanket is sold for Rs. 1,148, which results in a loss of 30%. For how much should it be sold to gain 5%?

(a) Rs. 1,423
(b) Rs. 1,543
(c) Rs. 1,722
(d) Rs. 1,734

Q17. Which of the following was founded by Prashant Chandra Mahalanobis?

(a) Miranda House
(b) Bharatiya Vidya Bhawan
(c) Indian Statistical Institute
(d) Lucknow University

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Q18. In a given alphabet pair, the first alphabet is related to the second alphabet by a certain logic. Study the given pairs carefully, and select the pair that follows the same logic from the given alternatives.

PARTS : RDVYY

CLOSE : EOSXK

(a) RHINO : TKMSU
(b) TIME: PQOFU
(c) MANGO : ODRTS
(d) CLASS : EODVV

Q19. Which reproductive parts of the flower contain the germ cells?

(a) Sepals and stamen
(b) Stamens and pistils
(c) Anther and sepals
(d) Petals and style

Q20. Six students P, Q, R, S, T and U are sitting in a straight line facing north. P and S sit at the ends of the row. T sits immediate neighbor of P, while U sits immediate neighbor of S. Only one person sits between Q and S. Apart from R, who is sitting immediate next to Q?

(a) R
(b) S
(c) T
(d) U

Q21. Who has the executive authority to advise the State Government on legal matters and to perform other duties of legal character?

(a) Solicitor General
(b) Attorney General
(c) Comptroller and Auditor General
(d) Advocate-General

Q22. The refractive index of a given transparent medium is 1.5. What will be the speed of light in that medium?

(a) 2 × 10^8m / sec
(b) 4.5 × 108m / sec
(c) 3 × 108m / sec
(d) 0.5 × 108m / sec

Q23. Which of the following sports events was hosted by India from 20 January 2022 in Mumbai, Navi Mumbai and Pune?

(a) FIFA Women's World Cup
(b) Asian Champions Trophy
(c) AFC Women's Asian Cup
(d) Asian Track & Para-Cycling Championships

Q24. Two types of cell divisions, A and B, are shown in the figure below. Which option provides the correct answer for:

i. Types of cell division

ii. When and where does division B take place?



A B

(a) i. A - Meiosis, B - Mitosis

ii. Meiosis takes place in reproductive cells for the formation of gametes

(b) i. A - Mitosis, B - Meiosis

ii. Meiosis takes place in reproductive cells for the formation of gametes

(c) i. A and B - Meiosis

ii. Meiosis takes place in body cells for growth

(d) i. A - Mitosis, B - Meiosis

ii. Meiosis takes place in body cells for growth

Q25. Study the given letter, number, symbol series, and answer the given question.

T % N 9 + M $ 3 U = L 8 Y @ G & 3 E > W

Find the total number of letters which are immediately followed by a symbol and immediately preceded by a number.

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

Q26. In a certain code language, 'ACADEMY' is written as 'FSJHDEB' and 'BARRIER' is written as 'YKNVUCC'. How will 'ATTEMPT' be written in that code language?

(a) AVRMWVB
(b) AVRNWVB
(c) BVWMRVA
(d) AVRIWVB

Q27. Rani borrowed an amount of Rs. 2,00,000 from the bank to start a business. How much simple interest will she pay at the rate of 7% per annum after 2 years?

(a) Rs. 24,000
(b) Rs. 26,000
(c) Rs. 28,500
(d) Rs. 28,000

Q28. Three statements are given followed by four conclusions I, II, III and IV. You have to consider these statements to be true, even if they seem at variance from commonly known facts. Decide which of the given conclusions logically follow/s from the given statements.

Statements:

1. Some pamphlets are copies.
2. All copies are readers.
3. All readers are scrolls.

Conclusions:

I. All pamphlets are scrolls.

II. All copies are scrolls.

III. Some readers are copies.

IV. Some scrolls are pamphlets.

(a) Only conclusions II, III and IV follow.
(b) Only conclusions II and IV follow.
(c) Only conclusions I, III and IV follow.
(d) Only conclusions I and III follow.

Q29. Three statements are given followed by three conclusions numbered I, II and III. Consider the statements assuming them to be true even if they seem to be at variance from commonly known facts, and state which of the conclusions logically follow from the statements?

statements:

1. All tigers are lions.
2. No cat is a lion.

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3. Some jaguars are cats.

conclusions:

I. Some jaguars are lions.

II. No jaguar is tiger.

(a) None follows.
(b) Both conclusions I and II follow.
(c) Only conclusion I follows.
(d) Only conclusions II follow.

Q30. When a number is divided by the sum of 335 and 265, a value equal to three times the difference between 335 and 265 is obtained as the quotient, and 35 as the remainder. Find the number.

(a) 127535
(b) 126035
(c) 124535
(d) 128235

Q31. Yeast is used to make _____.

(a) thing
(b) antibiotics
(c) Curd
(d) Liquor

Q32. The speed of light in two transparent media A and B are 2 x 10^8 m/sec and 2.25 x 10^8 m/sec. The refractive index of medium A with respect to medium B is equal to:

(a) 1.125
(b) 4.50
(c) 0.89
(d) 4.25

Q33. Simplify: 62 + 72 + √16

(a) 80
(b) 89
(c) 94
(d) 98

Q34. In which of the following Indian states is the Chhota Nagpur Plateau, located?

(a) Karnataka
(b) Assam
(c) Rajasthan
(d) Jharkhand

Q35. For a journey of 800 km, a truck covers the first 300 km at a speed of 50 km/h. At what speed should he cover the remaining distance so that his average speed is 60 km/h?

(a) 750/11 km/h
(b) 72 km/h
(c) 600/13 km/h
(d) 52 km/h

Q36. A 210 m long train crosses a man walking at a speed of 4.5 km/h in the opposite direction in 12 seconds. What is the speed (in km/h) of the train?

(a) 59.5
(b) 61.5
(c) 58.5
(d) 60.5

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Q37. India's Bhavna Jat, Raveena and Munita Prajapati won the bronze medal with a combined effort in the team category of the women's 20 km race walk event at the World Race Boxing Team Championships 2022 held in _____.

(a) Sweden
(b) Oman
(c) Norway
(d) United Arab Emirates

Q38. Which feature of the Indian Constitution refers to the existence of governments at the state level and at the Centre?

(a) parliamentary form of government
(b) Fundamental Rights
(c) secularism
(d) federalism

Q39. In this question a statement is given followed by two conclusions. Which of the two conclusions are correct with respect to the statement.

statement:

$T = S \geq N = A \leq U > P < Q$

conclusion:

I. $S > Q$

II. $A \leq T$

(a) Only conclusion II is correct.
(b) Neither conclusion I nor II follows.
(c) Both conclusions I and II are correct.
(d) Only conclusion I is correct.

Q40. In the given chemical reaction, which of the following chemical species acts as an oxidising agent and as a reducing agent, respectively?

$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$

(a) Al and Fe
(b) Fe and Al
(c) Fe_2O_3 and Al
(d) Al_2O_3 and Fe

Q41. India's first graphene innovation center will be set up in which state?

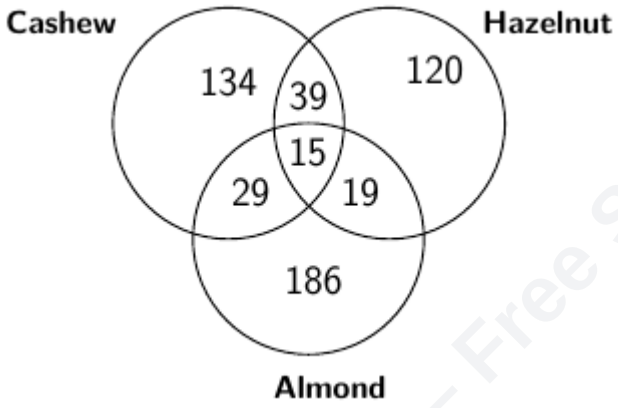
(a) Maharashtra
(b) Punjab
(c) Haryana
(d) Kerala

Q42. In Δ ABC and ΔDEF, angle A = 40°, angle B = 55°, angle D = 55°, angle E = 85°, and m(AB)=m(FD), Then which of the following option is correct?

(a) Δ ABC ~= Δ DFE
(b) Δ ABC ~= Δ Fed
(c) Δ ABC ~= Δ EDF
(d) Δ ABC ~= Δ FDE

Q43. Study the following diagram carefully, and answer the question based on it. The numbers given in different parts represent the number of people who like different dry fruits in breakfast.

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How many people like Hazelnut but do not like Cashew?

(a) 120
(b) 39
(c) 139
(d) 15

Q44. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(24, 12, 72)

(15, 16, 60)

(a) (20, 24, 120)
(b) (30, 40, 156)
(c) (17, 20, 65)
(d) (18, 12, 56)

Q45. Two trains running in opposite directions with the same speed. If their lengths are 120 m and 140 m, and they cross each other in 10 s, find the speed of each train.

(a) 14 m/s
(b) 13 m/s
(c) 10 m/s
(d) 16 m/s

Q46. The ratio of two numbers is 5 : 7. If their highest common factor (HCF) is 17, find the numbers.

(a) 85, 102
(b) 68, 85
(c) 102, 136
(d) 85, 119

Q47. Find the value of (a+1/b)^r(a-1/b)^s÷(b+1/a)^r(b-1/a)^s

(a) (a^r)/(b^s)
(b) (ab)^(r+s)
(c) (a/b)^(r+s)
(d) (b/a)^(r+s)

Q48. A metallic wire of resistance 100 Ω is bent into a circle having circumference equal to the length of the wire. The equivalent resistance between two diametrically opposite points of the circle is:

(a) 75 Ω
(b) 50 Ω
(c) 100 Ω
(d) 25 Ω

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Q49. Which of the following groups of elements have a tendency to form acidic oxides?

(a) 1
(b) 16
(c) 13
(d) 2

Q50. Answer the following question which is based on the given four letter clusters.

STED, LAYM, JOEK, CLDP

If in each of the clusters, each letter is changed to the next letter in the English alphabetical order, how many letter clusters thus formed will have no vowel?

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

Q51. Select the option that is related to the fifth number, the second number to the first number, and the fourth number to the third number.

12 : 145 :: 9 : 82 :: 11 : ?

(a) 121
(b) 120
(c) 123
(d) 122

Q52. Select the term that will come in place of the question mark (?) in the given series and logically complete the series?

D6W, G7T, M11N, V20E, ?

(a) H36S
(b) G36S
(c) H34S
(d) H36T

Q53. Each of the six students P, Q, R, S, T and U has different heights. P is taller than only two students. T is taller than only one student but shorter than exactly four students. S is taller than only four students but is not the tallest. Q is not taller than any student. R is not the tallest. Who among the following is the tallest student?

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

Q54. Presently the age of a father is 3 times the age of his daughter. After 10 years, his age will be twice the age of his daughter. Find the present age of the daughter.

(a) 20 years
(b) 10 years
(c) 15 years
(d) 5 years

Q55. If the places of '+' and '-' are interchanged, and the places of '÷' and '×' are interchanged in the following equation, then what will come in place of the question mark (?) in the equation?

7 × 7 ÷ 8 - 12 × 6 + 17 - 14 - 100 = ?

(a) 132
(b) 125
(c) 107
(d) 99

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Q56. As per information received till July 2022, which of the following states has set up 'Bharosa Kendras', which provide one-stop services for women and children, who are victims of sexual assault and violence?

(a) Gujarat
(b) Kerala
(c) Odisha
(d) Telangana

Q57. The Goods and Services Tax, which includes both goods and services, was introduced by the Government of India with effect from _____.

(a) 1 April 2015
(b) 1 July 2017
(c) 28 February 2016
(d) 1 March 2018

Q58. Which of the following Acts legally guarantees 100 days of wage employment in a financial year to adult members of a rural household who seek employment and are willing to do unskilled manual work?

(a) Indira National Rural Employment Guarantee Act
(b) Nehru National Rural Employment Guarantee Act
(c) Mahatma Gandhi National Rural Employment Guarantee Act
(d) Ambedkar National Rural Employment Guarantee Act

Q59. The following table shows the number of male and female students studying in different streams (ie; Arts, Science, Commerce and Law) of a college. Study the table, and answer the question asked.

Social class	male	Women
Art	202	112
Science	260	280
Commerce	116	190
Law	78	65
Total	656	647

What is the percentage of female students of commerce out of the total students of the college?

(a) 14.58%
(b) 16.46%
(c) 15.95%
(d) 13.28%

Q60. Metal oxides are generally _____ in nature.

(a) neutral
(b) acidic
(c) sweet
(d) alkaline

Q61. colorless Plastids are called?

(a) Chloroplastids
(b) leucoplastids
(c) chromoplastids
(d) apicoplastids

Q62. Kohli is 3 years younger than Rohit. If the ratio of ages of Kohli and Rohit is 7 : 8, then what is the age of Kohli?

(a) 21 years
(b) 27 years
(c) 18 years
(d) 24 years

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Q63. Find the nature of the roots of $x^2 - 14x + 49 = 0$.

(a) real and equal roots
(b) distinct roots
(c) no real roots
(d) imaginary roots

Q64. Which of the following term refers to a climatic condition in the marine environment, that results in periodic warming of the water body?

(a) El Nino
(b) La Mino
(c) La Nina
(d) El Mino

Q65. Select the quadratic equation which has one root $(1 + \sqrt{3})$.

(a) $x^2 - 2x - 2 = 0$
(b) $x^2 + 2x + 2 = 0$
(c) $x^2 + \sqrt{3}x + 1 = 0$
(d) $x^2 + 2x + 1 = 0$

Q66. Who led the Brahmo Samaj immediately after Raja Ram Mohan Roy?

(a) Dwarkanath Tagore
(b) Rabindra Nath Tagore
(c) Dr. Atma Ram
(d) Devendra Nath Tagore

Q67. Simplify: $3x(x - 6) + x^2 + 6x - 9 + 24 - x^3$

(a) $15 + 12x + 4x^2 - x^3$
(b) $15 - 12x + 4x^2 - x^3$
(c) $15 - 12x + 4x^2 + x^3$
(d) $15 + 12x + 4x^2 + x^3$

Q68. Select the number that will come in place of the question mark (?) in the following series?

7, 20, 37, 56, 79, 108, ?

(a) 136
(b) 126
(c) 139
(d) 122

Q69. A concave mirror forms a real, inverted and same image of an object. Where is the object placed?

(a) Between f and pole
(b) At infinity
(c) Between f and C
(d) At C

Q70. Simplify as an improper fraction: 1.2424...

(a) 124/99
(b) 41/33
(c) 123/90
(d) 91/90

Q71. How many subjects are entitled and listed for the Panchayat in the Indian Constitution?

(a) 29
(b) 25
(c) 33
(d) 19

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Q72. Select the number that will come in place of the question mark (?) in the following series?

45, 65, 90, 125, 180, ?

(a) 285
(b) 280
(c) 275
(d) 270

Q73. Consider the statements given below, and choose the correct answer.

Statement-I: Human stomach produces nitric acid.

Statement-II : Hydrochloric acid helps in digestion of food without injuring the stomach.

(a) Both the statements are correct. Statement II is the correct explanation of statement I.
(b) Only statement I is correct.
(c) Both the statements are correct. Statement I is the correct explanation of statement II.
(d) Only statement II is correct.

Q74. The lengths of the sides of a triangle are 5 cm, 7 cm and 10 cm. Find the area of the triangle (in cm 2).

(a) 350
(b) 25
(c) 2 √66
(d) 7 √10

Q75. The price of an article is increased by 20% and then two successive discounts of 5% each are allowed. The selling price of the article is _____ above its cost price.

(a) 8.3%
(b) 7.8%
(c) 9.2%
(d) 6.9%

Q76. This question is in Hindi. Read it online.

Q77. The diagonal of a quadrilateral is 32 m long, and its two offsets are 6 m and 10 m long. The area of the quadrilateral is

(a) 250 m^2
(b) 220 m2
(c) 276 m2
(d) 256 m2

Q78. To investigate the conduction of electric current, Ravi performed an experiment. He took different aqueous solutions or liquids (as electrolyte) and tried to pass electricity and connected the circuit with a bulb. In the presence of which of the following, will the bulb NOT glow?

(a) Octane (1)
(b) Copper sulphate (aq)
(c) Sodium chloride (aq)
(d) Calcium chloride (aq)

Q79. Octaves of Newland, respectively, begin with _____, and end with _____.

(a) H; Th
(b) Li; Na
(c) He; Ar
(d) Mg; Ca

Q80. An element A reacts with water to form a solution, which turns phenolphthalein solution into pink. Element A is most likely to be _____.

(a) S
(b) Mg

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(c) Ag
(d) C

Q81. _____ is a type of water storage system found in Madhya Pradesh.
(a) Bonded
(b) Tunnel
(c) Kulh
(d) Revolver

Q82. Eight lawyers with the initials A, K, L, M, N, O, P and Q were sitting around a square table and were facing the centre. Four of them were sitting at the corners, while the other four were at the exact centre of the sides. L, at a corner, was to the immediate right of M and was diagonally opposite to A. Q, sitting at a corner, was next to both M and K. P was second to the left of A. N was not sitting diagonally opposite to M. Which lawyer was second to the left of K?
(a) N
(b) P
(c) L
(d) O

Q83. Which is the most popular festival among the Garo tribe of Meghalaya?
(a) Porag Festival
(b) Nuakhai Festival
(c) Yaoshang Festival
(d) Vangla Festival

Q84. A 91 cm-long wire is cut into two pieces so that one length is three-fourth of the other. Find the length of the shorter piece.
(a) 39 cm
(b) 38 cm
(c) 42.17 cm
(d) 36.23 cm

Q85. The 'Institute of Indian Languages (CIIL)' is located in which of these cities?
(a) Hubli
(b) Bangalore
(c) Mangalore
(d) Mysore

Q86. Which of the following is a Holy Scriptures related to Buddhism?
(a) Tripitaka
(b) hadiss
(c) Augment
(d) Tanakh

Q87. This question is based on the following three letter words.
RAT DOT FRY CUT
If in each of the above words, each letter is changed to its next letter in the English alphabetical order, then how many words thus formed will have no vowel?
(a) One
(b) Zero
(c) two
(d) Three

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Q88. The population of a town is 2,24,375. If it grows at the rate of 4% per year, what will be its population after 2 years?

(a) 2,40,468
(b) 2,36,864
(c) 2,42,684
(d) 2,32,846

Q89. Ravi started a business by investing Rs. 50,000. After six months, Raju joined his business by investing Rs. 1,00,000. In the one year since Ravi invested, they earned a profit of Rs. 63,000. What is Raju's share in the profit?

(a) Rs. 31,500
(b) Rs. 31,000
(c) Rs. 32,500
(d) Rs. 32,000

Q90. In January 2022, Who among these has been awarded as Padma Bhushan Award in field of Science and Engineering?

(a) Buddhadev Bhattacharya
(b) Subbanna Ayyappan
(c) Sanjay Rajaram
(d) Sirpi Balasubramaniam

Q91. The Regional Rural Banks Act was passed in which year by the Government of India?

(a) 1966
(b) 1976
(c) 1986
(d) 1996

Q92. Movement in most of the animals is a coordinated activity of which of the following system/systems?

(a) Only muscular system
(b) Only skeletal and nervous systems
(c) Only nervous system
(d) Muscular, skeletal and nervous systems

Q93. If two angles of a triangle measure 60° and 80°, respectively, then the measure of the third angle of this triangle is:

(a) 50°
(b) 40°
(c) 70°
(d) 60°

Q94. With whom did the Indian Army sign a contract worth Rs. 3131.82 crore for manufacture and supply of missiles?

(a) Troop Comforts Limited
(b) Yantra India Limited
(c) India Optel Limited
(d) Bharat Dynamics Limited

Q95. When the minute hand travels a distance equal to the duration of 2 hours 20 minutes, what will be the angular distance traveled by it?

(a) 720°
(b) 840°
(c) 480°
(d) 590°

Q96. At a function, the chief guest was accompanied by some people, and all were sitting in the audience gallery facing towards the west. P sits second to the left of the chief guest, Q sits fourth to the right of P. The number of people sitting to the right of Q is exactly one less than the number of people sitting to the left of Q. No one sits to the left of P. How many total people were sitting in the audience gallery?

(a) 8

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(b) 10
(c) 9
(d) 7

Q97. _____ pairs of autosomes are found in humans.
(a) 22
(b) 23
(c) 46
(d) 2

Q98. The ratio of the field due to a current carrying circular coil of n turns to the field due to a single circular loop of same radius carrying the same current is _____.
(a) 1 : n1 : n2²
(b) n : 1
(c) 1 : n
(d) 1 : 1

Q99. P, Q, R, S, T and U live on six different floors of the same building. The ground floor of the building is numbered 1, the one above it is numbered 2, and so on till the topmost floor is numbered 6. Exactly three persons live between the floors on which R and Q live. T lives immediately above the floor on which P lives. U lives immediately above the floor on which Q lives. R lives immediately below the floor on which S lives. T lives on floor number 4. Q does not live on floor number 5. Who lives on floor number 6?
(a) P
(b) U
(c) R
(d) S

Q100. What is the process of generating current induced by a change in magnetic field called?
(a) electromagnetism
(b) electromagnetic induction
(c) electrical conduction
(d) electromagnetic radiation

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (c) Use of jute bags

The correct answer is the Use of jute bags.

Key Points

• At the Household level, the practice of waste segregation should be enforced and promoted.

• Education on waste disposal and management should be highly promoted at the school level.
• Sustainable alternatives like paper bags and cloth bags are evidence of the presence of alternatives from historical times.
• Strictness of laws is required for Waste disposal and management.
• At the commercial level, the use of plastic bags should be minimized and replaced with sustainable alternatives.

Additional Information

• Single-use plastics ban should be imposed with Greater strictness.
• The concept of 3R's Reduce, Reuse, Recycle is well efficient in Managing Non-biodegradable waste.
• There is a clear need for proper disposal of waste like Batteries, glass, and Heavy metals.
• Example of the City of Indore which gradually imbibed the culture the waste disposal and management and become the cleanest city in India.
• Use of International platforms like COP26 and United Nations for integrated approach on progress towards Sustainable Development Goals(SDG's).

Q2. Answer: (c) Rs. 52640

Given:

Petrol = 35%

Water = 12%

100% = Rs. 1,12,000

Solution:

100% = Rs. 1,12,000

1% = Rs. 1,120

Total(Water + Petrol)

= 35% + 12% = 47%

Total expenditure

= 47% of 1,12,000

= 47 x 1120 = Rs.52,640

Hence, the correct option is 3.

Q3. Answer: (b) 6

Shortcut Trick

Group terms with common coefficients: $2(\sec^2A - \tan^2A) + 4(\text{cosec}^2A - \cot^2A)$.

Apply identities: $\sec^2A - \tan^2A = 1$ and $\text{cosec}^2A - \cot^2A = 1$.

Calculation: $2(1) + 4(1) = 2 + 4 = 6$.

Therefore The correct answer is 6.

Alternate Method

Given: Expression = $2\sec^2A + 4\text{cosec}^2A - 2\tan^2A - 4\cot^2A$

Formula Used: $1 + \tan^2A = \sec^2A \Rightarrow \sec^2A - \tan^2A = 1$; $1 + \cot^2A = \text{cosec}^2A \Rightarrow \text{cosec}^2A - \cot^2A = 1$

=> Rearranging the expression: $(2\sec^2A - 2\tan^2A) + (4\text{cosec}^2A - 4\cot^2A)$

=> Factorizing: $2(\sec^2A - \tan^2A) + 4(\text{cosec}^2A - \cot^2A)$

=> Substituting the identity values: $2 \times 1 + 4 \times 1$

=> 2 + 4 = 6

Therefore The correct answer is 6.

Additional Information

Trigonometric Identities

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

Reciprocal Relations

$\sec\theta = 1/\cos\theta$, $\text{cosec}\,\theta = 1/\sin\theta$, $\tan\theta = \sin\theta/\cos\theta$, and $\cot\theta = \cos\theta/\sin\theta$.

Q4. Answer: (b) current flowing through the conductor

The correct answer is current flowing through the conductor.

Key Points:

• Consider a conductor with a cross sectional area of A and a length l.
• Let the material's resistivity be ρ.

• The conductor's resistance is therefore expressed as

• x = ρl⁄A.

• Temperature affects a conductor's resistance.

• The resistivity of the conductor increases as the conductor's temperature rises, and drops as the conductor's temperature falls.

• Since a conductor's resistance and resistivity are directly inversely correlated, resistance rises with rising temperature and falls with falling temperature.

• Thus, among the alternatives, a conductor's resistance is determined by its length, thickness (i.e., cross sectional area), and temperature.

• It does not depend on the conductor's current level.

Additional Information:

• A conductor is any material that enables the movement of an electrical current.

• How well a conductor can transport current in an electrical circuit depends on its resistance.

• Resistance is the capacity to obstruct the flow of an electric current.

• Current flows through a conductor as a result of the electrical force known as voltage, however the more resistance a conductor has, the less current will flow for any given magnitude of applied voltage.

• The resistance of a conductor is primarily affected by three variables:

• The length of the conductor.

• The cross-sectional area of the conductor.

• The building material of the conductor.

Q5. Answer: (d) Barchans

The correct answer is Barchans.

Key Points

• Barchans

• The horns of the crescent on barchans, which are convex facing the wind and indicate the lateral advance of sand.

• A landform known as Barchan, often spelt Barkhan, is both erosional and depositional in nature.

• The name "barchan" refers to the characteristics of wide-open, inland desert areas like Turkistan.

• Where the plains have little sand cover, Barchan dunes are likely to occur.

• Both the white sand dunes at the National Monument in New Mexico and the Grand Erg Oriental in the Sahara Desert are iconic examples of barchans.

Additional Information

• Alluvial fan-

• It is a fan-shaped mound of alluvium that forms as a river's flow slows down.

• Moraine-

• It is material left behind by a moving glacier. This material is usually soil and rock.

Q6. Answer: (a) 2000

The correct answer is 2000.

Given:

V=5V

I=2.5mA=2.5/1000=0.0025A

To find: Resistance (R)

Formula used:

Ohm's law: V=IR

Calculations:

V=IR

5=0.0025*R

R=5/0.0025=2000Ω

Thus, the resistance is 2000Ω.

Q7. Answer: (b) ATUMDLTS

According to the given information:

Number/Symbol	7	8	5	&	6	%	2
Codes	S	D	M	U	T	L	A

The given code is : 7 6 & 5 8 % 6 2

Here, the first condition follows:

"If the first element is an odd number and the last element is an even number, the codes for these two (the first and the last elements) are to be interchanged"

Therefore, 7 will be coded as A(2) & 2 will be coded as S(7).

Hence, the correct answer is "Option 2".

Q8. Answer: (d) Immediately below S

Given: Seven boxes, P, Q, R, S, T, U and V.

1) V is the topmost box.

2) Only three boxes are between V and U.

V
U

3) V is kept just above Q, which is just above S.

V
Q
S
U

4) 4) R is kept just below T.

And, P will placed on the remaining place.

V
Q
S
P
U
T
R

So, from the given arrangement P is placed Immediately below S.

Hence, the correct answer is "Option 4".

Q9. Answer: (c) 10 m

From the given information:

Mahesh started from a point facing towards the west, turned left and walked for X m, then turned right and walked for 22 m

Turn left and walked for 11 m, then turn left again and walked for 22 m.

The value of X = 21 - 11 = 10m.

Hence, the correct answer is "Option 3".

Q10. Answer: (d) Hydrogen

The correct answer is hydrogen.

Key Points:

• Alcohol with the chemical formula C2H5OH is ethanol.

• Alcohols react with sodium metals to produce hydrogen gas and sodium alkoxide, which are both released.

• In the process of forming sodium ethoxide from ethanol and sodium metal, hydrogen gas is produced.

• 2 C2H5OH + 2 Na → 2 C2H5ONa + H2

• As a result, hydrogen is the gas that results from the reaction of ethanol and sodium.

Additional Information:

• To determine whether ethanol is present in a mixture of organic molecules, the reaction of ethanol and salt is utilised as a confirmatory test.

• In this test, a supposedly alcoholic organic molecule is given a tiny bit of salt.

• It is confirmed that the unknown sample is ethanol if the addition of sodium metal to the liquid results in effervescence or rapidly rising bubbles that show the evolution of hydrogen gas.

• If the liquid does not bubble when sodium metal is added, the sample is not alcohol.

• This test is only a preliminary one; other tests are needed to definitively determine whether ethanol is present.

Q11. Answer: (b) m = -1

The correct answer is m = -1.

Key Points

• When an object is placed at a distance of 2f from a convex lens, the image is formed at a distance of 2f on the other side of the lens.

• The image formed is real, inverted, and of the same size as the object.

• Magnification (m) = Height of Image / Height of Object = -1 (negative sign indicates inversion).

• This scenario is a standard case in lens formulas and ray diagrams of convex lenses.

• Thus, magnification 'm' = -1 for object placed at 2f in convex lens.

Additional Information

• Convex Lens (Converging Lens)

• A convex lens is thicker at the center and converges parallel rays of light to a point called the focus.

• It forms real and inverted images for object distances greater than focal length (f), and virtual, erect images when the object is within f.

• Magnification (m)

• Magnification = v/u or Height of Image / Height of Object.

• Positive magnification indicates an erect image, negative indicates an inverted image.

• Lens Formula

• 1/f = 1/v - 1/u where f = focal length, v = image distance, u = object distance.

• All distances are measured from the optical center of the lens.

• Applications of Convex Lens

• Used in magnifying glasses, microscopes, cameras, and human eye correction.

Q12. Answer: (a) 6

Concept Used:

Calculation:

As, √360 = 18.97 and √170 = 13.03

Here, we have

(√360 + 12 ÷ 6 × 3 √170)÷ 2

(18.97 + 12 ÷ 6 ×3 - 13.03) ÷ 2

(18.97 + 2 × 3 - 13.03) ÷ 2

(18.97 + 6 - 13.03) ÷ 2

(24.97 - 13.03) ÷ 2

=> 11.94 ÷ 2 = 5.97 ≈ 6

Hence, the required approximate value is 6.

Q13. Answer: (c) 60 m, East

From the given information:

Starting from a point X, Shekhar walks 70 m towards the north. Then, he takes a left turn and walks 150 m.

Now, takes a left turn and walks 70 m.

And Finally, he takes a left turn and walks 90 m to reach point Y.

So, Distance from Y to X = 150 -90 = 60m.

Here, Point X is 60 m towards the east of Y.

Hence, the correct answer is "Option 3".

Q14. Answer: (b) 90%

Shortcut Trick

Term 1 percentage = 100% (Full marks)

Term 2 percentage = 75/90 × 100 = 83.33%

Weighted % = (100 × 0.40) + (83.33 × 0.60)

Final Score = 40 + 50 = 90%

Therefore The correct answer is 90%.

Alternate Method

Given:

Term 1 score = 80/80 (Full marks)

Term 2 score = 75/90

Weightage of Term 1 = 40% and Term 2 = 60%

Calculations:

=> Percentage score in Term 1 = (80 ÷ 80) × 100 = 100%

=> Percentage score in Term 2 = (75 ÷ 90) × 100 = 83.33%

=> Contribution of Term 1 = 100 × (40 ÷ 100) = 40%

=> Contribution of Term 2 = 83.33 × (60 ÷ 100) = 50%

=> Final score = Contribution 1 + Contribution 2

=> Final score = 40 + 50 = 90%

Therefore The correct answer is 90%.

Additional Information

Weighted Average Formula

The final score is calculated using the formula: Weighted Average = (w1x1 + w2x2) ÷ (w1 + w2), where w is the weight and x is the value.

Percentage Calculation

Percentage = (Obtained Marks ÷ Maximum Marks) × 100. This standardizes scores across different totals.

Rounding Off Decimals

When calculating to the nearest integer, if the decimal part is 0.5 or greater, round up; otherwise, round down.

Q15. Answer: (d) • and -

We apply the options on the given equation and solve it using BODMAS rule:

Given equation: 28 - 28 ÷ 14 + 7 × 2 = 16

Checking the options, after interchanging the symbols:

Option 1) × and -

28 × 28 ÷ 14 + 7 - 2 = 16

28 × 2 + 7 - 2 = 16

56 + 7 - 2 = 16

63 - 2 = 16

61 ≠ 16

Option 2) + and ÷

28 - 28 + 14 ÷ 7 × 2 = 16

28 - 28 + 2 × 2 = 16

28 - 28 + 4 = 16

32 - 28 = 16

4 ≠ 16

Option 3) × and ÷

28 - 28 × 14 + 7 ÷ 2 = 16

28 - 28 × 14 + 3.5 = 16

28 - 392 + 3.5 = 16

31.5 - 392 = 16

-360.5 ≠ 16

Option 4) + and -

28 + 28 ÷ 14 - 7 × 2 = 16

28 + 2 - 7 × 2 = 16

28 + 2 - 14 = 16

30 - 14 = 16

16 = 16

Hence the correct answer is option 4)

Q16. Answer: (c) Rs. 1,722

Shortcut Trick

Given Selling Price (SP1) = Rs. 1,148 at 30% loss, so 70% of CP = 1,148.

To gain 5% profit, we need to find 105% of CP.

Ratio of SPs = 70 : 105 = 2 : 3.

Since 2 units = Rs. 1,148, then 1 unit = Rs. 574.

New Selling Price (SP2) = 3 units = 3 × 574 = Rs. 1,722.

Therefore The correct answer is Rs. 1,722.

Alternate Method

Given → SP1 = Rs. 1,148, Loss% = 30%, Target Gain% = 5%.

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

=> Cost Price (CP) = (1148 × 100) ÷ (100 − 30) = (1148 × 100) ÷ 70.

=> CP = 16.4 × 100 = Rs. 1,640.

=> New Selling Price = [1640 × (100 + 5)] ÷ 100 = (1640 × 105) ÷ 100.

=> New SP = 16.4 × 105 = Rs. 1,722.

Therefore The correct answer is Rs. 1,722.

Additional Information

Relation between SP and CP

When there is a profit, SP = CP × (100 + Gain%) / 100. When there is a loss, SP = CP × (100 − Loss%) / 100.

Direct Calculation

Required SP = [Initial SP ÷ (100 − Loss%)] × (100 + Gain%). This skips the explicit Cost Price calculation step.

Q17. Answer: (c) Indian Statistical Institute

The correct answer is the Indian Statistical Institute.

Key Points

• On December 17, 1931, he opened the Indian Statistical Institute in Calcutta.

• The institution was designated as "an institute of national importance" and a "deemed university" in 1959.

• Mahalanobis made contributions to the field of statistics with his work and discoveries. The Mahalanobis Distance, abbreviated D2, is what most people remember him for.

• He also served on India's planning commission when the country gained independence. He became well-known for his work on India's second five-year plan.

• The Indian government decided to declare June 29th, the anniversary of his birth, as "National Statistical Day" in 2006.

Additional Information

• He also created the Profiloscope, a device used to measure the dimensions of the skull. He also made contributions to the field

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of physical anthropology.

• His contribution to large-scale sample surveys was the most significant. Pilot surveys were conceived by Mahalanobis.

• He developed a random sampling method that is thought to be the most precise in the entire globe. His research also enhanced agricultural yield estimates.

• He was particularly well-known for his Mahalanobis Plan, which was represented in the second draught of the five-year plan and called for significant investment in the establishment of fundamental heavy industries.

Q18. Answer: (a) RHINO : TKMSU

According to the English alphabets and their positional values:

The pattern followed here is:

For, PARTS : RDVYY

For, CLOSE : EOSXK

Now we consider the options:

Option 1) RHINO : TKMSU

Option 2) TIME: PQOFU

Option 3) MANGO : ODRTS

Option 4) CLASS : EODVV

Hence, the correct answer is option 1).

Q19. Answer: (b) Stamens and pistils

The correct answer is Stamens and pistils.

Key Points:

• The reproductive components of a flower, which also contain germ cells, are the stamens and the pistil.

• A flower can be either unisexual (watermelon, papaya) or bisexual (hibiscus, mustard) depending on whether it has stamens or pistils.

• The male reproductive component, the stamen, creates pollen grains with a yellowish hue.

• The female reproductive component of a flower is the pistil, which is located in the center.

• There are three pieces to it.

• The stigma is located at the end of the style and may be sticky.

• The ovary is located at the bottom, where it is enlarged.

• Ovules are found in the ovary, and each ovule contains an egg cell.

• The female gamete is found in the ovule and the male germ-cell is created by the pollen grain mate.

Additional Information:

• Sepals:

• A sepal is a part of the flower of an angiosperm (flowering plants).

• The often green sepals support the petals while they are in bloom and protect the flower while it is still in the bud stage.

• Anther:

• The portion of a flower that sheds pollen at the top of a stamen is called an anther.

• Petals:

• Flowers' reproductive organs are enclosed by petals, which are modified leaves.

• To lure pollinators, they are frequently brightly coloured or shaped differently.

• Style:

• The pistil stalk is referred to as the "style."

• When pollen reaches the stigma, it starts to form a pollen tube that will eventually go through the style and reach the ovary.

• Because only suitable pollen can form a pollen tube, the style protects against pollen contamination.

Q20. Answer: (d) U

Given, Six students P, Q, R, S, T and U.

1) P and S sit at the ends of the row.

2) T sits immediate neighbor of P, while U sits immediate neighbor of S.

3) Only one person sits between Q and S.

And, R will sit at the remaining place.

Here, U sits immediately next to Q.

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Hence, the correct answer is "Option 4".

Q21. Answer: (d) Advocate-General

The correct answer is Advocate-General.

Key Points

• As the chief legal representative of the State's government, the Advocate General carries out the responsibilities listed below:

• To provide legal advice to the state government on subjects that the governor refers to him for.

• To carry out any additional legal obligations that the state governor delegates to you.

• To perform the duties assigned to him or her by the Constitution or another piece of legislation.

• The Advocate General is permitted to represent the State in any court of law while carrying out his official responsibilities.

• The Advocate General is entitled to speak and participate in both Houses of the State legislature's sessions.

• Additionally, he or she has the ability to participate in committee meetings without being able to vote in any committee of the State legislature.

• Solicitor General

• In common law nations, a solicitor general or solicitor-general is typically a legal officer who serves as the principal advocate for a regional or national government in court proceedings.

• Attorney General

• The Attorney General of India acts as the chief court representative as well as the government's senior legal advisor.

• According to Article 76(1) of the Constitution, they are chosen by the Indian President at the request of the Union Cabinet and serve at the President's leisure.

• Comptroller and Auditor General

• According to Article 148 of the Indian Constitution, the Comptroller and Auditor General of India is the country's top auditing body.

• They have the authority to examine all monies received and spent by the Indian and state governments, as well as any autonomous organizations and businesses that get significant government funding.

Q22. Answer: (a) 2 × 10^8m / sec

The correct answer is 2 × 108m / sec.

Given:

Refractive index n=1.5

To find: Speed of light in the medium

Formula used:

The refractive index is defined as:

n=(Speed-of-light-in-vaccum)/(Speed-of-light -in-medium)

Calculations:

Here we have,

n=(Speed-of-light-in-vaccum)/(Speed-of-light -in-medium)

1.5=(3*10^8)/(Speed-of-light -in-medium)

Speed of light in the medium is =(3*10^8)/1.5=2*10^8m/sec

So, the speed of light in the medium is 2 × 108m / sec.

Q24. Answer: (b) i. A - Mitosis, B - Meiosis ii. Meiosis takes place in reproductive cells for the formation of gametes

The correct answer is

i. A - Mitosis, B - Meiosis

ii. Meiosis takes place in reproductive cells for the formation of gametes

Key Points

• Meiosis is a type of cell division that results in the formation of four daughter cells each with half the number of chromosomes as the parent cell.

• Mitosis is the type of cell division that results in the formation of two daughter cells each with the same number and kind of chromosomes as the parent cell.

• Mitosis is the process where the division of cells occurs by asexual reproduction.

• The meiosis mode of reproduction is through sexual reproduction and takes place in reproductive cells to form gametes.

• So from the question, it is clear that A - Mitosis, B - Meiosis, and Meiosis takes place in all the cells of the body.

So, option 2) is the correct answer.

Additional Information

• Mitosis and meiosis take place in the cell nuclei where both involve cell division.

• Both processes occur in the M-phase of the cell cycle.

• In both cycles, the stages are common- prophase, metaphase, anaphase and telophase.

• Synthesis of DNA occurs in both processes.

Q25. Answer: (c) 3

Given: T % N 9 + M $ 3 U = L 8 Y @ G & 3 E > W.

The Letters are immediately followed by a symbol and immediately preceded by a number.

So, the sequence will be Number, Letter, Symbol.

Here, 3 pairs are immediately followed by a symbol and immediately preceded by a number.

3U=, 8Y@, 3E>

Hence, the correct answer is "Option 3".

Q26. Answer: (d) AVRIWVB

According to the English alphabets and their positional values:

The pattern followed in the given codes is:

Each alphabet is increased to the positional value of its place value.

The alphabets are arranged backwards to form the code.

For, 'ACADEMY' is written as 'FSJHDEB'

For, 'BARRIER' is written as 'YKNVUCC'

Similarly, for 'ATTEMPT'

So, 'ATTEMPT' is written as 'AVRIWVB'

Hence the correct answer is option 4).

Q27. Answer: (d) Rs. 28,000

Shortcut Trick

Effective Rate of Interest for 2 years = 7% × 2 = 14%

Total Simple Interest = 14% of Rs. 2,00,000

=> Simple Interest = 14 × 2000 = Rs. 28,000

Therefore The correct answer is Rs. 28,000.

Alternate Method

Given:

Principal (P) = Rs. 2,00,000

Rate of Interest (R) = 7% per annum

Time period (T) = 2 years

Formula Used:

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

Calculations:

=> SI = (2,00,000 × 7 × 2) ÷ 100

=> SI = 2,000 × 7 × 2

=> SI = 2,000 × 14

=> SI = Rs. 28,000

Therefore The correct answer is Rs. 28,000.

Additional Information

Total Amount (A)

The total sum of money payable after the time period is the sum of Principal and Interest: A = P + SI.

Constant Interest

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

Compound Interest (CI)

Unlike SI, Compound Interest is calculated on the principal plus the accumulated interest of previous periods. Formula: A = P(1 + R/100)^T.

Q28. Answer: (a) Only conclusions II, III and IV follow.

Statements:

1. Some pamphlets are copies.

2. All copies are readers.

3. All readers are scrolls.

Venn diagram:

Conclusions:

I. All pamphlets are scrolls→ Does not follow → Since some pamphlets are copies when means only some pamphlets can be scrolls and the same can be seen in the Venn diagram thus the conclusion does not follow.

II. All copies are scrolls→ Follow → We have 'all copies are readers' & 'all readers are scrolls' then it is correct to conclude that all copies are scrolls therefore the conclusion follows.

III. Some readers are copies→ Follow → From the statements, 'all copies are readers' which means there have to be some part of readers who are copies and it is clearly visible in the Venn diagram therefore the conclusion follows.

IV. Some scrolls are pamphlets→ Follow → Here 'all copies are readers' & 'all readers are scrolls' which implies all copies are scrolls, also 'some copies are pamphlets' similarly some scrolls are pamphlets therefore the conclusion follows.

So only conclusions II, III & IV follows.

Hence the correct answer is option 1)

Q29. Answer: (a) None follows.

Given:

Statements:

1. All tigers are lions.

2. No cat is a lion.

3. Some jaguars are cats.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some jaguars are lions - Does not follow (As, there is no direct relation given between Jaguars and Lions, so it can be possible not definite).

II. No jaguar is tiger - Does not follow (As, there is no direct relation given between Jaguars and Lions, so it can be possible not definite).

So, None follows.

Hence, the correct answer is "Option 1".

Q30. Answer: (b) 126035

Shortcut Trick

Sum = 335 + 265 = 600 (Divisor)

Difference = 335 − 265 = 70

Quotient = 3 × 70 = 210

Number = (600 × 210) + 35 = 126000 + 35 = 126035

Therefore The correct answer is 126035.

Alternate Method

Given:

Divisor (D) = Sum of 335 and 265

Quotient (Q) = 3 × (Difference of 335 and 265)

Remainder (R) = 35

Formula Used:

Number (Dividend) = (Divisor × Quotient) + Remainder

Calculations:

=> Divisor = 335 + 265 = 600

=> Difference = 335 − 265 = 70

=> Quotient = 3 × 70 = 210

=> Number = (600 × 210) + 35

=> Number = 126000 + 35

=> Number = 126035

Therefore The correct answer is 126035.

Additional Information

Division Algorithm

For any whole numbers a and b (b ≠ 0), there exist unique integers q and r such that a = bq + r, where 0 ≤ r < b.

Remainder Property

The remainder must always be smaller than the divisor and can never be a negative value in standard arithmetic division.

Verification Rule

To verify a division result, always check if (Dividend − Remainder) is exactly divisible by both the Divisor and the Quotient.

Q32. Answer: (a) 1.125

μ_AV_B = μ_AV_A

V_A= 2 * 108m/sec, V_B= 2.25 * 108 m/sec

According to Snell's law

μ_AV_A = μ_BV_B

μ is the refractive index w.r.t air and V is the velocity in that medium

The refractive index of medium A with respect to medium B is equal to = μAB

μAB =μA / μ_B = VB/VA = 2.25 * 10^8/ 2 * 10^8 = 1.125

μAB = 1.125

Hence, the correct answer is "Option(1)".

Q33. Answer: (b) 89

Calculation:

Here, we have 62 + 72 + √16

=> 36 + 49 + 4 = 85 + 4

=> 89

Hence, the required value is 89.

Q34. Answer: (d) Jharkhand

The correct answer is Jharkhand.

Key Points

• A large portion of Jharkhand, as well as adjacent regions of Bihar, Odisha, West Bengal, and Chhattisgarh, are included in the Chhota Nagpur Plateau, an eastern Indian plateau.

• To the North and East of the plateau are the Indo-Gangetic Plains, and to the South is the Mahanadi River Basin.

• Precambrian rocks make up the Plateau. The plateau was created by continental uplift brought on by forces that originated deep inside the earth.

• The Rajmahal Hills, which make up the Chhota Nagpur Plateau's northern edge, is primarily made of basalt and are covered in basaltic lava flows.

Additional Information

• The Sanjay National Park in Chhattisgarh and the Palamau Tiger Reserve in Jharkhand are nearby.

• A tropical and subtropical dry broadleaf forests ecoregion surrounds the plateau and is found in the Chhota Nagpur.

• Sal Trees are another prominent feature of the area. These trees are a good source of both food and lumber.

• The greatest concentration of mineral resources in India is located in the Chhota Nagpur region. Resources including bauxite, iron ore, and others are abundant in the area.

Q35. Answer: (a) 750/11 km/h

Shortcut Trick

Total Time required = Total Distance ÷ Average Speed = 800 ÷ 60 = 40/3 hours.

Time spent on first part = 300 ÷ 50 = 6 hours.

Remaining Time = 40/3 − 6 = 22/3 hours.

Required Speed = Remaining Distance ÷ Remaining Time = 500 ÷ (22/3) = 1500/22 = 750/11 km/h.

Therefore The correct answer is 750/11 km/h.

Alternate Method

Given:

Total Distance (D) = 800 km, Target Average Speed (V_(avg)) = 60 km/h.
Part 1: d1 = 300 km, s1 = 50 km/h.
Part 2: d2 = 800 − 300 = 500 km, s2 = V km/h.
Formula Used:
Average Speed = Total Distance ÷ Total Time
Calculations:
=> Total Time (T) = 800 ÷ 60 = 40/3 hours
=> Time for first part (t1) = 300 ÷ 50 = 6 hours
=> Time for remaining part (t2) = T − t1 = 40/3 − 6
=> t2 = (40 − 18) ÷ 3 = 22/3 hours
=> Speed for remaining part (s2) = d2 ÷ t2
=> s2 = 500 ÷ (22/3) = (500 × 3) ÷ 22
=> s2 = 1500 ÷ 22 = 750/11 km/h
Therefore The correct answer is 750/11 km/h.
Additional Information
Average Speed Formula
Average Speed is defined as total distance divided by total time: V_(avg) = (d1 + d2) / (t1 + t2).
Special Case: Equal Distances
If a journey is divided into two equal distances with speeds x and y, the Average Speed = 2xy / (x + y).
Unit Conversion
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Q36. Answer: (c) 58.5

Shortcut Trick
Relative Speed (km/h) = (Distance ÷ Time) × (18/5)
Relative Speed = (210 ÷ 12) × (18 ÷ 5) = 17.5 × 3.6 = 63 km/h
Since they move in opposite directions, Relative Speed = Speed of Train + Speed of Man
Speed of Train = 63 − 4.5 = 58.5 km/h
Therefore The correct answer is 58.5 km/h.
Alternate Method
Given: Length of train (L) = 210 m, Speed of man (V_m) = 4.5 km/h, Time (t) = 12 s
Formula Used: Speed = Distance ÷ Time; Relative Speed (Opposite) = V1 + V2
=> Let the speed of the train be V km/h.
=> Relative speed = (V + 4.5) km/h
=> Convert speed to m/s: Relative speed = (V + 4.5) × (5/18) m/s
=> Distance = Speed × Time
=> 210 = (V + 4.5) × (5/18) × 12
=> 210 = (V + 4.5) × (60/18)
=> 210 = (V + 4.5) × (10/3)
=> 21 × 3 = V + 4.5
=> 63 = V + 4.5
=> V = 63 − 4.5 = 58.5 km/h
Therefore The correct answer is 58.5 km/h.
Additional Information
Relative Speed Rules
When two objects move in opposite directions, relative speed is the sum of their speeds (V1 + V2). In the same direction, it is the difference (V1 − V2).
Unit Conversion
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.
Train Crossing a Man
When a train crosses a stationary or moving person, the distance covered is equal to the length of the train.

Q37. Answer: (b) Oman

The correct answer is Oman.

Key Points

• At the World Race Walking Team Championships 2022, which were conducted over the weekend in Muscat, Oman, three athletes from India Tokyo Olympian Bhawna Jat, Ravina, and Munita Prajapati joined forces to win India a bronze medal in the team classification of the women's 20km race walk.

• In the women's 20km race in Muscat, Ravina finished 14th, which was the best result for an Indian.

Additional Information

• The World Athletics Race Walking Team Championships have been held for 61 years, and this is India's first medal in that time.

• With a third-place result behind China and Greece and a bronze medal, the Indian team of Bhawna Jat, Ravina, and Munita Prajapati. Fourth place in the standings went to Lithuania.

• It was the first medal Indian women have ever won at a major race walking competition. In the 2012 men's 20km, the Indian trio of KT Irfan, Surinder Singh, and Babubhai Kesharabhai Panucha took home the bronze medal.

Q38. Answer: (d) federalism

The correct answer is Federalism.

Key Points

• Federalism-

• It Is a system of government in which powers have been divided between the center and the state.

• There are two types of federation:-Holding together federation, Coming together federation.

• The Constitution establishes a dual polity consisting of the Union at the Centre and the states at the periphery.

• Powers and functions of each tier of government are specified and guaranteed by the constitution i.e. Division of Power.

• India has a bi-cameral legislature and it is an essential feature of federalism.

Additional Information

• The Supreme Court has been given the power to settle disputes between central and state governments.

• Federalism was introduced into modern India by the government of India Act of 1919.

• Secularism:-

• It is the principle of separation of the state from religious institutions.

• Parliamentary system-

• It is a form of government where executives hold the power with the majority support of the legislature.

Q39. Answer: (a) Only conclusion II is correct.

Given statement:

$T = S \geq N = A \leq U > P < Q$

Conclusion:

I. $S > Q$ → False ($S \geq N = A \leq U > P < Q$ → No definite relation can be possible between S and Q).

II. $A \leq T$ → True → ($T = S \geq N = A$ gives $T \geq A$).

So, only conclusion II is correct.

Hence, the correct answer is option 1).

Q40. Answer: (c) Fe2O3 and Al

The correct answer is Fe2O3 and Al.

Key Points:

• In the aforementioned reaction, ferric oxide reacts with aluminium to produce aluminium oxide and iron, which is;

• $2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$.

• Here, aluminium (Al) is the oxidised substance, and iron (Fe) is the reduced substance.

• We can quickly determine which substance is oxidising and which is decreasing because of the difference in the oxidation numbers of iron and aluminium.

• Aluminum (Al) undergoes oxidation reactions that increase its oxidation number from zero to three while also introducing oxygen into the mix.

• Fe_2O_3 acts as an oxidising agent.

• Due to the removal of oxygen from Fe_2O_3 and the addition of Al, Fe_2O_3 is reduced to Fe.

• Aluminum (Al) thus serves as the reducing agent.

Additional Information:

• The addition of oxygen or any other electronegative element, or the removal of an electropositive element, is a process known as oxidation.

• Oxidizing agent:

• In a redox reaction, an oxidising agent is a chemical that absorbs or gains electrons or has a tendency to add oxygen atoms.

• Hydrogen or any other electropositive element is introduced while oxygen or any other electronegative element is subtracted during the reduction reaction.

• Reducing agent:

• A reducing agent is a type of chemical that has the ability to eliminate oxygen from elements or take hydrogen.

Q41. Answer: (d) Kerala

The correct answer is Kerala.

Key Points

• It is a joint venture of the Digital University of Kerala, the Centre for Materials for Electronics Technology (C-MET) and Tata Steel Limited. It will be set up in Thrissur Kerala.

• Graphene is a one-atom-thick layer of carbon atoms arranged in a hexagonal arrangement.

• An Innovation Center is a cross-functional plan that creates a safe haven for new ideas.

• Earlier in 2020, researchers from the City University of Hong Kong produced a laser-induced form of graphene masks that inactivate the coronavirus species.

Additional Information

• The state government would provide the basic infrastructure for the project. The Centre would help attract investors to develop graphene products.

• The project would give a major boost to scientific research as well as the state's industrial sector.

• This result in Kerala's human resources capital being effectively exploited, which will help Kerala to emerge as a knowledge-based economy.

Q42. Answer: (d) Δ ABC ~= Δ FDE

Shortcut Trick

Find the missing angles: In Δ ABC, angle C = 180° − (40° + 55°) = 85°. In Δ DEF, angle F = 180° − (55° + 85°) = 40°.

Match vertices with equal angles: A (40°) ↔ F (40°), B (55°) ↔ D (55°), and C (85°) ↔ E (85°).

Check the given side: AB = FD. Since A ↔ F and B ↔ D, side AB corresponds to side FD.

By ASA congruence rule, the triangles are congruent in the order of their corresponding vertices.

Therefore The correct answer is Δ ABC ~= Δ FDE.

Alternate Method

Given: In Δ ABC, angle A = 40°, angle B = 55°. In Δ DEF, angle D = 55°, angle E = 85°, and AB = FD.

Formula Used: Angle Sum Property (Sum of angles = 180°) and ASA (Angle-Side-Angle) Congruence Rule.

A

B

C

F

D

E

Q43. Answer: (c) 139

We have to find the number of people who like Hazelnut but do not like Cashew so we highlight the region with Hazelnut.

The shaded part shows the person who likes Hazelnut but does not like Cashew.

Total = 120 + 19 = 139.

Hence, the correct answer is "Option 3".

Q44. Answer: (a) (20, 24, 120)

The pattern followed in the given series is:

Logic: First term × (Second term ÷ 4) = Third term

Now we apply the pattern on the given sets:

(24, 12, 72)

24 × (12 ÷ 4) = 72

24 × 3 = 72
72 = 72
(15, 16, 60)
15 × (16 ÷ 4) = 60
15 × 4 = 60
60 = 60
Now we apply the pattern on the given options:
Option 1) (20, 24, 120)
20 × (24 ÷ 4) = 120
20 × 6 = 120
120 = 120
Option 2) (30, 40, 156)
30 × (40 ÷ 4) = 156
30 × 10 = 156
300 ≠ 156
Option 3) (17, 20, 65)
17 × (20 ÷ 4) = 65
17 × 5 = 65
85 ≠ 65
Option 4) (18, 12, 56)
18 × (12 ÷ 4) = 56
18 × 3 = 56
54 ≠ 56
Hence, the correct answer is "Option 1".

Q45. Answer: (b) 13 m/s

Shortcut Trick
Total distance = Sum of lengths = 120 + 140 = 260 m.
Relative speed = Total distance ÷ Time = 260 ÷ 10 = 26 m/s.
Since both trains have the same speed and move in opposite directions, Relative Speed = 2 × Speed.
Speed of each train = 26 ÷ 2 = 13 m/s.
Therefore The correct answer is 13 m/s.
Alternate Method
Given: Length of train 1 (L1) = 120 m, Length of train 2 (L2) = 140 m, Time (t) = 10 s, Speed (v1 = v2 = v).
Formula Used: Relative Speed = (L1 + L2) ÷ Time
=> Total distance = 120 + 140 = 260 m
=> Relative speed in opposite direction = v + v = 2v
=> 2v = 260 ÷ 10
=> 2v = 26 m/s
=> v = 13 m/s
Therefore The correct answer is 13 m/s.
Additional Information
Relative Speed (Opposite Direction)
When two objects move in opposite directions, their relative speed is the sum of their individual speeds: S_(rel) = S1 + S2.
Relative Speed (Same Direction)
When two objects move in the same direction, their relative speed is the difference of their individual speeds: S_(rel) = |S1 − S2|.
Speed Conversion
To convert km/hr to m/s, multiply by 5/18. To convert m/s to km/hr, multiply by 18/5.

Q46. Answer: (d) 85, 119

Shortcut Trick
Given Ratio = 5 : 7 and HCF = 17.

Numbers are always multiples of their HCF.
First number = 5 × 17 = 85.
Second number = 7 × 17 = 119.
Therefore The correct answer is 85, 119.
Alternate Method
Given:
Ratio of two numbers = 5 : 7
Highest Common Factor (HCF) = 17
Formula Used:
If ratio is a : b and HCF is h, then numbers are (a × h) and (b × h).
Calculations:
=> Let the numbers be 5x and 7x.
=> The HCF of 5x and 7x is x.
=> Since HCF is given as 17, x = 17.
=> First number = 5x = 5 × 17 = 85.
=> Second number = 7x = 7 × 17 = 119.
Therefore The correct answer is 85, 119.
Additional Information
LCM and HCF Relationship
Product of two numbers = HCF × LCM. This is valid for any two positive integers.
LCM of Numbers in Ratio
If ratio of two numbers is a : b and their HCF is h, then their LCM = a × b × h.
Co-prime Numbers
If the HCF of two numbers is 1, they are called co-prime numbers (e.g., 5 and 7).

Q47. Answer: (c) (a/b)^(r+s)

Calculations:
=> (a+1/b)^r(a-1/b)^s÷(b+1/a)^r(b-1/a)^s
=> ((ab+1)/b)^r((ab-1)/b)^s÷((ab+1)/a)^r((ab-1)/a)^s
=> ((((ab+1)^r)/(b^r))(((ab-1)^s)/(b^s)))/((((ab+1)^r)/(a^r))^r(((ab-1)^s)/(a^s)))
=> (a^r × a^s)/(b^r × b^s))
=> (a^(r+s))/(b^(r+s))
=> (a/b)^(r+s)
Hence, The correct option is 3.

Q48. Answer: (d) 25 Ω

The correct answer is 25Ω.
Key Points
• Resistance
• The property of materials that makes it possible for electric current to flow is known as resistance.
• The flow of current is certainly impeded by resistance.
• The Greek uppercase letter omega is the unit of resistance, and the resistance varies depending on the voltage across a particular resistor and the current passing through it.
• A measure of the resistance to current flow in a specific electrical circuit is referred to as resistance.
• Resistance in parallel: 1/R_(tot)= 1/R1+1/R2
• Resistance in series: R_(tot)= R1+R2
Additional Information
• Calculations
• Since the wire is in form of circle it has the upper and lower part of resistance to be 50Ω each.
So as the other two 50Ω are connected in parallel, the equivalent resistance is,
1/Rtot= 1/50+1/50= 2/50= 1/25
Rtot= 25Ω

• Thus, the equivalent resistance between two diametrically opposite points of the circle is 25Ω.

Q49. Answer: (b) 16

The correct answer is 16.

Key Points

• Group 16 elements

• The elements in Group 16 of the periodic table make up the oxygen family, which is also known as the chalcogens. It is considered to be one of the main groups of elements.

• Oxygen, sulfur, selenium, tellurium, or polonium increase metallic properties first. Polonium is primarily made of metal. M. Curie discovered it and gave it the name Poland in honor of her home country.

• As the group's atomic weight rises, so does its electronegativity, ionization energy (or IP), and electron affinity.

• The melting point and atomic radius increase.

• Due to its small size, oxygen has distinct chemical properties from sulfur. There are more differences between O and S than there are between the other members.

Additional Information

• Acidic oxide

• An oxide that, upon addition to water, either produces an acidic solution or serves as an acceptor of hydroxide ions, effectively acting as a Lewis acid, is known as an acidic oxide.

• Typically, acidic oxides have a low pKa and can be organic or inorganic.

• When dissolved, carbon dioxide, a common acidic oxide, results in the formation of carbonic acid and the formation of an acidic solution.

Q50. Answer: (a) Two

Now, Each letter is changed to the next letter in the English alphabetical order, then:

Here, 2 such clusters formed with no vowels: MBZN & KPFL.

Hence, the correct answer is "Option 1".

Q51. Answer: (d) 122

The pattern followed in the given series is:

Logic: First term × First term + 1 = Second term.

Now we apply the pattern on the given series:

For, 12 : 145

12 × 12 + 1 = 145

144 + 1 = 145

145 = 145

For, 9 : 82

9 × 9 + 1 = 82

81 + 1 = 82

82 = 82

Similarly, 11 : ?

11 × 11 + 1 = ?

121 + 1 = 122.

Hence, the correct answer is "Option 4".

Q52. Answer: (a) H36S

According to the English alphabets and their positional values:

The pattern followed in the given series is:

The difference between numbers are the square of natural numbers.

The first alphabet is increased to +3,+6,+9,+12 positional value.

The last alphabet is decreased by -3,-6,-9,-12 positional value.

Hence, the correct answer is "Option 1".

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Q53. Answer: (c) U

Given: Six students P, Q, R, S, T and U.

1) P is taller than only two students.

_ > _ > _ > P > _ > _

2) T is taller than only one student but shorter than exactly four students.

_ > _ > _ > P > T > _

3) S is taller than only four students but is not the tallest.

_ > S > _ > P > T > _

4) Q is not taller than any student.

5) R is not the tallest.

_ > S > R/Q > P > T > Q/R

And, U will place o the remaining position,

U > S > R > P > T > Q

Here, U is the tallest.

Hence, the correct answer is "Option 3".

Q54. Answer: (b) 10 years

Shortcut Trick

Present Ratio (Father : Daughter) = 3 : 1 (Difference = 2 units)

Future Ratio (after 10 years) = 2 : 1 (Difference = 1 unit)

Equate difference by multiplying future ratio by 2 → 4 : 2

Change in units = 4 − 3 = 1 unit, which represents 10 years.

Daughter’s present age = 1 unit × 10 = 10 years.

Therefore The correct answer is 10 years.

Alternate Method

Given: Present ratio is 3:1 and ratio after 10 years is 2:1.

=> Let Daughter’s present age = x years.

=> Father’s present age = 3x years.

=> According to the question: (3x + 10) = 2 × (x + 10)

=> 3x + 10 = 2x + 20

=> 3x − 2x = 20 − 10

=> x = 10

Therefore The correct answer is 10 years.

Additional Information

Ratio Difference Method

When the same number of years is added to two people, the difference between their ages remains constant. Adjusting ratios to keep this difference equal simplifies the calculation.

Algebraic Verification

If present age is 3x and x, then (3x + n) / (x + n) = m / k, where n is the number of years and m:k is the future ratio.

Linear Equations in Ages

Most age problems can be solved by setting up a linear equation based on the relationship given for different points in time.

Q55. Answer: (c) 107

Solve it using BODMAS rule:

Given equation: 7 × 7 ÷ 8 - 12 × 6 + 17 - 14 - 100 = ?

After interchanging '+' and '-' and '÷' and '×'

7 ÷ 7 × 8 + 12 ÷ 6 - 17 + 14 + 100 = ?

=> 1 × 8 + 2 - 17 + 14 + 100 = ?

=> 8 + 2 - 17 + 14 + 100 = ?

=> 124 - 17 = 107.

Hence, the correct answer is "Option 3".

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Q56. Answer: (d) Telangana

The correct answer is "Telangana".

Key Points

• The Department of Women and Child Development, Telangana provided logistical support, finance, and assistance for the establishment of BHAROSA as a Society for Protection of Women and Children in Hyderabad in May 2016.

• BHAROSA offers rapid access to expert services to everyone who knocks on its doors.

• In addition to psychological counselling, a variety of police, medical, legal, and prosecution services are offered in an integrated manner.

• Relief and rehabilitation are the results of this multifaceted help, if necessary.

• Thus, as per information received till July 2022, Telangana has set up 'Bharosa Kendras', which provide one-stop services for women and children, who are victims of sexual assault and violence.

Additional Information

• Over the years, there has been an increase in sexual offences in the nation.

• Although the government adopted the Prevention of Children from Sexual Offences Act, 2012 (POCSO) in response to the need for a specific law to address crimes against children, its execution required significant support on the ground.

• Up to 3,000 POCSO incidents are reported and looked into annually, and four child sexual assault victims are denied justice every day because police close their investigations due to a lack of information or insufficient proof.

Q57. Answer: (b) 1 July 2017

The correct answer is 1 July 2017.

Key Points

• The GST Bill, 2014 was passed in May 2015. It was enacted as Constitution Act, 2016, with effect from, 16th September, 2016. The GST was launched on 1st July 2017.

• It is a tax levied when a consumer buys a good or service. It is meant to be a single, comprehensive tax that will subsume all the other smaller indirect taxes on consumption like service tax, etc.

• It subsumed 17 large taxes and 13 cesses. It is a single tax on the supply of goods and services, right from the manufacturer to the end consumer.

• It is a step towards 'One Nation, One Tax'.

Additional Information

• It is Simple and Easy to administer because multiple indirect taxes at the central and state levels are being replaced by a single tax “GST”.

• It makes Better control on leakage because of better tax compliance, reduction of rent-seeking, transparency in taxation due to IT use.

• It has Higher revenue efficiency since the cost of the collection will decrease along with an increase in the ease of compliance, it will lead to higher tax revenue.

• The single and transparent tax will provide a lowering of inflation. and provide Relief in overall tax burden.

• It has Tax democracy that is luxury items will be taxed more and basic goods will be tax-free.

Q58. Answer: (c) Mahatma Gandhi National Rural Employment Guarantee Act

The correct answer is Mahatma Gandhi National Rural Employment Guarantee Act.

Key Points

• A rural wage employment scheme called MGNREGA was launched in India in 2005.

• The Ministry of Rural Development (MRD), which oversees the full implementation of this programme with state governments, keeps an eye on it.

• By creating chances for wage employment, it helps the impoverished in rural areas improve the security of their means of subsistence.

• Additionally, it strives to build a rural asset base that would improve productive job opportunities and increase and sustain a rural household's income.

Additional Information

• Adult members of rural households now have the legal right to employment due to the Act. At least one-third of the recipients must be women.

• It promotes the empowerment of disadvantaged groups. The largest social security programme in the world is MGNREGA.

• It functions as a plan to fight poverty. It was a tool that many utilised to escape poverty.

• Also, it contributes to the creation of jobs and financial inclusion of individuals.

• It also gave the rural economy a boost.

Q59. Answer: (a) 14.58%

Given:

Table below

social class	male	Women
Art	202	112
Science	260	280
Commerce	116	190
Method	78	65
gross	656	647

Calculations:

Total Number of students

= Total male + Total female

= 656 + 647

= 1303

Females in commerce

= 190

Percentage required

= 190 × 100/1303

= 14.58%

Hence, The Required value is 14.58%.

Q60. Answer: (d) alkaline

The Correct answer is Alkaline.

Key Points

• Metal oxides have a simple chemical structure.

• An oxygen atom is connected to another atom in a chemical known as an oxide.

• These compounds can be created by partnering oxygen atoms with metals, which donate their electrons in their valence shells in the process.

• Since they react with weak acids to produce salt and water, metal oxides are basic in nature.

• Ionic metal oxides typically react with substances that produce water and contain hydroxide ions. A basic solution is created as a result of the reaction with water.

Additional Information

• They are basic because salt and water are created when metal oxides and acids react. They are basic because they neutralise the acids.

• Acidic oxides can be produced by metalloids or nonmetals. With water, they react, producing an acidic solution.

• The oxides known as amphoteric oxides exhibit both acidic and basic behaviour. Amphoteric oxides are neutralizers of both acids and bases with characteristics of both acidic and basic oxides.

Q61. Answer: (b) leucoplastids

The correct answer is leucoplastids.

Key Points

• Leucoplastids

• Leucoplasts are organelles found in plant cells and belong to the plastid family. In contrast to other plastids like chloroplast, they lack pigmentation.

• They are referred to as amyloplasts, elaioplasts, or proteinoplasts (also known as aleuroplasts), depending on whether they are specialized for the bulk storage of protein, lipid, or starch.

• Leucoplasts serve a wide range of essential biosynthetic functions and do not serve a major storage function in many cell types.

Additional Information

• Plastids

• The plastid is a membrane-bound organelle that is found in the cells of some eukaryotic organisms, including plants, algae, and bacteria.

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• Cyanobacteria that live inside cells are known as intracellular endosymbiotics.

• Leucoplasts are non-pigmented plastids that can occasionally differentiate, chromoplasts are used for pigment synthesis and storage, and chloroplasts are used for photosynthesis.

Q62. Answer: (a) 21 years

Shortcut Trick

Ratio of Kohli to Rohit = 7 : 8

Difference in ratio parts = 8 − 7 = 1 unit

Given age difference = 3 years => 1 unit = 3 years

Age of Kohli = 7 units = 7 × 3 = 21 years

Therefore The correct answer is 21 years.

Alternate Method

Given: Ratio of ages = 7 : 8 and Age difference = 3 years.

=> Let the age of Kohli be 7x and the age of Rohit be 8x.

=> According to the question: 8x − 7x = 3

=> x = 3

=> Age of Kohli = 7x = 7 × 3 = 21 years

=> Age of Rohit = 8x = 8 × 3 = 24 years

Therefore The correct answer is 21 years.

Additional Information

Ratio and Proportion Basics

If two quantities are in the ratio a : b, they can be represented as ax and bx where x is a common multiplier.

Constant Age Difference

The difference between the ages of two people remains constant regardless of the number of years that pass.

Finding Values from Ratio

Value of a part = (Total Value ÷ Sum of Ratio parts) × Specific Ratio part.

Q63. Answer: (a) real and equal roots

Shortcut Trick

Recognize the equation as a perfect square trinomial.

$x^2 - 14x + 49 = (x - 7)^2 = 0$

Since the equation is in the form $(x - k)^2 = 0$, both roots are equal to k.

Therefore, the roots are x = 7 and x = 7, which are real and equal.

Therefore The correct answer is real and equal roots.

Alternate Method

Given: Quadratic equation $x^2 - 14x + 49 = 0$

Formula: For a quadratic equation $ax^2 + bx + c = 0$, the nature of roots is determined by the Discriminant (D) where $D = b^2 - 4ac$.

=> Comparing $x^2 - 14x + 49 = 0$ with $ax^2 + bx + c = 0$, we get:

=> a = 1, b = −14, c = 49

=> $D = (-14)^2 - 4 \times 1 \times 49$

=> D = 196 − 196

=> D = 0

=> When the Discriminant is zero, the roots are always real and equal.

Therefore The correct answer is real and equal roots.

Additional Information

Nature of Roots Cases

1. If D > 0, the roots are real and distinct. 2. If D = 0, the roots are real and equal. 3. If D < 0, the roots are non-real or imaginary.

Discriminant Formula

The discriminant $D = b^2 - 4ac$ is used to find the nature of roots without solving the entire quadratic equation.

Quadratic Formula

Roots are calculated as $x = (-b \pm \sqrt{D}) \div 2a$. If D = 0, then $x = -b \div 2a$.

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Q64. Answer: (a) El Nino

The correct answer is El Nino.

Key Points

• El Niño

• Trade winds deteriorate during El Nino. The west coast of the Americas receives a push of warm water from the east.

• El Nio is Spanish for Little Boy, sometimes known as the Christ Child. In the 1600s, South American fishermen were aware of stretches of exceptionally warm Pacific Ocean water. El Nio de Navidad was the full term they used because it usually peaks in December.

• El Nio has a big impact on our weather. The Pacific jet stream shifts south of its neutral location due to the warmer waters.

• The northern U.S. and Canada are seeing drier and warmer weather than typical as a result of this shift. However, these times are wetter than typical and have more flooding in the Southeast and Gulf Coast regions of the United States.

• El Nino has a significant impact on marine species off the Pacific coast as well. Under typical circumstances, upwelling delivers cold, nutrient-rich water from the depths to the top. Upwelling weakens or ceases entirely during El Nino.

• There are fewer phytoplankton off the coast when the nutrients from the deep are absent. This has an impact on fish that consume phytoplankton, which has an impact on everything that consumes fish.

• Tropical animals like yellowtail and albacore tuna may enter regions that are usually too cold as a result of the warmer waters.

Additional Information

• La Niña

• La Nia is Spanish for "Little Girl." La Nina is also frequently referred to as El Viejo, the opposite of El Nino, or just "a cold event." El Nino's influence is reversed by La Nina.

• Trade winds are even stronger than usual during La Nina occurrences, bringing more warm water into Asia. Upwelling increases off the west coast of the Americas, sending cold, nutrient-rich water to the surface.

• The Pacific's chilly waters force the jet stream northward. Drought in the southern United States and severe rainfall and flooding in the Pacific Northwest and Canada are typically the results of this.

• Wintertime temperatures are often warmer in the South and cooler in the North during a La Nina year.

• Over the eastern Pacific, La Nina causes the jet stream to weaken and migrate northward. The South experiences warmer and drier winters than usual during La Nina events. Canada and the North generally have a cooler, wetter climate.

• The waters off the Pacific coast are cooler and richer in nutrients during La Nina. Because of the ecology, areas like the California coast are home to more marine life and cold-water species like squid and salmon.

• El Nino and La Nina episodes normally last nine to twelve months, but can occasionally last for years.In general, El Nino and La Nina events happen every two to seven years, but they don't always happen at the same time.

• El Nino seems to happen more frequently than La Nina.

Q65. Answer: (a) $x^2 - 2x - 2 = 0$

Shortcut Trick

For a quadratic equation with rational coefficients, irrational roots always occur in conjugate pairs.

If one root is $1 + \sqrt{3}$, the other root must be $1 - \sqrt{3}$.

Sum of roots = $(1 + \sqrt{3}) + (1 - \sqrt{3}) = 2$

Product of roots = $(1 + \sqrt{3}) \times (1 - \sqrt{3}) = 1 - 3 = -2$

Equation: $x^2 - (\text{Sum})x + (\text{Product}) = 0 \Rightarrow x^2 - 2x - 2 = 0$.

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

Alternate Method

Given: One root of the quadratic equation $(\alpha) = 1 + \sqrt{3}$

Formula: If the coefficients of the quadratic equation $ax^2 + bx + c = 0$ are rational, then irrational roots occur in conjugate pairs.

=> If $\alpha = 1 + \sqrt{3}$, then the second root $(\beta) = 1 - \sqrt{3}$.

=> Sum of roots $(\alpha + \beta) = (1 + \sqrt{3}) + (1 - \sqrt{3})$

=> Sum of roots = 2

=> Product of roots $(\alpha\beta) = (1 + \sqrt{3}) \times (1 - \sqrt{3})$

=> Product of roots = $(1)^2 - (\sqrt{3})^2 = 1 - 3 = -2$

=> The quadratic equation is given by: $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

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

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

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

Additional Information

Conjugate Root Theorem

For equations with rational coefficients, if $p + \sqrt{q}$ is a root, then $p - \sqrt{q}$ is the second root.

Sum and Product of Roots

For $ax^2 + bx + c = 0$, sum = $-b/a$ and product = c/a.

Discriminant and Nature of Roots

Nature is determined by $D = b^2 - 4ac$. If D is not a perfect square, roots are irrational and occur in pairs.

Formation of Quadratic Equation

If roots are known, the equation is $x^2 - (\text{Sum of roots})x + (\text{Product of roots}) = 0$.

Q66. Answer: (d) Devendra Nath Tagore

The correct answer is Devendra Nath Tagore.

Key Points

• Debendranath Tagore

• Maharishi Debendranath Tagore was a social reformer and scholar. In 1842, he became a member of the Brahmo Samaj, which Raja Rammohan Roy had established in 1828.

• Prior to that, he served as the leader of the 1839-founded Tattvabodhini Sabha.

• He was born in Calcutta in May 1817.

• Along with Raja Rammohan Roy, his father, Dwarkanath Tagore, was a very successful merchant and philanthropist in Calcutta.

• Rabindranath Tagore, a well-known Bengali poet, artist, writer, and essayist, was his son.

• The monthly theological newspaper Tattvabodhini Patrika was launched by the Debendranath Tagore-founded Tattvabodhini Sabha.

• Both Tattvabodhini Sabha and Tattvabodhini Patrika promoted the theories of Raja Rammohan Roy and concentrated on the methodical study of India's past with a reasonable viewpoint.

Additional Information

• A Tatwabodhini Pathshala or Theological School was established by Debendranath in 1844 to teach Vedanta and prepare young men to instruct in the Brahmo religion.

• Soon after Keshab Chandra Sen joined the Samaj in 1858, he appointed him the acharya.

• Keshab Chandra Sen and his adherents established the Brahmo Samaj of India in 1866 following his removal as acharya in 1865.

• Debendranath Tagore's Samaj later became known as the Adi Brahmo Samaj.

• He wrote and published the theistic treatise of religion and ethics known as the Brahma Dharma Grantha.

Q67. Answer: (b) $15 - 12x + 4x^2 - x^3$

Shortcut Trick

Put x = 1 in the given expression: $3(1)(1 - 6) + 1^2 + 6(1) - 9 + 24 - 1^3$

=> $3(-5) + 1 + 6 - 9 + 24 - 1 = -15 + 21 = 6$.

Now, check Option 2: $15 - 12(1) + 4(1)^2 - (1)^3 = 15 - 12 + 4 - 1 = 6$.

Since the values match, Option 2 is the correct simplification.

Therefore The correct answer is $15 - 12x + 4x^2 - x^3$.

Alternate Method

Given Expression: $3x(x - 6) + x^2 + 6x - 9 + 24 - x^3$

Method: Expand terms using the Distributive Law and combine Like Terms.

=> $3x^2 - 18x + x^2 + 6x - 9 + 24 - x^3$

=> $-x^3 + (3x^2 + x^2) + (-18x + 6x) + (24 - 9)$

=> $-x^3 + 4x^2 - 12x + 15$

=> $15 - 12x + 4x^2 - x^3$

Therefore The correct answer is $15 - 12x + 4x^2 - x^3$.

Additional Information

BODMAS Rule

It stands for Brackets, Orders, Division, Multiplication, Addition, and Subtraction, defining the sequence of operations.

Distributive Property

The rule $a \times (b + c) = (a \times b) + (a \times c)$ is used to expand products of polynomials.

Degree of Polynomial

The degree is the highest power of the variable in the polynomial; for $-x^3 + 4x^2 - 12x + 15$, the degree is 3.

Q68. Answer: (c) 139

The pattern followed here is:

The difference between the numbers is prime number.

Hence, the correct answer is "Option 3".

Q69. Answer: (d) At C

The correct answer is At C.

Key Points

• Concave mirror image formation at C

• The object emits two rays, one of which passes through the mirror's focus and the other parallel to the principal axis.

• After reflection at point C, these rays form an image that is real and inverted and has the same size as the object.

• So, at C the image formed is real, inverted, and the same size.

Additional Information

• Other Concave mirror image formation

• When the Object is at Infinity: We take into account two rays from the object that are parallel to the principal axis under this circumstance. After reflection, these rays converge to form an image in front of the mirror at F, the primary focus of the mirror. As a result, an extremely reduced, point-sized, real, and inverted image is created.

• The Object is Placed Between C and F: One of the two rays under consideration here is parallel to the principal axis, and the other is passing through the concave mirror's principal focus. The image is real and inverted, it is larger than the object's size, and it is formed beyond C.

• The Object is Placed Between F and P: One ray is going parallel to the principal axis, and the other is going through the mirror's center of curvature. The resulting image is virtual, straight, and larger than the object.

Q70. Answer: (b) 41/33

Calculations:

Let 1.2424... be x.

Then, 100x = 124.2424...

=> 100x - x = 124.2424... - 1.2424...

=> 99x = 123

=> x = 123/99 = 41/33

Hence, The Required value is 41/33.

Q71. Answer: (a) 29

The correct answer is 29.

Key Points

• The 73rd Constitution Amendment Act of 1992 added the 11th Schedule to the Indian Constitution. 29 subjects are on this programme.

• This schedule includes crucial subjects including the authority of Panchayats, rural development, eradicating poverty, markets, roads, and clean water, among others.

Additional Information

• The following operational elements, which fall under the jurisdiction of the Panchayats, are listed in the eleventh schedule of the Indian Constitution:

• Agriculture, especially the expansion of agriculture

• Soil conservation, land reform implementation, land consolidation, and land enhancement.

• 3. Poultry, dairying, and animal husbandry

• It is expected that the subjects covered under the eleventh schedule of the Indian constitution are made to ensure the development of the rural India.

Q72. Answer: (c) 275

The pattern followed here is:

Here, '275' will complete the series.

Hence, the correct answer is "Option 3".

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Q73. Answer: (d) Only statement II is correct.

The correct answer is Only statement II is correct.

Key Points

• Role of HCL in Stomach

• The stomach's pH typically falls between 1.5 and 3.

• This is because the stomach releases hydrochloric acid.

• In order to prevent microbial diseases, this acidic condition is necessary for microbial digestion.

Numerous microbes are killed in this acidic environment as well.

• Additionally, it assists in the digestion of food particles.

• It has a crucial function in activating pepsin.

Pepsin is a gastric juice that the stomach uses to break down proteins.

• The stomach's hydrochloric acid is also necessary for vitamin B12 absorption.

• Additionally, RBCs and nerve tissues cannot function without vitamin B12.

Additional Information

• HCL in Stomach

• Hydrochloric acid is the acronym for HCl.

• Different gastric juices are released by the gastric glands during digestion.

• Hydrochloric acid is also secreted by gastric glands in addition to these juices.

• Hydrochloric acid is secreted during digestion as a result of parietal cells being activated.

Q74. Answer: (c) 2 √66

Shortcut Trick

Identify sides a = 5, b = 7, c = 10.

Calculate semi-perimeter s = (5 + 7 + 10) ÷ 2 = 11.

Apply Heron's Formula: Area = √[s(s−a)(s−b)(s−c)].

Area = √[11 × (11−5) × (11−7) × (11−10)] = √[11 × 6 × 4 × 1] = √264.

Factor out perfect square: √(4 × 66) = 2√66.

Therefore The correct answer is 2√66 cm².

Alternate Method

Given: Sides of the triangle a = 5 cm, b = 7 cm, and c = 10 cm.

Formula Used: Heron's Formula for area of triangle = √[s(s − a)(s − b)(s − c)], where s is the semi-perimeter.

=> Semi-perimeter (s) = (a + b + c) ÷ 2

=> s = (5 + 7 + 10) ÷ 2 = 22 ÷ 2 = 11 cm

=> Area = √[11 × (11 − 5) × (11 − 7) × (11 − 10)]

=> Area = √[11 × 6 × 4 × 1]

=> Area = √[264]

=> Area = √[4 × 66] = 2√66 cm²

Therefore The correct answer is 2√66 cm².

Additional Information

Heron's Formula

Used for finding the area of any triangle when the lengths of all three sides are known: Area = √[s(s−a)(s−b)(s−c)].

Semi-perimeter (s)

It is half the perimeter of the triangle, calculated as s = (a + b + c) / 2.

Right-Angled Triangle Area

For a right triangle, Area = 1/2 × Base × Height. Heron's formula will give the same result if applied.

Q75. Answer: (a) 8.3%

Shortcut Trick

Let Cost Price (CP) be 100.

Marked Price (MP) = 100 × 1.20 = 120.

Successive discount of 5% and 5% = 5 + 5 − (5 × 5) ÷ 100 = 9.75%.

Selling Price (SP) = 120 × (100 − 9.75) ÷ 100 = 120 × 0.9025 = 108.3.

Profit above CP = 108.3 − 100 = 8.3%.

Therefore The correct answer is 8.3%.

Alternate Method

Given → Markup % = 20%, Successive Discounts = 5% and 5%.

Formulas: SP = CP × (100 + Increase%) ÷ 100 × (100 − D1%) ÷ 100 × (100 − D2%) ÷ 100

=> Let Cost Price = 100 units.

=> Marked Price = 100 + 20% of 100 = 120 units.

=> Price after 1^(st) discount = 120 − (5% of 120) = 120 − 6 = 114 units.

=> Selling Price (after 2^(nd) discount) = 114 − (5% of 114) = 114 − 5.7 = 108.3 units.

=> Percentage above CP = [(108.3 − 100) ÷ 100] × 100 = 8.3%.

Therefore The correct answer is 8.3%.

Additional Information

Successive Discounts

When multiple discounts are applied one after another, the total discount is calculated on the reducing balance. Formula for two discounts: a + b − (ab ÷ 100).

Effective Percentage Change

The net change can be calculated using the fractional multiplier method: Initial × (1 + r1) × (1 − r2) × (1 − r3).

Q76. Answer: (a)

The correct answer is Argument I does not support the statement, while Argument II supports the statement.

Key Points

• In large cities, apartments on higher floors typically have less air pollution.

• Due to their proximity to the streets, air pollutants like dust and grime are more likely to settle on lower levels unless there is a strong wind to carry them there.

• Few people can access a building's upper stories. Even if you avoid the stairs, there are just more people and levels to pass through on the upper floors, therefore the wait time for the elevator is longer. Furniture and everyday objects like groceries and shopping bags may be difficult to move as a result.

Additional Information

• Lower floors of a highrise are typically the "least glamorous" option. They are significantly less expensive as a result. People will be able to save a significant amount of money when they take into account their lower air conditioning expenditures.

• For residents in townhouses, living on the ground floor could also mean having access to a backyard or courtyard.

• This is a benefit for tenants who have children, or pets or enjoy having parties outside.

Q77. Answer: (d) 256 m2

Shortcut Trick

The area of a quadrilateral with a given diagonal and two perpendicular offsets is calculated directly using the formula:

Area = (1 ÷ 2) × d × (h1 + h2)

Area = (1 ÷ 2) × 32 × (6 + 10) = 16 × 16 = 256 m²

Therefore The correct answer is 256 m².

Alternate Method

Given:

Length of the diagonal (d) = 32 m

Length of the first offset (h1) = 6 m

Length of the second offset (h2) = 10 m

Formula Used:

Area of quadrilateral ABCD = Area of ΔABC + Area of ΔADC

Area of quadrilateral = (1 ÷ 2) × Diagonal × h1 + (1 ÷ 2) × Diagonal × h2 = (1 ÷ 2) × d × (h1 + h2)

Calculations:

=> Area = (1 ÷ 2) × 32 × (6 + 10)

=> Area = 16 × 16

=> Area = 256 m²

Let us analyze the options to justify the correct choice:

=> Option (1) is 250 m², which is incorrect because the calculated area is exactly 256 m².

=> Option (2) is 220 m², which is incorrect.

=> Option (3) is 276 m², which is incorrect.

=> Option (4) is 256 m², which matches our calculated value exactly.

Therefore The correct answer is 256 m².

Additional Information

Area of a Rhombus

If the diagonals of a quadrilateral are perpendicular to each other (like in a rhombus), the area is given by (1 ÷ 2) × d1 × d2.

Area of a Trapezium

For a trapezium with parallel sides a and b, and height h, the area is given by (1 ÷ 2) × (a + b) × h.

Heron's Formula for Triangles

If a quadrilateral is split into two triangles with known side lengths, Heron's formula √(s(s−a)(s−b)(s−c)) can be used to find the area of each triangle individually.

Q78. Answer: (a) Octane (1)

The correct answer is Octane (1).

Key Points

• Metals are the elements that conduct electricity and non-metals are elements that don't conduct electricity.

• Here, given to find an aqueous solution that doesn't conduct electricity we have, Copper sulfate, Sodium chloride, and calcium chloride are metallic solutions that conduct electricity and make the bulb glow.

• But, here we have Octane which has the formula C8H18 which is a non-metal which doesn't conduct electricity in its aqueous state.

Thus, the correct answer is Octane.

Additional Information

• Octane is a gasoline additive that is needed for proper functioning of modern engines.

• Octane rating is an index of a fuel's ability to resist engine knock in engines having different compression ratios, which is a characteristic of iso-octane.

• It has 18 different structural isomers.

Q79. Answer: (a) H; Th

The correct answer is H; Th.

Key Points

• Newlands' Law of Octaves (1865): Arranged elements in order of increasing atomic weights.

• Octaves concept: Every eighth element had similar chemical properties, like the octave in music.

• First element of the octaves: Hydrogen (H)

• Last element of the octaves: Thorium (Th)

• Octaves of Newland

• Early attempts at categorising components into groups based on their qualities included Newland's law of octaves.

• The 18th and 19th centuries saw the discovery of a large number of new elements, rendering obsolete the general division of elements into metals and non-metals.

• To find and group together elements with related properties, several tests were carried out.

• It is significant to remember that the establishment of the contemporary periodic table was based on earlier techniques of classifying elements, such as Newland's law of octaves.

• According to the law of octaves, every eighth element possesses characteristics that are identical when the elements are ordered in ascending order of atomic mass.

• In music, where every eighth note is equivalent to the first, Newlands likened the similarity between the elements to that. This was the first attempt to give each element an atomic number. However, this approach to categorising materials encountered strong opposition in the scientific community.

Additional Information

• Newland's Law of Octaves' limitations

• In Newland's periodic table, several elements fit into the same positions. Nickel and cobalt, for instance, were put in the same slot.

• Groups of elements were created based on their dissimilar features. For instance, several metals, such as cobalt, nickel, and platinum, were classed with halogens.

• The octaves of Newland's law was only accurate for elements up to calcium. It was impossible to fit elements with larger atomic

masses within octaves.

• The octave design could not accommodate the later-found components. As a result, there was no room for the discovery of new elements using this system of classifying elements.

Q80. Answer: (b) Mg

The correct answer is Mg.

Key Points

• Magnesium

• The chemical element magnesium has the atomic number 12 and the symbol Mg.

• It is a shiny gray metal with a low density, a high chemical reactivity, and a low melting point.

• It almost always has an oxidation state of +2, like the other alkaline earth metals in group 2 of the periodic table, which only occur naturally when combined with other elements.

• It readily reacts with air to form a magnesium oxide passivation coating that prevents the metal from corroding further. A brilliant white light burns the free metal.

Additional Information

• Phenolphthalein

• Phenolphthalein is usually dissolved in alcohols to be used in experiments because it is slightly soluble in water.

• It is a weak acid that, in solution, can lose H+ ions. The double deprotonated phenolphthalein ion is fuchsia, while the nonionized phenolphthalein molecule is colorless.

• In higher pH, further proton loss occurs slowly and results in a colorless form. Because of sulfonation, the phenolphthalein ion in concentrated sulfuric acid is orange-red.

Q81. Answer: (a) Bonded

The correct answer is Bonded.

Key Points

• Bonded

• Bonded water storage systems are common in Madhya Pradesh.

• These tank containers, also known as water tank bund, are typically made of UV-stabilized polyethene and serve as a protective cover for a liquid tank.

• The idea behind this container is that the water that escapes will be contained within the outer skin rather than spilling onto the surrounding area in the event that the tank splits or overfills with water.

• If the water contains harmful bacteria, there may be a risk of contamination spreading, which could lead to cleanup costs or liability for general health risks.

Additional Information

• Tunnel

• Design for tunnels and underground roads is done in reservoirs, not every day like it is for other structures. Rock or soil could be used to construct it.

• For instance, a highway tunnel is designed to withstand external loads imposed by the rock cover or any other overburdened material.

• Tunnels that carry water, on the other hand, are built to withstand both permanent and external loads.

• Kulh

• Over four hundred years ago, a local system of canal irrigation known as Kulhs was developed in parts of Himachal Pradesh.

• The water that was flowing in the streams was diverted into man-made channels, which carried the water to a number of villages further down the hillside.

• All of the villages came to an agreement on how to manage the water in these kulhs.

Q82. Answer: (d) O

Eight lawyers: A, K, L, M, N, O, P, and Q

They are sitting around a square table and facing the center. Four of them were sitting at the corners, while the other four were at the exact center of the sides.

1) L, at a corner, was to the immediate right of M

2) L was diagonally opposite to A.

3) P was second to the left of A.

4) Q, sitting at a corner, was next to both M and K.

5) N was not sitting diagonally opposite to M.

Lawyer "O" was placed second to the left of K.

Hence, the correct answer is "Option 4".

Q83. Answer: (d) Vangla Festival

The correct answer is Vangla Festival.

Key Points

• Vangla Festival

• Among the Garos of Meghalaya, India, the Wangala Festival is one of the most well-known celebrations.

• Saljong, the fertility-promoting Sun god, is honoured at the harvest celebration known as Wangala Festival.

• The Wangala Festival commemoration signals the conclusion of a time of labour, which boosts field productivity. Additionally, it denotes the start of winter.

• Wangala Celebration, also known as a 100 drums festival, is when the tribal people make sacrifices to appease Saljong, the Sun God, who serves as their primary god.

• It is often observed for two days, however it can occasionally last up to a week.

• The first-day ceremony, referred to as "Ragula," takes place within the chief's home.

• In essence, the Wangala Festival serves to protect and advance Garos's culture.

Additional Information

Festival	State
Poorang Festival	Assam
Nuakhai Festival	Odisha
Yaoshang	Manipur

Q84. Answer: (a) 39 cm

Shortcut Trick

Ratio of the two pieces is 3 : 4.

Total ratio parts = 3 + 4 = 7 units.

7 units = 91 cm → 1 unit = 13 cm.

Shorter piece = 3 units = 3 × 13 = 39 cm.

Therefore The correct answer is 39 cm.

Alternate Method

Given: Total length of wire = 91 cm.

Formula Used: Length of piece = [Ratio part ÷ Sum of ratios] × Total Length

Let the length of the longer piece be x.

=> Length of the shorter piece = 3/4 × x

=> Total length = x + 3x/4 = 91

=> (4x + 3x) / 4 = 91

=> 7x / 4 = 91

=> x = (91 × 4) / 7

=> x = 13 × 4 = 52 cm

=> Shorter piece = 91 − 52 = 39 cm

Therefore The correct answer is 39 cm.

Additional Information

Ratio and Proportion

If a value V is divided into two parts in the ratio a : b, the parts are [a/(a+b)] × V and [b/(a+b)] × V.

Linear Equations

For cutting problems, representing the unknown segments as variables (x and kx) helps in forming a solvable algebraic equation.

Q85. Answer: (d) Mysore

The correct answer is Mysore.

Key Points

• Institute of Indian Languages (CIIL)

• In Mysuru, Karnataka, there is a research and teaching facility for Indian languages called the Central Institute of Indian Languages (CIIL).

• It is a division of the Ministry of Human Resource Development's Language Bureau. The institute's mission is to preserve and catalogue minor, indigenous, and tribal languages.

• By instructing non-native students in 15 Indian languages, it encourages linguistic concord.

• It was established on July 17, 1969.

Additional Information The Central Institute of Indian Languages has seven centres:

• Centre for Classical Languages.

• Centre for Tribal, Minor, Endangered Languages and Languages Policy.

• Centre for Lexicography, Folklore, Literature and Translation Studies.

• Centre for Literacy Studies.

• Centre for Testing & Evaluation.

• Centre for Materials Production, Publications and Sales.

• Centre for Information in Indian Languages.

Q86. Answer: (a) Tripitaka

The correct answer is Tripitaka.

Key Points

• Tripitaka

• The name "Tripitaka," or "Three Baskets," is frequently used to refer to a number of Buddhist scriptures. In English, it is known as the Pali Canon. Sutta Pitaka, Vinaya Pitaka, and Abhidhamma Pitaka are the three pikas.

• Theravadin Tripitaka is the only fully surviving Tripitaka in Pali.

• The Srvstivda Tripitaka is a nearly complete Sanskrit text that has been preserved in Sanskrit, Chinese, and Tibetan.

• The Abhidhammapitaka's seven books have survived in Chinese translation.

• In Gandhari, the Dhammaguptakatripitaka is written.

• The Tripitaka also exists in the Mahasanghika, Mahisasaka, Mlasrvstivda, and Kyapya forms.

Additional Information

Hdith	Islamic holy book
Tanakh	Consist of a major portion of the Christian bible.

Q87. Answer: (a) One

Now, Each letter is changed to its next letter:

Here, there is only one word that has no vowel i.e., GSZ.

Hence, the correct answer is "Option 1".

Q88. Answer: (c) 2,42,684

Shortcut Trick

Growth rate 4% per year for 2 years.

Successive percentage growth = 4 + 4 + (4 × 4) ÷ 100 = 8.16%.

Population after 2 years = 2,24,375 × 108.16%.

Calculation: 2,24,375 × 1.0816 = 2,42,684.

Therefore The correct answer is 2,42,684.

Alternate Method

Given:

Initial Population (P) = 2,24,375

Rate of Growth (R) = 4%

Time Period (n) = 2 years

Formula Used:

Final Population = $P \times (1 + R/100)^n$

Calculations:

=> Population after 2 years = $2,24,375 \times (1 + 4/100)^2$

=> Population after 2 years = $2,24,375 \times (1 + 1/25)^2$

=> Population after 2 years = 2,24,375 × (26/25) × (26/25)

=> Population after 2 years = (2,24,375 ÷ 625) × 676

=> Population after 2 years = 359 × 676

=> Population after 2 years = 2,42,684

Therefore The correct answer is 2,42,684.

Additional Information

Population Growth

When the population grows at a constant rate, it follows the Compound Interest formula: $A = P(1 + r/100)^n$.

Population Depreciation

If the population decreases or a machine's value depreciates, use the formula: $A = P(1 − r/100)^n$.

Fractional Conversion

Growth of 4% is equivalent to a multiplying factor of 26/25. For 2 years, the factor becomes $(26/25)^2$.

Q89. Answer: (a) Rs. 31,500

Shortcut Trick

Profit sharing ratio = (Investment × Time) ratio

Ravi : Raju = (50,000 × 12) : (1,00,000 × 6)

Ravi : Raju = 6,00,000 : 6,00,000 = 1 : 1

Since the ratio is 1 : 1, the profit is divided equally.

Raju profit share = Rs. 63,000 ÷ 2 = Rs. 31,500

Therefore The correct answer is Rs. 31,500.

Alternate Method

Given:

Investment of Ravi = Rs. 50,000 | Time period = 12 months

Investment of Raju = Rs. 1,00,000 | Time period = 6 months (Joined after 6 months)

Total Annual Profit = Rs. 63,000

Formula Used:

Profit Ratio = (Capital1 × Time1) : (Capital2 × Time2)

=> Ravi profit equivalent = 50,000 × 12 = 6,00,000

=> Raju profit equivalent = 1,00,000 × 6 = 6,00,000

=> Profit Ratio (Ravi : Raju) = 6,00,000 : 6,00,000

=> Ratio = 1 : 1

=> Total Ratio Parts = 1 + 1 = 2 units

=> 2 units = Rs. 63,000

=> 1 unit = Rs. 63,000 ÷ 2 = Rs. 31,500

=> Raju share (1 unit) = Rs. 31,500

Therefore The correct answer is Rs. 31,500.

Additional Information

Partnership Profit Rule

In any business partnership, the Profit (P) is directly proportional to the product of Capital (C) and Time (T). Formula: P1 : P2 = C1T1 : C2T2.

Types of Partners

An Active Partner manages the business and may take a salary before profit distribution, while a Sleeping Partner only provides capital.

Compound Partnership

When partners invest different amounts for different durations of time, it is called a compound partnership, where effective capital is calculated per unit of time.

Q90. Answer: (c) Sanjay Rajaram

The correct answer is Sanjay Rajaram.

Key Points

• Sanjay Rajaram

• Mexican scientist Dr. Sanjaya Rajaram (1943–2021), who received the 2014 World Food Prize, is of Indian descent.

• He received this honour for his scientific work in creating 480 wheat types that have been made available in 51 nations.

• Building on the achievements of the Green Revolution, this innovation has increased global wheat production by more than 200 million tonnes.

• He received the highest civilian honours from the Indian government, the Padma Shri (2001) and the Padma Bhushan (2022).

• Rajaram started working as a wheat breeder at the International Maize and Wheat Improvement Center in Mexico in 1969. (CIMMYT).

Additional Information

Buddhadev Bhattacharya	**7th Chief minister of west bengal.**
Subbanna Ayyappan	Subbanna Ayyappan received the Padma Shri award in 2022 from the Indian government, the third-highest honour in the Padma series of awards, in recognition of their outstanding contributions to the fields of science and engineering. The honour is given in appreciation of his contributions as a "Respected Aquaculture Scientist - Powering India's Blue Revolution."
Sirpi Balasubramaniam	A prominent Tamil author and poet, Dr. Sirpi Balasubramaniam (86), will receive the Padma Shri Award in January 2022. He has written almost 130 volumes, including the poetry collections Muganthu Theera Kadal and Senganthal, as well as several articles and around 20 novels in translation.

Q91. Answer: (b) 1976

The correct answer is 1976.

Key Points

• The Regional Rural Banks Act was passed in 1976 by the Government of India.

• Regional Rural Banks (RRBs) are government-controlled scheduled commercial banks operating in a number of Indian states on a local level.

• The Ministry of Finance, Government of India, is the owner of these banks.

• They were established to provide fundamental banking and financial services to rural communities.

Additional Information

• RRB offers financial services to rural residents who were previously unserviced by commercial banks.

• In rural areas, they support the growth of small-scale industry and agriculture. They encourage rural residents to be resourceful and entrepreneurial.

• RRBs do have urban branches though. RRBs carry out a variety of tasks, including offering banking services to rural and semi-urban areas, managing government projects like paying MGNREGA workers' wages and distributing pensions and offering para-banking services like lockers, debit and credit cards, mobile banking, internet banking, and UPI services.

Q92. Answer: (d) Muscular, skeletal and nervous systems

The correct answer is Muscular, skeletal, and nervous systems.

Key Points

• Movement is one of the significant features of living beings. Animals and plants exhibit a wide range of movements.

• Streaming of protoplasm in the unicellular organism like Amoeba is a simple form of movement. Movement of cilia, flagella, and tentacles is shown by many organisms.

• Human beings can move limbs, jaws, eyelids, tongues, etc. Some of the movements result in a change of place or location. Such voluntary movements are called locomotion.

• Cells of the human body exhibit three main types of movements, namely

• Amoeboid: Some specialized cells in our body like macrophages and leucocytes in blood exhibit amoeboid movement.

• Ciliary: Ciliary movements occur in most of our internal tubular organs which are lined by ciliated epithelium.

• Muscular: Movements of our limbs, jaws, tongue, etc, require muscular movement.

• The Muscular system is an organ system consisting of skeletal, smooth, and cardiac muscles. It permits the movement of the body, maintains posture, and circulates blood throughout the body.

• The skeletal system includes all of the bones and joints in the body.

• The nervous system is part of an animal's body that coordinates its behavior and transmits signals between different body areas.

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Q93. Answer: (b) 40°

Shortcut Trick

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

Sum of given angles = 60° + 80° = 140°.

Third angle = 180° − 140° = 40°.

Therefore The correct answer is 40°.

Alternate Method

Given:

First angle (angle A) = 60°

Second angle (angle B) = 80°

Formula Used:

In ΔABC, angle A + angle B + angle C = 180° (Angle Sum Property)

Calculations:

=> angle A + angle B + angle C = 180°

=> 60° + 80° + angle C = 180°

=> 140° + angle C = 180°

=> angle C = 180° − 140°

=> angle C = 40°

Therefore The correct answer is 40°.

Additional Information

Angle Sum Property

The sum of the interior angles of a triangle is always 180°, regardless of the triangle's shape or size.

Exterior Angle Theorem

An exterior angle of a triangle is equal to the sum of the two opposite interior angles.

Classification by Angles

A triangle is Acute if all angles < 90°, Right if one angle = 90°, and Obtuse if one angle > 90°.

Q94. Answer: (d) Bharat Dynamics Limited

The correct answer is Bharat Dynamics Limited.

Key Points

• Bharat Dynamics Limited

• The Indian Army signed a contract worth Rs. 3131.82 crores for the manufacture and supply of missiles with Bharat Dynamics Limited.

• BDL has the ability to integrate and provide Anti-Submarine Warfare Suite (ASW Suite) systems that include fire control systems, torpedoes, and torpedo defence systems.

• The aerospace and defence electronics company Bharat Electronics Limited is owned by the Indian government (BEL). It primarily manufactures state-of-the-art electrical products for use in ground and aviation applications.

• BEL is one of the nine PSUs that are a part of the Indian Ministry of Defense. In Vishakhapatnam, Bhanur, and Hyderabad, the company currently runs three production facilities.

Additional Information

• The Indian Army and Bharat Dynamics Limited (BDL) have a contract in place for the production and supply of Konkurs - M anti-tank guided missiles.

• On February 2, a deal for Rs 3,131.82 crores was inked; it would be completed in three years.

• A second-generation mechanised infantry anti-tank guided missile called the Konkurs-M is designed to obliterate armoured vehicles with explosive reactive armour.

• The missile can be fired from a ground launcher or a BMP-II tank. Its range is 75 to 4,000 metres, and its flying time is 19 seconds.

Q95. Answer: (b) 840°

Shortcut Trick

Total time in minutes = (2 × 60) + 20 = 140 minutes.

Angular speed of minute hand = 6° per minute.

Angular distance = 140 × 6° = 840°.

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Therefore The correct answer is 840°.

Alternate Method

Given:

Duration = 2 hours 20 minutes

Formula Used:

1 hour = 360° (complete rotation of minute hand)

1 minute = 6°

Calculations:

=> Total duration = 2 hours + 20 minutes

=> Angular distance for 2 hours = 2 × 360° = 720°

=> Angular distance for 20 minutes = 20 × 6° = 120°

=> Total angular distance = 720° + 120° = 840°

Therefore The correct answer is 840°.

Additional Information

Minute Hand Speed

The minute hand moves 360° in 60 minutes, which equals 6° per minute.

Hour Hand Speed

The hour hand moves 360° in 12 hours (720 minutes), which equals 0.5° per minute.

Relative Speed

The relative speed of the minute hand with respect to the hour hand is 5.5° per minute.

Q96. Answer: (a) 8

Given: The persons were sitting in the audience gallery facing towards the west.

1) No one sits to the left of P.

2) P sits second to the left of the chief guest.

3) Q sits fourth to the right of P.

4) The number of people sitting to the right of Q is exactly one less than the number of people sitting to the left of Q..

There are total 8 people sitting in the audience gallery.

Hence, the correct answer is "Option 1".

Q97. Answer: (a) 22

The correct answer is 22.

Key Points

• An autosome is one of the numbered chromosomes, as opposed to the sex chromosomes.

• Humans have 22 pairs of autosomes and one pair of sex chromosomes (XX or XY).

• Autosomes control the inheritance of all an organism expect the sex-linked ones, which are controlled by the sex chromosomes.

• The members of an autosome pair in a diploid cell have the same morphology, unlike those in allosomal pairs, which may have different structures.

Additional Information

• All human autosomes have been identified and mapped by extracting the chromosomes from a cell arrested in metaphase.

• Each autosome has several genes each of which performs certain unique functions.

• The number of gene varies from 200 to 2000.

Q98. Answer: (b) n : 1

The correct answer is n:1.

Given:

A circular coil of n turns and a single circular loop.

To find:

The ratio of the field is due to the both coil and circular loop.

Calculations:

No of turns in the circular coil is n.

No of turns in the single loop is 1.

As the magnetic field is directly proportional to the number of turns we have:

(No-of-turns-in-coil)/(No-of-turns-in-single-loop)=n/1

So, the ratio of the field is n:1.

Q99. Answer: (d) S

Given:

1) T lives on floor number 4.

2) T lives immediately above the floor on which P lives.

Floor	Person
6	
5	
4	T
3	P
2	
1	

3) U lives immediately above the floor on which Q lives. Q does not live on floor number 5.

Floor	Person
6	
5	
4	T
3	P
2	U
1	Q

4) Exactly three persons live between the floors on which R and Q live.

And, S will lives on the remaining floor.

Floor	Person
6	S
5	R
4	T
3	P
2	U
1	Q

Here, S lives on the 6th floor.

Hence, the correct answer is option 4).

Q100. Answer: (b) electromagnetic induction

The correct answer is electromagnetic induction.

Key Points

• Electromagnetic induction is a current produced because of voltage production (electromotive force) due to a changing magnetic field.

• This process happens when a conductor is placed in a moving magnetic field (when using an AC power source) or when a conductor is constantly moving in a stationary magnetic field.

• The factors which influence voltage production are the number of cells and varying magnetic fields.

Additional Information

• Electromagnetic Induction was discovered by Michael Faraday in 1831.

• Some of the applications of electromagnetic induction are as follows: AC generators, Transformers, etc.

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