RRB Group D Previous Year Paper (Held on: 25 Aug 2022 Shift 3)

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

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CBT

Q1. Which of the following is not the use of washing soda?

i. Manufacture of glass, soap and paper

ii. As a cleaning agent for domestic purposes

iii. For removing permanent hardness of water

iv. Baking cake

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

Q2. A sum was invested at a certain rate of simple interest per annum for 2 years. Had it been invested at 2% per annum more than the existing rate, the simple interest accrued in the 2 years would bave been Rs. 240 more. Find the sum invested.

(a) Rs. 24,000
(b) Rs. 8,000
(c) Rs. 16,000
(d) Rs. 6,000

Q3. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

RBM 7, NXI 11, JTE 13, FPA 17, BLW 19, ?

(a) XHS 23
(b) XSO 21
(c) XOS 21
(d) FHA 23

Q4. Find the value of √729/15 × 25/√81 × 15/√225.

(a) 3
(b) 2
(c) 5
(d) 4

Q5. The atomic size _____ moving from left to right and _____ moving from up to down in the periodic table.

(a) increases, decreases
(b) decreases, decreases
(c) increases, increases
(d) decreases, increases

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Q6. Which of the following sexually transmitted diseases is transmitted by a virus?

(a) Syphilis
(b) AIDS
(c) Cold
(d) Gonorrhoea

Q7. In a certain code language, 'NATURE' is written as 'QYWSUC' and 'REASON' is written as 'UCDQRL'. How will 'LOTION' be written in that language?

(a) NMVGQL
(b) OLWFRK
(c) OMWGRL
(d) MNGVLQ

Q8. Which of the following sequences of events occurs during the formation of urine in the human body?

(a) Filtration, reabsorption, secretion
(b) Secretion, filtration, reabsorption
(c) Reabsorption, filtration, secretion, storage
(d) Filtration, secretion, reabsorption, secretion

Q9. The Right to Education in the Indian Constitution was added by introducing a new Article, _____, in the Chapter on Fundamental Rights in 2002 by the 86^(th) Constitutional Amendment.

(a) 21A
(b) 23A
(c) 19A
(d) 25A

Q10. Simplify $(3^3 \times 2^4 \times 7^2)/(3^2 \times 56)$.

(a) 70
(b) 36
(c) 28
(d) 42

Q11. Which of the following optical devices can be used to produce a parallel beam of rays from a point source of light?

(A) Convex lens
(B) Concave lens
(C) Concave mirror
(D) Convex mirror

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

Q12. An object is placed in front of a convex mirror at a point between infinity and the pole of the mirror. The image formed is:

(a) virtual and erect
(b) virtual and inverted
(c) real and inverted
(d) real and erect

Q13. If the surface area of a spherical ball is 616 m2, its volume is:

(a) 1437.33 m3
(b) 1657.29 m3
(c) 1238.33 m3
(d) 1786.35 m3

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Q14. The position of how many letters will remain unchanged if each of the letters in the word BREAKDOWN is arranged in alphabetical order?

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

Q15. Which of the following educational Institutes won the Rashtriya Khel Protsahan Puruskar 2021 in the category 'Identification and Nurturing of Budding and Young Talent'?

(a) Lingayas Institute of Management and Technology
(b) Indian Institute of Technology
(c) Manav Rachna Educational Institution
(d) Maharashtra Institute of Technology

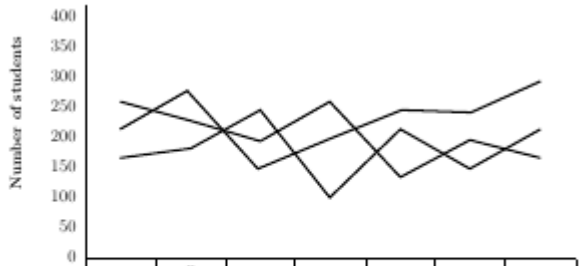
Q16. I walk at a speed of 10 km/h and reach the destination in 2 hrs. If I increase my speed by 5 km/h, how early would I reach my destination?

(a) 40 min
(b) 30 min
(c) 20 min
(d) 50 min

Q17. Who is remembered as 'Deshbandhu', who served as the President of the Indian National Congress for one session in 1922 and co-founded the Swaraj Party with Motilal Nehru?

(a) Aurobindo Ghosh
(b) Lala Lajpat Rai
(c) Chittaranjan Das
(d) Gopal Krishna Gokhale

Q18. The following line graph shows the educational qualifications of students (Tenth, Intermediate [Inter] and Degree) of seven districts, P, Q, R, S, T, U and V, of a state. Study the graph and answer the question.



	P	Q	R	S	T	U	V
Tenth	340	300	260	340	180	260	220
Inter	220	240	320	140	280	200	280
Degree	280	360	200	260	320	320	380

What is the difference between the total number of students with Tenth qualification from all the districts together and the total number of students with Degree qualification from all the districts together?

(a) 240
(b) 210
(c) 230
(d) 220

Q19. Sam steps out from his house and walks 160 m towards the east. He then takes a right turn and walks 50 m. He then turns right and walks 70 m. He then turns left and walks 35 m. He then turns right and walks 90 m to reach a gift shop. How far and in which direction is the gift shop from Sam's house? (All turns are 90 degree turns only)

(a) 120 m, South
(b) 85 m, South
(c) 85 m, North
(d) 120 m, North

Q20. Marathi, which is an Indo-Aryan language, is the _____ largest language spoken by 6.86% of the total population of India according to the 2011 census.

(a) Fifth
(b) Fourth
(c) Second
(d) Third

Q21. Consider the below statements and identify the correct answer.

Statement I: Graphite is bad conductors of electricity.

Statement II: In graphite, each carbon atom is bonded to three other carbon atoms in the same plane giving a hexagonal array.

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

Q22. The 'Kangra' and 'Kullu' valley is situated in which state of India?

(a) Uttarakhand
(b) Sikkim
(c) Arunachal Pradesh
(d) Himachal Pradesh

Q23. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.

SEARCH : ESRAHC :: DESIGN : EDISNG :: LAYOUT : ?

(a) UTYOLA
(b) ALOYTU
(c) UYTLOA
(d) AOLTYU

Q24. What approximate value should come in place of the question mark (?) in the following equation? 126.012 × 14.987 - 603.045 = ? + 261.987

(a) 845
(b) 875
(c) 1235
(d) 1025

Q25. Which state is famous for celebrating the Pongal festival?

(a) Tamil Nadu
(b) Odisha
(c) Telangana
(d) Tripura

Q26. Which of the following is NOT a main site of transpiration?

(a) Cuticle
(b) Lenticels
(c) Intracellular spaces
(d) Stomata

Q27. The Sarpanch or the president of the Gram Panchayat is elected by the ward members as per the State Act for a period of _____ years.

(a) 2
(b) 5
(c) 3
(d) 1

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Q28. Which of the following numbers will replace the question mark (?) in the given series?

5, 24, 46, 74, 111, 160, 224, ?

(a) 305
(b) 350
(c) 306
(d) 360

Q29. Shaily starts walking from her home and goes 45 m towards the east. She then takes a right turn and walks 85 m. She then turns left and walks 40 m. She then takes a final left turn and walks 85 m to reach an ATM. How far is the ATM from her home? (All turns are 90 degree tums only)

(a) 80 m
(b) 125 m
(c) 40 m
(d) 85 m

Q30. Consider the below statements and identify the correct answer.

Statement I: Lithium, Sodium, and Rubidium are elements of Dobereiner's triad.

Statement II: In triads, the atomic mass of the middle element was roughly the average of the atomic masses of the other two elements.

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

Q31. The roots of quadratic equation that satisfies $12x^2 = 27x$ are:

(a) 0, 9/4
(b) 1, 4/3
(c) 0, 3/4
(d) 1, 3/4

Q32. Find the mean of the following data.

x	3	2	10	4	5
f	5	3	4	2	6

(a) 3.68
(b) 4.95
(c) 8.65
(d) 6.52

Q33. A certain number of people are sitting in a row, facing the north. Only 6 persons are sitting between Monika and Dipen. Monika is at the 8^(th) place from the extreme right end of the row. Ketan is at some place towards the left of Monika. Ketan and Monika have exactly 3 persons sitting between them. Ketan is at the 10^(th) place from the extreme left end. Dipen is sitting at the extreme right end. If no other person is sitting in the row, what is the total number of persons seated?

(a) 21
(b) 23
(c) 22
(d) 20

Q34. According to Centre for Monitoring Indian Economy (CMIE), which state recorded the highest unemployment rate in June 2022?

(a) Haryana
(b) Kerala
(c) Gujarat
(d) Goa

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Q35. The 'Garo', 'Khasi' and 'Jaintia' hills are part of which physical division of India?

(a) The Coastal Plains
(b) The Peninsular Plateau
(c) The Himalayan Mountain
(d) The Northern Plains

Q36. Find the mean proportional between 17 and 68.

(a) 42
(b) 38
(c) 46
(d) 34

Q37. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(12, 313, 13)

(7, 50, 1)

(a) (12, 158, 12)
(b) (9, 90, 3)
(c) (4, 125, 11)
(d) (15, 150, 10)

Q38. A, B and C started a business with investments in the ratio 20 : 15 : 12. After 3 months C withdrew half of his investment and after another 9 months, a profit of Rs. 3,23,000 is divided among them. The share of C is:

(a) Rs. 57,000
(b) Rs. 1,57,000
(c) Rs. 1,52,000
(d) Rs. 1,14,000

Q39. A, B, C, D, E, F, G and H are sitting around a square table facing the centre of the table. Some of them are sitting at the corners, while some are sitting at the exact centre of the sides. E is sitting at any one of the sides and is the immediate neighbour of both B and D. C is sitting exactly opposite to D, and H is sitting exactly opposite to B. G is sitting second to the left of E and to the immediate left of D. F is exactly opposite to G. Who among the following is sitting exactly opposite to A?

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

Q40. What is another term for 'pedology'?

(a) Oceanography
(b) Geomorphology
(c) Phyto Geography
(d) Soil Geography

Q41. Which vulgar fraction is equal in value to the mixed recurring decimal 0.3125125125 .....?

(a) 1967/4995
(b) 1561/4995
(c) 1653/4995
(d) 1783/4995

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Q42. What day of the week was 1 January 2009, if 1 January 2006 was a Sunday?

(a) Wednesday
(b) Saturday
(c) Friday
(d) Thursday

Q43. The least number which, when diminished by 7, is divisible by 12, 16, 18 and 21 is:

(a) 1015
(b) 1051
(c) 1105
(d) 1150

Q44. Which of the following statements regarding fertilizers is FALSE?

(a) Must be properly stored
(b) Leaches out with rains or irrigation water
(c) Never contaminate air and water
(d) Nutrient amounts calculated in advance can be applied

Q45. Two pipes A and B can fill the tank in 5 hours and 8 hours, respectively. Pipe C can empty the same tank in 10 hours. Find the time taken to fill the empty tank when all the pipes are opened simultaneously.

(a) 47/9 hours
(b) 44/9 hours
(c) 42/9 hours
(d) 45/9 hours

Q46. Who among the following is the in charge of the Union Territories in the absence of the Chief Minister?

(a) Lieutenant Governor
(b) President
(c) Chief Justice of India
(d) Prime Minister

Q47. For the following data, find the weighted mean.

X_i	4	3	5	7	2	1
W_i	1	0	2	1	3	5

(a) 2.66
(b) 5.6
(c) 7.5
(d) 8

Q48. Which of the following is the correct set of raw materials for washing soda preparation?

(a) NaCl, NH3, CO2
(b) NaCl, CO2
(c) NaCl and H2O
(d) NaCl, NH3

Q49. Six friends scored different marks in their annual psychology examination. Q scored more than exactly four friends. M scored more than exactly three friends. Both P and N scored more than T. Y scored the least marks. N is not the top scorer. Who scored the highest marks?

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

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Q50. In March 2022, who unveiled a new brand 'VIDA' for its emerging mobility solutions and upcoming electric vehicles?

(a) Tata Motors
(b) Maruti Suzuki
(c) Hero Motocorp
(d) Hyrundai Motors

Q51. A, B, C, D, E, F, G and H are sitting around a square table facing the centre of the table, Some of them are sitting at the corners, while some are sitting at the exact centre of the sides. A is sitting at one of the corners and is the immediate neighbour of E and F. D is sitting exactly opposite to A and to the immediate left of B. C is sitting at one of the corners and to the immediate right of F. G is not sitting at any of the corners. Who among the following is sitting exactly opposite to F?

(a) B
(b) G
(c) E
(d) H

Q52. The material most suitable for making the filament of an incandescent bulb is:

(a) tin-lead alloy
(b) nichrome
(c) manganin
(d) tungsten

Q53. In ΔPQR, angle PQR = 90º, m(PQ) = 3 cm and m(PR) = 6 cm. What is the measure of angle PRQ?

(a) 45º
(b) 70º
(c) 60º
(d) 30º

Q54. Which of the following numbers will replace the question mark (?) in the given series?

25, 29, 38, 54, 79, ?

(a) 110
(b) 96
(c) 120
(d) 115

Q55. A decision is given followed by two statements I and II. Read all the information carefully and select the correct option.

Decision:

Company K has a wide chain of grocery stores and sweet shops across all cities and even villages of Country M. The CEO of Company K has decided to discontinue cash payments completely from next month onwards.

Statements:

I. As per the reports of the last 3 years, around 24% of payments each month were through cash.

II. 35% of the population of Country M is either illiterate or does not have access to bank accounts.

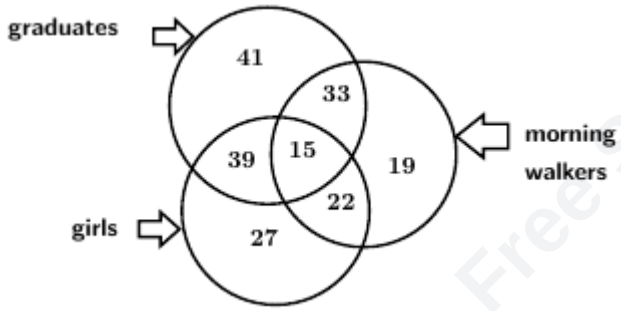
(a) Both statements I and II strengthen the decision
(b) Statement I is a neutral statement and II weakens the decision
(c) Statement I weakens the decision and statement II is a neutral statement
(d) Both statements I and II weaken the decision

Q56. Simplify (a + 2b - c)(b - c) + (a - c)2b + b^2.

(a) 2b2 + 3ab - 4bc + c
(b) $3b^2 + c^2 + 3ab - 5bc - ac$
(c) 3ab - 5bc - ac - 2abc
(d) 3b2 + 3ab - 5bc - ac

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Q57. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



Which of the following statements is correct on the basis of the above diagram?

(a) The number of morning walkers who are also girls but not graduates is 19.
(b) The number of girls who are both graduates and morning walkers is 39.
(c) The number of graduates who are also morning walkers but not girls is 33.
(d) The number of graduates who are also girls but not morning walkers is 22.

Q58. Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

Some prizes are caps.

Some caps are medals.

All prizes are masks.

Conclusions:

I. Some masks are caps.

II. Some masks are medals.

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

Q59. An electric device draws a current of 5 A when connected to a 220 V supply. The power of the electric device is:

(a) 0.44 kW
(b) 1.1 kW
(c) 110 W
(d) 440 W

Q60. Chandra is 10 years younger than Chandrika. 5 years later Chandrika will be twice as old as Chandra. Find Chandrika's present age.

(a) 20 years
(b) 15 years
(c) 10 years
(d) 25 years

Q61. What is the average amount of urine that an adult human produces in 24 hours?

(a) 1.5-2.5 litres
(b) 1.5-2 litres
(c) 1-1.5 litres
(d) 1-1.8 litres

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Q62. Which state on 23 December 2021, passed Shakti Criminal Laws?

(a) Karnataka
(b) Assam
(c) Maharashtra
(d) Kerala

Q63. Which of the following is/are example(s) of exothermic reaction?

i. Making of slaked lime
ii. Burning of natural gas
iii. Respiration

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

Q64. What is the nature of the roots of $3x^2 - 6x + 5 = 0$?

(a) The roots are real and more than 2.
(b) The roots are real and distinct.
(c) There are no real roots.
(d) The roots are real and equal.

Q65. A parallelogram has one parallel side length of 12 cm and perpendicular distance between its base and other parallel side is 8 cm. Its area is _____.

(a) 24 cm^2
(b) 192 cm2
(c) 48 cm2
(d) 96 cm2

Q66. An object of size 3.0 cm is placed in front of a concave mirror of focal length 18 cm, at a distance of 54 cm. The image formed is _____ and its height is _____.

(a) inverted, 1.5 cm
(b) erect, 1.5 cm
(c) inverted, 0.75 cm
(d) erect, 0.75 cm

Q67. In triangle ABC, AB = 3 m, BC = 4 m, and AC = 5 m. In triangle PRQ, PR = 4 m, PQ = 5 m, and RQ = 3 m. Which of the following is a correct order of congruency?

(a) ΔCBA congruent to ΔRPQ
(b) ΔABC congruent to ΔRPQ
(c) ΔBCA congruent to ΔRPQ
(d) ΔBAC congruent to ΔRPQ

Q68. The S.I unit of resistance is equivalent to:

(a) volt/ampere
(b) joule/coulomb
(c) coulomb/joule
(d) ampere/volt

Q69. Securities sold by the Central Bank with a clear specification of repurchase date and price is called _____.

(a) outright open market operations
(b) reverse repo
(c) repurchase agreement
(d) Interest Rate Swap

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Q70. In March 2022, which bank launched 'Project Banksakhi' in Odisha?

(a) HDFC Bank
(b) Bank of Maharashtra
(c) Axis Bank
(d) PNB Bank

Q71. The LCM of two numbers is 385 and their HCF is 7. If the sum of the two numbers is 112, then their difference is:

(a) 43
(b) 42
(c) 50
(d) 35

Q72. The reaction in which a single reactant splits into the two or more simpler products is called:

(a) decomposition reaction
(b) combination reaction
(c) displacement reaction
(d) double displacement reaction

Q73. Study the given number series and answer the question that follows.

29, 74, 93, 75, 19, 52, 75, 94, 93, 71

If the ten's and one's position is interchanged for all the numbers, then which original number will form the largest and the smallest in the series, respectively?

(a) 29 and 71
(b) 93 and 94
(c) 93 and 71
(d) 19 and 29

Q74. Urgelling Gompa is found in the Indian state of _____.

(a) Uttarakhand
(b) Sikkim
(c) Arunachal Pradesh
(d) Himachal Pradesh

Q75. Reaction conditions are indicated at which place in the chemical equation?

(a) In the beginning of the equation
(b) Only above the arrow
(c) Above and/or below the arrow
(d) Only below the arrow

Q76. Which option correctly shows the path that the sperms take when they are released from the human male reproductive system?

(a) Testis → Vas deferens → Ureter → Penis
(b) Testis → Vas deferens → Urethra → Penis
(c) Testis → Ureter → Urethra → Penis
(d) Testis → Ureter → Vas deferens → Penis

Q77. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 4681342, what will be difference between the highest and lowest digits thus formed?

(a) 4
(b) 2
(c) 5
(d) 6

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Q78. The pattern of magnetic field lines due to a current carrying solenoid is similar to a:

(a) current carrying straight wire
(b) bar magnet
(c) current carrying circular loop
(d) horseshoe magnet

Q79. A shopkeeper offered successive discounts of 10% and 15% on an article having a marked price of Rs. 28,000. Find the selling price of the article.

(a) Rs. 21,240
(b) Rs. 21,420
(c) Rs. 22,140
(d) Rs. 21,402

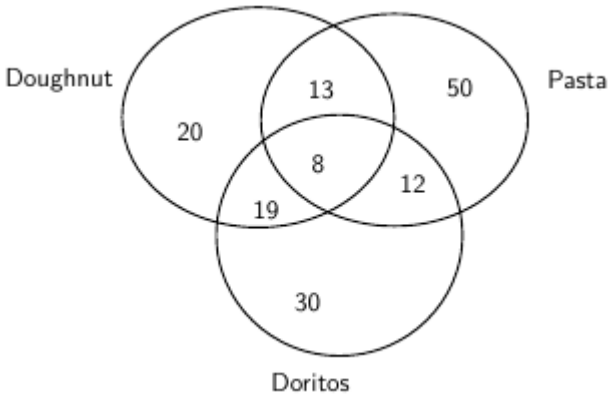
Q80. Which of the following apps has been launched to make the Indian Parliament proceedings accessible to the public at large in January 2022?

(a) Sansad Yojana
(b) Sansad Dekho Live
(c) Digital Sansad
(d) Online Sansad Karyawahi

Q81. Which of the following longitudes is considered as the International Date Line?

(a) 90° E
(b) 0°
(c) 90° W
(d) 180°

Q82. Study the given diagram carefully and answer the following question. The numbers in different sections indicate the number of persons who eat certain foods in breakfast.



How many people eat Pasta but NOT Doughnut?

(a) 62
(b) 79
(c) 71
(d) 50

Q83. Study the given number, symbol series and answer the question that follows.

8 @ 4 * 7 ^ 5 3 # 9 1< 5 7 @ 4 $ # 2 * 6 ! 4 & 9 < 6

How many such numbers are there which are immediately preceded by a symbol and immediately followed by an odd number?

(a) 2
(b) 4
(c) 3
(d) 5

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Q84. World Water Day is celebrated on _____.

(a) 26 August
(b) 15 August
(c) 22 March
(d) 8 March

Q85. In certain store, the profit is 260% of the cost. If the selling price is Rs. 7,200, then the cost price is:

(a) Rs. 3,000
(b) Rs. 2,000
(c) Rs. 2,420
(d) Rs. 2,200

Q86. Rays coming from the sun are refracted by the atmosphere. Due to this, the apparent sunrise is about _____ the actual sunrise.

(a) 2 minutes after
(b) 2 minutes before
(c) 1 minute after
(d) 1 minute before

Q87. Each of A, B, C, D, E and F has an exam on a different day of a week starting from Monday and ending on Saturday of the same week. None of them have the exam before C and after B. F has the exam just after A and just before D. E has the exam on Tuesday and just before A. Who among the following has the exam on Friday?

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

Q88. Solve $(a - b)^3 + (b - 2c)^3 + (-a + 2c)^3$.

(a) a − b + 2c
(b) 3((a − b) (b − 2c) (−a + 2c))
(c) (a − b + 2c)2
(d) a − 2c + 4b

Q89. Find the volume of a cuboid whose length is 12 m, breadth is 10 m, and height is 15 m.

(a) 1800 m^3
(b) 1300 m3
(c) 1500 m3
(d) 1700 m3

Q90. Today, age of the father is twice the sum of the ages of his 3 children. After 15 years father's age will be equal to the sum of the ages of his children. How old is the father 15 years from today?

(a) 90 years
(b) 85 years
(c) 75 years
(d) 95 years

Q91. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

35 : 21 :: 20 : 12 :: 40 : ?

(a) 24
(b) 39
(c) 42
(d) 26

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Q92. In this question, a statement is followed by two conclusions. Which of the two conclusions is/are true with respect to the statement?

Statement: U ≤ W = V < Y > I ≥ F > N

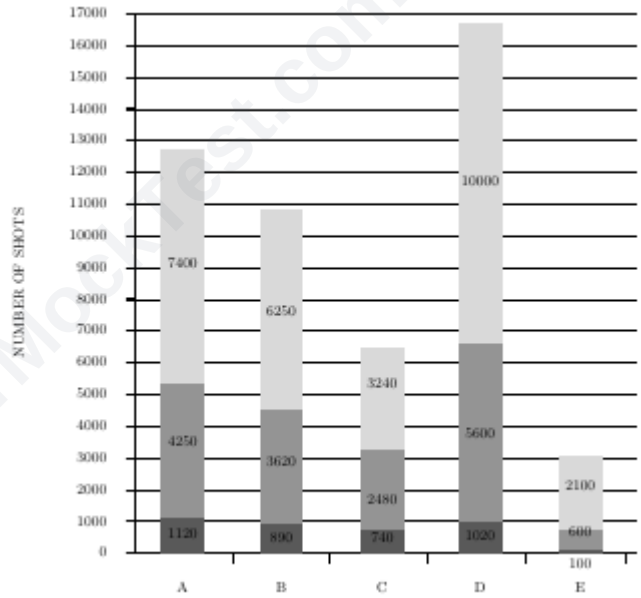
Conclusions:

I. Y > U

II. N < I

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

Q93. Data regarding the sales of the number of shoes of sizes 7, 8 and 9 in five showrooms, A to E, is given in the following stacked bar chart. Study the chart and answer the question.



By approximately what percentage is the sales of shoes of size 8 more than the sales of shoes of size 9 in showroom C?

(a) 215%
(b) 225%
(c) 335%
(d) 235%

Q94. What is the full form of UNEP?

(a) United Nations Environment Programme
(b) United Nations Environment Planning
(c) United Nations Educational Planning
(d) United Nations Educational Programme

Q95. 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	**9**	**∞**	**8**	**4**	**÷**	**-/+**	**6**	**$**	**!**	**2**	**=**	**5**	**7**	**3**
Code	H	G	K	L	U	Q	S	U	W	Y	A	C	E	G

Conditions:

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

(ii) If the first element is an EVEN number and the last, an ODD number, the first and last elements are to be coded as &.

(iii) If both the third and the fourth elements are prime numbers, the fourth element is to be coded as the code for the third element and vice-versa.

Question: 2675$!

(a) WSCEUY
(b) WECSUY
(c) WSECUY
(d) WUYECS

Q96. In February 2022, where was India's most powerful supercomputer Param Pravega launched?

(a) IIT Roorkee
(b) IISc Bengaluru
(c) IIT Gandhinagar
(d) IIT Ropar

Q97. What approximate value should come in place of the question mark (?) in the following equation? (23.01 + 16.986) + 2.023 × 4.05 - 41.999 + 643.999 = ?

(a) 745
(b) 765
(c) 542
(d) 650

Q98. Eight boxes, P, Q, R, S, T, U, V and W, are kept one over the other, but not necessarily in the same order. V is fourth from the top and immediately below R. W is kept at the topmost position and immediately above P. Only one box is there between S and T. T is kept below S, and U is kept above Q. How many boxes are there between T and Q?

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

Q99. As of March 2022, who is the President of the Indian Olympic Association?

(a) Nita Ambani
(b) Abhay Singh Chautala
(c) Narinder Dhruv Batra
(d) N Ramachandran

Q100. Identify the correct statement(s) from among the following.

(a) The direction of magnetic field at a point can be found by placing a magnetic compass at that point.
(b) A freely suspended magnetic needle points in north-east direction.
(c) The magnetic field lines are denser near the poles of a magnet.
(d) Two magnetic field lines can intersect at a given point.

(a) Both (a) and (b)
(b) Both (a) and (d)
(c) Both (b) and (c)
(d) Both (a) and (c)

ANSWER KEY

1	b	2	d	3	a	4	c	5	d	6	b	7	c	8	a	9	a	10	d
11	b	12	a	13	a	14	d	15	c	16	a	17	c	18	d	19	b	20	d
21	d	22	d	23	b	24	d	25	a	26	c	27	b	28	c	29	d	30	b
31	a	32	b	33	a	34	a	35	b	36	d	37	b	38	a	39	b	40	d
41	b	42	d	43	a	44	c	45	b	46	a	47	a	48	a	49	a	50	c

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51	a	52	d	53	d	54	d	55	d	56	b	57	c	58	c	59	b	60	b
61	d	62	c	63	b	64	c	65	d	66	a	67	c	68	a	69	c	70	b
71	b	72	a	73	a	74	c	75	c	76	b	77	d	78	b	79	b	80	c
81	d	82	a	83	c	84	c	85	b	86	b	87	a	88	b	89	a	90	c
91	a	92	d	93	d	94	a	95	a	96	b	97	d	98	b	99	c	100	d

SOLUTIONS

Q1. Answer: (b) iv

The correct answer is 2 Only.

Key Points

• Washing soda (sodium carbonate, Na_2CO_3) is commonly used in various domestic and industrial applications. It is important to understand its uses to identify which option is not applicable.

• Manufacture of glass, soap, and paper: Washing soda is used in the production process of these items. It acts as a source of sodium ions and helps in the chemical reactions required to produce glass, soap, and paper.

• As a cleaning agent for domestic purposes: Washing soda is widely used as a cleaning agent in households. It is effective in removing grease, oil, and stains from various surfaces.

• For removing permanent hardness of water: Washing soda is also used to soften hard water. It reacts with the calcium and magnesium ions in hard water to form insoluble precipitates, thereby reducing water hardness.

• Baking cake: This is not a use of washing soda. Baking soda (sodium bicarbonate, $NaHCO_3$) is used in baking, not washing soda. Baking soda acts as a leavening agent that helps cakes and other baked goods rise.

Therefore, option 2 (Baking cake) is not a use of washing soda.

Q2. Answer: (d) Rs. 6,000

Shortcut Trick

The additional Simple Interest is solely due to the 2% increase in the Rate of Interest over 2 years.

Total percentage increase in interest = Rate increase × Time

=> 2% × 2 = 4%

Given: 4% of the Sum (Principal) = Rs. 240

=> 100% of the Sum = (240 ÷ 4) × 100 = 60 × 100 = Rs. 6,000

Therefore The correct answer is Rs. 6,000.

Alternate Method

Given: Time (T) = 2 years, Rate increase = 2% per annum, Difference in Simple Interest (ΔSI) = Rs. 240.

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

=> Let the Sum be P and the original rate be R.

=> New Rate = (R + 2)%

=> New SI − Original SI = 240

=> [P × (R + 2) × 2 ÷ 100] − [P × R × 2 ÷ 100] = 240

=> (2PR + 4P − 2PR) ÷ 100 = 240

=> 4P ÷ 100 = 240

=> P = (240 × 100) ÷ 4

=> P = 60 × 100 = Rs. 6,000

Therefore The correct answer is Rs. 6,000.

Additional Information

Relationship between SI and Parameters

Simple interest is directly proportional to the Principal, the Rate of Interest, and the Time duration (SI prop. to P × R × T).

Amount Formula

The total Amount (A) at the end of the period is A = P + SI = P[1 + (RT ÷ 100)].

Change in Interest

If the rate changes from R1 to R2, the change in interest is given by ΔSI = P × (R2 − R1) × T ÷ 100.

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Q3. Answer: (a) XHS 23

The logic followed here is,

Hence, the correct answer is "XHS 23".

Q4. Answer: (c) 5

Calculate the square roots:

• √729 = 27 (since 729 = 27^2)

• √81 = 9 (since 81 = 9^2)

• √225 = 15 (since 225 = 15^2)

2. Substitute these values into the expression:

(27 / 15) × (25 / 9) × (15 / 15)

3. Simplify:

• 27 / 15 = 9 / 5

• 15 / 15 = 1

(9 / 5) × (25 / 9) × 1

4. Cancel common terms:

(9 × 25) / (5 × 9) = 25 / 5 = 5

The value is: 5

Q5. Answer: (d) decreases, increases

The correct answer is option 4

Key Points

• The atomic size decreases moving from left to right across a period in the periodic table.

• The atomic size increases moving from top to bottom within a group in the periodic table.

• These trends are due to the increase in nuclear charge across a period and the addition of electron shells down a group.

Additional Information

• Atomic size refers to the distance between the nucleus of an atom and its outermost electron shell.

• As you move from left to right across a period, the number of protons in the nucleus increases, leading to a stronger attraction between the nucleus and the electron cloud, causing the atomic size to decrease.

• As you move down a group, additional electron shells are added, which outweighs the increase in nuclear charge, resulting in an increase in atomic size.

• This trend is important for understanding chemical reactivity and properties of elements.

Q6. Answer: (b) AIDS

The correct answer is AIDS

Key Points

• AIDS is a sexually transmitted disease caused by the Human Immunodeficiency Virus (HIV).

• HIV attacks the body's immune system, specifically the CD4 cells (T cells), which are crucial for immune defense.

• Without treatment, HIV reduces the number of T cells in the body, making the person more likely to get infections or infection-related cancers.

• Over time, HIV can destroy so many of these cells that the body can't fight off infections and disease, leading to the most severe phase of HIV infection, known as AIDS.

Additional Information

• Syphilis is caused by the bacterium Treponema pallidum.

• Gonorrhoea is caused by the bacterium Neisseria gonorrhoeae.

• Common cold is caused by various viruses, predominantly rhinoviruses, but it is not considered a sexually transmitted disease.

• Preventive measures for HIV/AIDS include safe sex practices, regular testing, and the use of antiretroviral therapy (ART) for those infected.

Q7. Answer: (c) OMWGRL

The logic followed here is,

NATURE: QYWSUC

REASON: UCDQRL

Similarly,

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LOTION: ?

Hence, the correct answer is "OMWGRL".

Q8. Answer: (a) Filtration, reabsorption, secretion

The correct answer is option 1

Key Points

• During the formation of urine in the human body, the sequence of events is filtration, reabsorption, and secretion.

• Filtration occurs in the glomerulus, where blood pressure forces water and solutes out of the blood and into the renal tubule.

• Reabsorption is the process where necessary substances and water are reabsorbed back into the blood from the renal tubules.

• Secretion involves the addition of waste products and other substances from the blood into the renal tubule.

Additional Information

• The kidneys play a crucial role in maintaining homeostasis by regulating the volume and composition of body fluids.

• The nephron is the functional unit of the kidney, consisting of the glomerulus and renal tubule.

• After filtration, the filtrate passes through the proximal tubule, loop of Henle, distal tubule, and collecting duct, where reabsorption and secretion occur.

• The final product, urine, is collected in the renal pelvis and transported to the bladder for excretion.

Q9. Answer: (a) 21A

The correct answer is 21A

Key Points

• 21A was added to the Indian Constitution by the 86th Constitutional Amendment in 2002.

• This amendment made the Right to Education a fundamental right for children aged 6 to 14 years.

• Article 21A states that "The State shall provide free and compulsory education to all children of the age of six to fourteen years in such manner as the State may, by law, determine."

• This was a significant step towards ensuring educational opportunities for all children in India.

• The amendment is part of the broader effort to improve literacy rates and educational standards in the country.

Additional Information

• The 86th Amendment also introduced Article 51A(k) which made it a fundamental duty of parents to provide opportunities for education to their children aged 6 to 14 years.

• Prior to this amendment, the Directive Principles of State Policy under Article 45 urged the state to provide free and compulsory education, but it was not enforceable by law.

• The Right to Education Act (RTE) 2009 was enacted to operationalize the provisions of Article 21A.

• The RTE Act lays down the norms and standards for schools, pupil-teacher ratios, and infrastructure, ensuring quality education for all children.

• This landmark amendment and subsequent legislation have been pivotal in advancing educational rights and access in India.

Q10. Answer: (d) 42

To simplify $(3^3 \times 2^4 \times 7^2) / (3^2 \times 56)$:

1. Factorize 56:

$56 = 2^3 \times 7$

2. Substitute 56 into the expression:

$(3^3 \times 2^4 \times 7^2) / (3^2 \times (2^3 \times 7))$

3. Simplify the expression:

• For the base 3: $(3^3 / 3^2) = 3^1 = 3$

• For the base 2: $(2^4 / 2^3) = 2^1 = 2$

• For the base 7: $(7^2 / 7^1) = 7^1 = 7$

4. Combine the results:

$3 \times 2 \times 7 = 42$

The simplified value is: 42

Q11. Answer: (b) Both (A) and (C)

The correct answer is 2 Only.

Key Points

To produce a parallel beam of rays from a point source of light, we need optical devices that can convert diverging rays from the

point source into parallel rays. The following points explain why:

• Convex Lens: A convex lens can converge light rays from a point source to form a parallel beam if the point source is placed at its focal point. The rays emerging from the other side of the lens will be parallel to the principal axis.

• Concave Mirror: A concave mirror can also produce a parallel beam of rays if the point source is placed at its focal point. The reflected rays will be parallel to the principal axis.

Why not the other options?

• Concave Lens: A concave lens diverges light rays and cannot produce a parallel beam from a point source.

• Convex Mirror: A convex mirror also diverges light rays, making it unable to produce a parallel beam from a point source.

Therefore, the correct combination of optical devices that can produce a parallel beam of rays from a point source is both a convex lens and a concave mirror, which corresponds to Option 2.

Q12. Answer: (a) virtual and erect

The correct answer is virtual and erect

Key Points

• An object placed between infinity and the pole of a convex mirror always forms a virtual and erect image.

• Convex mirrors diverge light rays, making them appear to come from a point behind the mirror.

• These mirrors are commonly used as rear-view mirrors in vehicles because they provide a wider field of view.

• The image formed is smaller than the object, which helps in reducing blind spots for drivers.

Additional Information

• Convex mirrors have a reflecting surface that curves outward.

• The focal point of a convex mirror is virtual, as the light rays appear to diverge from this point.

• The mirror equation and the magnification formula can be used to determine the position and size of the image.

• Convex mirrors are also used in hallways of buildings, on roads at curves, and in other safety applications to provide a panoramic view.

Q13. Answer: (a) 1437.33 m3

Shortcut Trick

For a sphere, if Surface Area = 616 m^2, then $4 \times (22/7) \times r^2 = 616$.

Using standard values: If Area is 616, then radius (r) = 7 m.

Volume = $(4/3) \times \pi \times r^3 = (4/3) \times (22/7) \times 7 \times 7 \times 7$.

Volume = $4312 \div 3 = 1437.33\ m^3$.

Therefore The correct answer is 1437.33 m^3.

Alternate Method

Given: Surface Area of spherical ball = 616 m^2

Formula Used: Surface Area = $4\pi r^2$; Volume = $(4/3)\pi r^3$

=> $4 \times (22/7) \times r^2 = 616$

=> $r^2 = (616 \times 7) \div (4 \times 22)$

=> $r^2 = 616 \times 7 \div 88$

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

=> Radius (r) = 7 m

=> Volume = $(4/3) \times (22/7) \times 7 \times 7 \times 7$

=> Volume = $(4 \times 22 \times 49) \div 3$

=> Volume = $4312 \div 3 = 1437.333...$

Therefore The correct answer is 1437.33 m^3.

Additional Information

Hemisphere Properties

For a hemisphere of radius r, the Curved Surface Area is $2\pi r^2$, the Total Surface Area is $3\pi r^2$, and the Volume is $(2/3)\pi r^3$.

Ratio of Sphere to Cylinder

A sphere inscribed in a cylinder (height = 2r) occupies 2/3 of the cylinder's volume and has the same surface area as the curved surface of the cylinder.

Units of Measurement

Always ensure Area is in square units (m^2, cm^2) and Volume is in cubic units (m^3, cm^3, liters).

Q14. Answer: (d) 2

According to the given information,

Letters	B	R	E	A	K	D	O	W	N
In Alphabetical order	A	B	D	E	K	N	O	R	W

Here, we can see that there are 2 letters whose position remains unchanged.

Hence, the correct answer is "2".

Q15. Answer: (c) Manav Rachna Educational Institution

The correct answer is Manav Rachna Educational Institution

Key Points

• Manav Rachna Educational Institution won the Rashtriya Khel Protsahan Puruskar 2021 in the category 'Identification and Nurturing of Budding and Young Talent'.

• The award recognizes the efforts of organizations in promoting sports and identifying young talents in India.

• Manav Rachna Educational Institution has been actively involved in nurturing sports talent through its various programs and initiatives.

• The institution provides excellent infrastructure and facilities to support young athletes in their training and development.

Additional Information

• The Rashtriya Khel Protsahan Puruskar was instituted by the Government of India to encourage the involvement of corporates and institutions in the promotion of sports.

• The award is given annually and covers various categories including identification and nurturing of talent, encouragement to sports through corporate social responsibility, and others.

• Institutions and organizations across India are recognized for their contributions to the development of sports and athletes.

• Manav Rachna Educational Institution's commitment to sports is reflected in its consistent efforts to provide training, scholarships, and opportunities to young athletes.

Q16. Answer: (a) 40 min

Shortcut Trick

Speed Ratio (Old : New) = 10 : (10 + 5) = 10 : 15 = 2 : 3

Time Ratio (Inverse of Speed) = 3 : 2

Given Original Time (3 units) = 2 hours = 120 minutes

=> 1 unit = 40 minutes

Time Saved (3 − 2 = 1 unit) = 40 minutes

Therefore The correct answer is 40 min.

Alternate Method

Given: Initial speed = 10 km/h, Time = 2 hrs, Speed increase = 5 km/h

Formula: Distance = Speed × Time

=> Total Distance = 10 km/h × 2 hrs = 20 km

=> New Speed = 10 + 5 = 15 km/h

=> New Time = Distance ÷ New Speed = 20 ÷ 15 = 4/3 hours

=> New Time in minutes = (4/3) × 60 = 80 minutes

=> Original Time in minutes = 2 × 60 = 120 minutes

=> Time saved = 120 − 80 = 40 minutes

Therefore The correct answer is 40 min.

Additional Information

Inverse Proportion of Speed and Time

When the distance is constant, speed (s) is inversely proportional to time (t). If speed increases by a factor of x/y, time decreases to the ratio of y/x.

Unit Conversion

To convert hours to minutes, multiply by 60. To convert km/h to m/s, multiply the speed by 5/18.

Relative Speed

When two objects move in the same direction, relative speed is the difference (s1 − s2). In opposite directions, it is the sum (s1 + s2).

Q17. Answer: (c) Chittaranjan Das

The correct answer is Chittaranjan Das

Key Points

• Chittaranjan Das is remembered as 'Deshbandhu'.

• He served as the President of the Indian National Congress for one session in 1922.

• He co-founded the Swaraj Party with Motilal Nehru.

• Chittaranjan Das played a significant role in the Indian freedom struggle and was an influential leader of his time.

Additional Information

• Chittaranjan Das was a prominent lawyer and political leader.

• He was known for his defense of Aurobindo Ghosh in the Alipore Bomb Case.

• He was a key figure in the Non-Cooperation Movement led by Mahatma Gandhi.

• Das's contributions to the freedom struggle were not only political but also social and educational.

• His efforts laid the groundwork for future political movements and parties in India.

Q18. Answer: (d) 220

Given:

Number of students with Tenth qualification in all districts:

P = 340, Q = 300, R = 260, S = 340, T = 180, U = 260, V = 220

Number of students with Degree qualification in all districts:

P = 280, Q = 360, R = 200, S = 260, T = 320, U = 320, V = 380

Formula used:

Total for Tenth qualification = Sum of students with Tenth qualification in all districts

Total for Degree qualification = Sum of students with Degree qualification in all districts

Difference = Total for Degree qualification - Total for Tenth qualification

Calculation:

Total for Tenth qualification:

=> 340 + 300 + 260 + 340 + 180 + 260 + 220 = 1900

Total for Degree qualification:

=> 280 + 360 + 200 + 260 + 320 + 320 + 380 = 2120

Difference:

=> 2120 - 1900 = 220

Therefore The difference between the total number of students with Tenth and Degree qualifications is 220.

Q19. Answer: (b) 85 m, South

According to the given information,

1) Sam steps out from his house and walks 160 m towards the east.

2) He then takes a right turn and walks 50 m.

3) He then turns right and walks 70 m.

4) He then turns left and walks 35 m. He then turns right and walks 90 m to reach a gift shop.

Here, we can see that the shop is 85 m, south of the house.

Hence, the correct answer is "85 m, South".

Q20. Answer: (d) Third

The correct answer is Third.

Key Points

• Marathi is the Third largest language spoken in India, according to the 2011 census.

• It is an Indo-Aryan language with a significant number of speakers, accounting for 6.86% of the total population of India.

• The language holds a vital place in the cultural and linguistic diversity of India.

• Marathi is predominantly spoken in the state of Maharashtra, but it is also used in other regions of the country.

• As a major language, it contributes to the rich linguistic heritage of India, which is home to several languages and dialects.

Additional Information

• According to the 2011 census, the total number of Marathi speakers in India is approximately 83 million.

• Marathi has a rich literary tradition and has produced several notable authors, poets, and playwrights.

• The language has its own script, known as the Devanagari script, which is also used for writing Hindi and Sanskrit.

• Marathi is one of the 22 scheduled languages of India, recognized in the Eighth Schedule of the Indian Constitution.

• The state government of Maharashtra actively promotes the use and development of the Marathi language through various cultural and educational initiatives.

Q21. Answer: (d) Statement II is correct, and Statement I is incorrect.

The correct answer is 4 Only.

Key PointsGraphite Properties:

• Statement I: Graphite is actually a good conductor of electricity. This is because of the presence of free electrons in its structure that can move easily within its layers. Hence, Statement I is not correct.

• Statement II: In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, forming a hexagonal array. This leaves one electron free per carbon atom, which contributes to graphite's conductivity. Hence, Statement II is correct.

• Graphite's structure consists of layers of hexagonally arranged carbon atoms, where each layer is bonded weakly to adjacent layers. This allows the layers to slide over each other, making graphite a good lubricant.

• The delocalized electrons within the layers are responsible for graphite's ability to conduct electricity.

• Because of these free electrons, graphite is used in applications like electrodes in batteries and electric arc furnaces.

Q22. Answer: (d) Himachal Pradesh

The correct answer is Himachal Pradesh

Key Points

• The 'Kangra' and 'Kullu' valleys are located in the state of Himachal Pradesh.

• Himachal Pradesh is known for its scenic beauty, and both Kangra and Kullu valleys are popular tourist destinations.

• The Kangra Valley is famous for its lush green landscapes and tea gardens.

• The Kullu Valley, often referred to as the "Valley of Gods," is renowned for its picturesque hills and temples.

• Both valleys are significant for their cultural heritage and natural beauty.

Additional Information

• Himachal Pradesh is located in the northern part of India and is bordered by states like Jammu and Kashmir, Punjab, Haryana, and Uttarakhand.

• The state is known for its rich cultural heritage and is a hub for various adventure sports activities like trekking, paragliding, and skiing.

• Himachal Pradesh has a diverse climate that varies from hot and sub-humid tropical in the southern tracts to cold, alpine, and glacial in the northern and eastern mountain ranges.

• The state is also home to many famous hill stations such as Shimla, Manali, and Dharamshala.

• Himachal Pradesh is an important pilgrimage destination, housing several revered temples and monasteries.

Q23. Answer: (b) ALOYTU

The logic followed here is,

SEARCH : ESRAHC

DESIGN : EDISNG

Similarly,

LAYOUT : ?

Hence, the correct answer is "ALOYTU".

Q24. Answer: (d) 1025

Given:

126.012 × 14.987 - 603.045 = ? + 261.987

Formula Used:

To find the approximate value of ?, we rearrange the equation:

126.012 × 14.987 - 603.045 - 261.987 = ?

Calculation:

Step 1: Calculate 126.012 × 14.987

=> 126.012 × 14.987 ≈ 126 × 15 = 1890

Step 2: Subtract 603.045 from the result

=> 1890 - 603.045 ≈ 1890 - 603 = 1287

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Step 3: Subtract 261.987 from the result

=> 1287 - 261.987 ≈ 1287 - 262 = 1025

The correct answer is option 4.

Q25. Answer: (a) Tamil Nadu

The correct answer is Tamil Nadu

Key Points

• Pongal is a major festival celebrated in the state of Tamil Nadu.

• The festival is dedicated to the Sun God and marks the beginning of the Tamil month of Thai.

• Pongal is a four-day festival, with each day having its own significance and rituals.

• The festival is celebrated with the preparation of a special dish called Pongal, which is made from newly harvested rice, milk, and jaggery.

• Pongal signifies the end of the winter solstice and the start of the sun's six-month-long journey northwards.

Additional Information

• The festival is similar to Makar Sankranti celebrated in other parts of India.

• Pongal is also a time for family reunions and gatherings, with people wearing new clothes and decorating their homes with kolam (rangoli).

• The four days of Pongal are known as Bhogi Pongal, Surya Pongal, Mattu Pongal, and Kaanum Pongal.

• On Mattu Pongal, cattle are worshipped and adorned with colorful decorations as a mark of gratitude for their help in farming.

• Pongal is not only celebrated in Tamil Nadu but also by Tamilians worldwide.

Q26. Answer: (c) Intracellular spaces

The correct answer is Intracellular spaces

Key Points

• Intracellular spaces are not a main site of transpiration.

• Transpiration primarily occurs through the stomata, which are small openings on the surface of leaves that allow for gas exchange.

• The cuticle, a waxy layer on the surface of leaves, also plays a minor role in transpiration by limiting water loss.

• Lenticels are small openings in the bark of stems and roots that facilitate gas exchange and can also contribute to transpiration.

Additional Information

• Transpiration is the process of water movement through a plant and its evaporation from aerial parts, such as leaves, stems, and flowers.

• It is essential for maintaining the flow of water and nutrients from the roots to other parts of the plant.

• Transpiration also helps in cooling the plant and maintaining the turgor pressure, which is crucial for the structural integrity of the plant.

Q27. Answer: (b) 5

The correct answer is 5 years

Key Points

• The Sarpanch or the president of the Gram Panchayat is elected by the ward members as per the State Act for a period of 5 years.

• Gram Panchayat is the basic unit of local self-government in rural India.

• The election process is governed by the respective State Election Commission, ensuring democratic governance at the grassroots level.

• The Sarpanch plays a crucial role in the administration of the village, implementing development programs and addressing the needs of the villagers.

• The tenure of 5 years allows for continuity and stability in the local governance and development initiatives.

Additional Information

• The Gram Panchayat system was introduced through the 73rd Constitutional Amendment Act of 1992, which aimed to decentralize power and enhance grassroots democracy.

• Each Gram Panchayat covers a village or a group of villages and is responsible for local administration and development.

• The Panchayati Raj system is a three-tier structure comprising the Gram Panchayat at the village level, the Panchayat Samiti at the block level, and the Zila Parishad at the district level.

• The Sarpanch is assisted by a team of elected Panchayat members, ensuring collective decision-making and administration.

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• The Gram Sabha, consisting of all registered voters in the village, is the supreme body that oversees the functioning of the Gram Panchayat.

• The Sarpanch and Panchayat members are accountable to the Gram Sabha, which meets regularly to discuss and approve the village's development plans and activities.

Q28. Answer: (c) 306

The logic followed here is,

Hence, the correct answer is "306".

Q29. Answer: (d) 85 m

According to the given information,

1) Shaily starts walking from her home and goes 45 m towards the east.

2) She then takes a right turn and walks 85 m.

3) She then turns left and walks 40 m.

4) She then takes a final left turn and walks 85 m to reach an ATM.

Here, we can see that the distance between the home and the ATM = (45 + 40) = 85 m

Hence, the correct answer is "85 m".

Q30. Answer: (b) Statement II is correct, Statement I is incorrect.

The correct answer is 2 Only.

Key Points

Dobereiner's Triads:

• Statement I is incorrect: Lithium, Sodium, and Rubidium are not elements of Dobereiner's triad. The correct triad involving Lithium is Lithium, Sodium, and Potassium.

• Statement II is correct: In Dobereiner's triads, the atomic mass of the middle element is approximately the average of the atomic masses of the other two elements. This was one of the early attempts to classify elements based on their properties and atomic masses.

Therefore, the correct answer is statement II only.

Q31. Answer: (a) 0, 9/4

Shortcut Trick

Whenever a quadratic equation is in the form $ax^2 = bx$, one root is always 0.

The other root is simply the ratio of the coefficients b/a.

Here, a = 12 and b = 27.

Second root = 27/12 = 9/4.

Therefore The correct answer is 0, 9/4.

Alternate Method

Given:

The quadratic equation is $12x^2 = 27x$

Method Used:

We use the factorization method by bringing all terms to one side to find the roots.

Calculations:

=> $12x^2 - 27x = 0$

=> $3x(4x - 9) = 0$

Now, set each factor to zero:

=> Case 1: 3x = 0

=> x = 0

=> Case 2: 4x − 9 = 0

=> 4x = 9

=> x = 9/4

Therefore The correct answer is 0, 9/4.

Additional Information

General Form of Quadratic Equation

A standard quadratic equation is represented as $ax^2 + bx + c = 0$, where a, b, and c are constants.

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Zero Root Property

If the constant term (c) in a quadratic equation is zero, then at least one of the roots of the equation is always 0.

Nature of Roots

The nature of roots is determined by the discriminant (D), calculated as $D = b^2 - 4ac$. If $D > 0$, the roots are real and distinct.

Sum and Product of Roots

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

Q32. Answer: (b) 4.95

Shortcut Trick

Directly calculate the weighted sum of observations: (3×5) + (2×3) + (10×4) + (4×2) + (5×6) = 15 + 6 + 40 + 8 + 30 = 99.

Find total frequency: 5 + 3 + 4 + 2 + 6 = 20.

Mean = Total Sum ÷ Total Frequency = 99 ÷ 20 = 4.95.

Therefore The correct answer is 4.95.

Alternate Method

Given: Observations (x) = {3, 2, 10, 4, 5} and Frequencies (f) = {5, 3, 4, 2, 6}.

Formula Used: Arithmetic Mean (μ) = $\Sigma(f_i \times x_i) / \Sigma f_i$

Calculations:

=> $\Sigma fx = (3 \times 5) + (2 \times 3) + (10 \times 4) + (4 \times 2) + (5 \times 6)$

=> $\Sigma fx = 15 + 6 + 40 + 8 + 30 = 99$

=> $\Sigma f = 5 + 3 + 4 + 2 + 6 = 20$

=> Mean (μ) = 99 ÷ 20

=> Mean = 4.95

Therefore The correct answer is 4.95.

Additional Information

Arithmetic Mean of Frequency Distribution

It represents the average value where the sum of product of observations and their frequencies is divided by the total frequency.

Sum of Deviations

The algebraic sum of deviations of a set of observations from their arithmetic mean is always zero: $\Sigma f_i(x_i - \mu) = 0$.

Assumed Mean Method

A shortcut for large data: Mean = A + (Σfd / Σf), where A is the assumed mean and d = x − A.

Q33. Answer: (a) 21

According to the given information,

1) Only 6 persons are sitting between Monika and Dipen. Monika is at the 8th place from the extreme right end of the row.

2) Dipen is sitting at the extreme right end.

3) Ketan is at some place towards the left of Monika. Ketan and Monika have exactly 3 persons sitting between them.

4) Ketan is at the 10th place from the extreme left end.

Here, the total number of persons seated = (9 + 1 + 3 + 1 + 6 + 1) = 21

Hence, the correct answer is "21".

Q34. Answer: (a) Haryana

html The correct answer is Haryana

Key Points

• Haryana recorded the highest unemployment rate in June 2022, according to the Centre for Monitoring Indian Economy (CMIE).

• CMIE is an independent think tank that provides economic and business data, information, and research.

• Haryana's high unemployment rate is a significant concern for the state government, which is working on various schemes to generate employment opportunities.

• Unemployment rate is a critical indicator of the economic health of a state, reflecting the percentage of the labor force that is unemployed but actively seeking employment.

Additional Information

• Centre for Monitoring Indian Economy (CMIE) was established in 1976 and provides data on various economic indicators like employment, GDP, and inflation.

• CMIE's data is widely used by policymakers, economists, and researchers to analyze economic trends and formulate policies.

• The unemployment rate is calculated by dividing the number of unemployed individuals by the total labor force and multiplying by 100.

• Factors contributing to high unemployment rates can include economic downturns, lack of industry, and inadequate skills among the workforce.

• State governments often implement skill development programs, entrepreneurship initiatives, and job fairs to combat high unemployment rates.

Q35. Answer: (b) The Peninsular Plateau

The correct answer is option 2

Key Points

• The 'Garo', 'Khasi', and 'Jaintia' hills are part of the Peninsular Plateau of India.

• The Peninsular Plateau is one of the oldest and most stable landmasses in India and includes several hill ranges and plateaus.

• The Garo, Khasi, and Jaintia hills are located in the northeastern part of India, primarily in the state of Meghalaya.

• These hills are known for their rich biodiversity and unique cultural heritage.

• The region receives heavy rainfall and is characterized by lush green landscapes and numerous rivers and waterfalls.

Additional Information

• The Garo, Khasi, and Jaintia hills are part of the Meghalaya plateau, which is an extension of the Indian Peninsular Plateau.

• Meghalaya, meaning "the abode of clouds," is known for its scenic beauty and is a popular tourist destination.

• The region is predominantly inhabited by indigenous tribes such as the Garos, Khasis, and Jaintias, each with their distinct languages, cultures, and traditions.

• The hills play a crucial role in the climate and ecology of the region, contributing to the overall biodiversity and environmental stability.

• The Peninsular Plateau also includes other significant hill ranges like the Aravalli, Vindhya, Satpura, and the Western and Eastern Ghats.

Q36. Answer: (d) 34

Shortcut Trick

Mean Proportional (MP) = $\sqrt{(a \times b)}$

MP = $\sqrt{(17 \times 68)}$

MP = $\sqrt{(17 \times 17 \times 4)} = 17 \times 2 = 34$

Therefore The correct answer is 34.

Alternate Method

Given: First number (a) = 17, Second number (b) = 68

Formula Used: If x is the mean proportional between a and b, then a : x = x : b

=> $x^2 = a \times b$

=> $x = \sqrt{(17 \times 68)}$

=> $x = \sqrt{(1156)}$

=> x = 34

Therefore The correct answer is 34.

Additional Information

Third Proportional

The third proportional of two numbers a and b is c, such that a : b = b : c, given by $c = b^2/a$.

Fourth Proportional

The fourth proportional of three numbers a, b, and c is d, such that a : b = c : d, given by $d = (b \times c)/a$.

Compounded Ratio

The compounded ratio of (a : b) and (c : d) is (a × c) : (b × d).

Q37. Answer: (b) (9, 90, 3)

The logic followed here is,

Logic: Second number = $(\text{First number})^2 + (\text{Second number})^2$

(12, 313, 13)

→ $313 = (12)^2 + (13)^2$

→ 313 = 144 + 169

(7, 50, 1)

→ 50 = (7)2 + (1)2

→ 50 = 49 + 1

Now, let's check each option,

1) (12, 158, 12)

→ 158 = (12)2 + (12)2

→ 158 ≠ 144 + 144

2) (9, 90, 3)

→ 90 = (9)2 + (3)2

→ 90 = 81 + 9 => Follows the logic.

3) (4, 125, 11)

→ 125 = (4)2 + (11)2

→ 125 ≠ 16 + 121

4) (15, 150, 10)

→ 150 = (15)2 + (10)2

→ 150 ≠ 225 + 100

Here, we can see that only Option 2 follows the logic.

Hence, the correct answer is "(9, 90, 3)".

Q38. Answer: (a) Rs. 57,000

Shortcut Trick

Ratio of Investments = 20 : 15 : 12

Profit Ratio = (20 × 12) : (15 × 12) : (12 × 3 + 6 × 9) = 240 : 180 : 90 = 8 : 6 : 3

Total units = 8 + 6 + 3 = 17 units → Rs. 3,23,000

1 unit = Rs. 19,000 Therefore C share (3 units) = 3 × 19,000 = Rs. 57,000

Therefore The correct answer is Rs. 57,000.

Alternate Method

Given: Ratio of capitals of A, B, and C = 20 : 15 : 12. Total Profit = Rs. 3,23,000. Total Time = 12 months.

Formula: Profit Ratio = (Capital1 × Time1) : (Capital2 × Time2) : (Capital3 × Time3)

=> Share of A = 20 × 12 = 240

=> Share of B = 15 × 12 = 180

=> Share of C = (12 × 3) + (6 × 9) = 36 + 54 = 90

=> Profit Ratio A : B : C = 240 : 180 : 90 = 8 : 6 : 3

=> Sum of ratios = 8 + 6 + 3 = 17

=> C share = (3 ÷ 17) × 3,23,000

=> C share = 3 × 19,000 = 57,000

Therefore The correct answer is Rs. 57,000.

Additional Information

Partnership Investment Rule

Profit is always distributed in the ratio of the product of Capital and Time (Profit prop. to C × T).

Working vs. Sleeping Partner

A working partner may receive an additional percentage of profit as a salary before the remaining profit is divided based on investment ratios.

Change in Capital

If a partner adds or withdraws capital mid-term, calculate the effective capital by summing (Amount × Duration) for each period.

Q39. Answer: (b) E

According to the given information,

1) E is sitting at any one of the sides and is the immediate neighbour of both B and D.

2) G is sitting second to the left of E and to the immediate left of D.

3) C is sitting exactly opposite to D, and H is sitting exactly opposite to B.

4) F is exactly opposite to G.

Here, we can see that E is sitting exactly opposite to A.

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Hence, the correct answer is "E".

Q40. Answer: (d) Soil Geography

The correct answer is Soil Geography.

Key Points

• Pedology is a branch of soil science focusing on the formation, morphology, and classification of soils as bodies within the natural landscape.

• It is another term for Soil Geography.

• It studies how global landforms, biogeochemical conditions, and living organism habitats have evolved together with the characteristics and patterns of soil distribution.

• Pedologists contribute to the preservation of the soil resource and the advancement of information about the Earth's surface through their comprehension of the causes and magnitudes of soil variations.

Additional Information

• Oceanography is the study of all aspects of the ocean.

• It covers a wide range of topics, from marine life and ecosystems to currents and waves, the movement of sediments, and seafloor geology.

• Geomorphology is the study of landforms and landform evolution.

• The topic traditionally has been studied both qualitatively, which is the description of landforms, and quantitatively, which is process-based and describes forces acting on Earth's surface to produce landforms and landform change.

• Phytogeography is the study of the distribution of plants or taxonomic groups of plants and its focus is to explain the ranges of plants in terms of their origin, dispersal, and evolution.

Q41. Answer: (b) 1561/4995

Given:

Mixed recurring decimal = 0.3125125125...

Formula Used:

Convert a recurring decimal to fraction using algebraic methods.

Calculation:

Let x = 0.3125125125...

To eliminate the recurring part, multiply by 10000:

=> 10000x = 3125.125125125...

Now, subtract the original equation from this new equation:

=> 10000x - x = 3125.125125125... - 0.3125125125...

=> 9999x = 3124.8126125...

Recognize that the decimal part cancels out:

=> 9999x = 3124.8125

Divide both sides by 9999:

=> x = (3124.8125)/(9999)

Simplify the fraction:

=> x = (1561)/(4995)

Therefore, the vulgar fraction equal to the mixed recurring decimal 0.3125125125... is (1561)/(4995).

Q42. Answer: (d) Thursday

The logic followed here is:

Logic: A normal year advances the day of the year by 1 day. And a leap year advances the day of the year by 2 days.

Given: 1 January 2006 was a Sunday.

Number of odd days between 1 January 2006 and 1 January 2009 = (1 + 2 + 1) = 4

So, 1 January 2009 is → Sunday + 4 = Thursday.

Hence, the correct answer is "Thursday".

Q43. Answer: (a) 1015

Shortcut Trick

The least number divisible by a set of numbers is their LCM.

Since the number is divisible after being diminished by 7, the required number = LCM + 7.

LCM of 12, 16, 18, 21:

12 = 4 × 3, 16 = 16, 18 = 2 × 9, 21 = 3 × 7 => LCM = 16 × 9 × 7 = 1008.

Required number = 1008 + 7 = 1015.

Therefore The correct answer is 1015.

Alternate Method

Given: Divisors are 12, 16, 18, 21 and the remainder needed after subtraction is 7.

Formula: Required Number = LCM(x, y, z, ...) + Remainder

=> Prime factors of 12 = $2^2 \times 3$

=> Prime factors of 16 = 2^4

=> Prime factors of 18 = 2×3^2

=> Prime factors of 21 = 3 × 7

=> LCM = 2^4 × 3^2 × 7 = 16 × 9 × 7

=> LCM = 144 × 7 = 1008

=> Required Number = 1008 + 7 = 1015

Therefore The correct answer is 1015.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by two or more numbers without leaving a remainder.

Case of Addition/Subtraction

If the question asks for a number which when increased by x is divisible, subtract x from LCM. If diminished, add x to LCM.

HCF Relationship

For two numbers a and b, the product of the numbers equals the product of their HCF and LCM: a × b = HCF × LCM.

Q44. Answer: (c) Never contaminate air and water

The correct answer is option 3

Key Points

• Fertilizers must be properly stored to prevent moisture absorption, caking, and degradation of nutrients.

• Fertilizers can leach out with rains or irrigation water, leading to nutrient loss and potential contamination of groundwater.

• It is false that fertilizers never contaminate air and water. Improper use of fertilizers can lead to nutrient runoff into water bodies, causing eutrophication, and can release gases like ammonia and nitrous oxide into the air.

• Nutrient amounts calculated in advance can be applied to meet the specific needs of crops, optimizing growth and yield while minimizing waste and environmental impact.

Additional Information

• Pedology is a branch of soil science focusing on the formation, morphology, and classification of soils as bodies within the natural landscape. It is another term for Soil Geography.

• Pedology studies how global landforms, biogeochemical conditions, and living organism habitats have evolved together with the characteristics and patterns of soil distribution.

• Pedologists contribute to the preservation of the soil resource and the advancement of information about the Earth's surface through their comprehension of the causes and magnitudes of soil variations.

• Oceanography is the study of all aspects of the ocean, covering topics from marine life and ecosystems to currents and waves, the movement of sediments, and seafloor geology.

• Geomorphology is the study of landforms and landform evolution, traditionally studied both qualitatively and quantitatively.

• Phytogeography is the study of the distribution of plants or taxonomic groups of plants, focusing on explaining the ranges of plants in terms of their origin, dispersal, and evolution.

Q45. Answer: (b) 44/9 hours

Shortcut Trick

Combined efficiency (A + B − C) = (1/5 + 1/8 − 1/10) of the tank per hour.

LCM of 5, 8, 10 = 40. Combined efficiency = (8 + 5 − 4)/40 = 9/40.

Time taken = Total work / Net efficiency = 40/9 hours.

40/9 = 4(4/9) hours.

Therefore The correct answer is 4(4/9) hr.

Alternate Method

Given: Filling time Pipe A = 5 hours, Pipe B = 8 hours. Emptying time Pipe C = 10 hours.

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

Person	Days	Total Work	Efficiency
Pipe A	5	40	+8
Pipe B	8	+5	
Pipe C	10	−4	

=> Total Efficiency (A + B + C) = 8 + 5 − 4 = 9 units/hr

=> Total Time = Total Work ÷ Total Efficiency

=> Time = 40 ÷ 9

=> Time = 4(4/9) hr

Therefore The correct answer is 4(4/9) hr.

Additional Information

Pipes & Cisterns Sign Convention

Inlet pipes (filling) are assigned positive efficiency, while outlet pipes (emptying/leakage) are assigned negative efficiency.

Net Work Formula

If pipe A fills in 'x' hours and pipe B empties in 'y' hours, the part filled in 1 hour is (1/x − 1/y).

Q46. Answer: (a) Lieutenant Governor

The correct answer is Lieutenant Governor

Key Points

• Lieutenant Governor is the in charge of the Union Territories in the absence of the Chief Minister.

• In Union Territories where there is no legislative assembly, the Lieutenant Governor acts as the administrator appointed by the President of India.

• The Lieutenant Governor has similar powers to a state governor but operates under the direct control of the Union Government.

• In Union Territories with a legislative assembly, like Delhi and Puducherry, the Lieutenant Governor's role is more ceremonial, though they still hold significant administrative powers.

Additional Information

• The President of India appoints the Lieutenant Governors for Union Territories.

• The Union Territories are regions that are directly governed by the Central Government of India, unlike states which have their own governments.

• Examples of Union Territories include Delhi, Puducherry, Chandigarh, Andaman and Nicobar Islands, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, and Ladakh.

• The administrative structure and powers of the Lieutenant Governor can vary between Union Territories based on specific legislative provisions.

Q47. Answer: (a) 2.66

Shortcut Trick

Weighted Mean is calculated as the sum of products of values and their weights divided by the total sum of weights.

Sum of (Value × Weight) = (4×1) + (3×0) + (5×2) + (7×1) + (2×3) + (1×5) = 4 + 0 + 10 + 7 + 6 + 5 = 32.

Total Weights = 1 + 0 + 2 + 1 + 3 + 5 = 12.

Weighted Mean = 32 ÷ 12 = 2.666...

Therefore The correct answer is 2.66.

Alternate Method

Given:

Observations (X_i) = {4, 3, 5, 7, 2, 1}

Corresponding Weights (W_i) = {1, 0, 2, 1, 3, 5}

Formula Used:

Weighted Mean = $\sum(W_i \times X_i) \div \sum W_i$

Calculations:

=> Total sum of weights ($\sum W_i$) = 1 + 0 + 2 + 1 + 3 + 5 = 12

=> Sum of weighted observations ($\sum W_iX_i$) = (4 × 1) + (3 × 0) + (5 × 2) + (7 × 1) + (2 × 3) + (1 × 5)

=> ∑W_iX_i = 4 + 0 + 10 + 7 + 6 + 5 = 32

=> Weighted Mean = 32 ÷ 12

=> Weighted Mean = 2.6666...

Therefore The correct answer is 2.66.

Additional Information

Arithmetic Mean (AM)

The simple average of data points where every observation is given equal importance. Formula: AM = ∑X_i ÷ n.

Geometric Mean (GM)

Useful for sets of positive numbers that are interpreted according to their product. Formula: GM = (X1 × X2 × ... × X_n)^(1/n).

Harmonic Mean (HM)

The reciprocal of the arithmetic mean of the reciprocals. Formula: HM = n ÷ ∑(1/X_i).

Relationship between Means

For any set of positive numbers, the relationship is always: AM ≥ GM ≥ HM.

Q48. Answer: (a) NaCl, NH3, CO2

The correct answer is Option 1

Key Points

• NaCl, NH3, and CO2 are the correct set of raw materials for washing soda preparation.

• Washing soda, or sodium carbonate (Na2CO3), is prepared using the Solvay process.

• In the Solvay process, ammonia (NH3), carbon dioxide (CO2), and sodium chloride (NaCl) are the primary raw materials.

• These materials react in a series of steps to produce sodium carbonate (washing soda) and other by-products.

Additional Information

• In the Solvay process, ammonia is recovered and recycled, making the process economical.

• The process involves several steps including the formation of ammonium bicarbonate, which then reacts with sodium chloride to form sodium bicarbonate and ammonium chloride.

• Sodium bicarbonate is then heated to form sodium carbonate (washing soda) and carbon dioxide, which is recycled back into the process.

• The Solvay process is widely used in industrial applications due to its efficiency and cost-effectiveness.

Q49. Answer: (a) P

According to the given information,

1) Q scored more than exactly four friends.

Q > > > > __

2) M scored more than exactly three friends.

Q > M > > >

3) Y scored the least marks.

Q > M > > __ > Y

4) Both P and N scored more than T.

5) N is not the top scorer.

P > Q > M > N > T > Y

Here, we can see that P scored the highest marks.

Hence, the correct answer is "P".

Q50. Answer: (c) Hero Motocorp

The correct answer is Hero Motocorp

Key Points

• Hero Motocorp unveiled a new brand 'VIDA' for its emerging mobility solutions and upcoming electric vehicles in March 2022.

• 'VIDA' aims to offer a comprehensive range of electric mobility solutions that are sustainable and innovative.

• The brand launch is part of Hero Motocorp's vision to lead the future of mobility with cutting-edge technology and eco-friendly products.

• Hero Motocorp is one of the world's largest two-wheeler manufacturers and has been expanding its portfolio to include electric vehicles.

Additional Information

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• Hero Motocorp was founded in 1984 and is headquartered in New Delhi, India.

• The company has a strong presence in over 40 countries across Asia, Africa, and South and Central America.

• Hero Motocorp has consistently been at the forefront of innovation, introducing various models and technologies that cater to diverse customer needs.

• The launch of 'VIDA' aligns with the global trend towards sustainable transportation and the increasing demand for electric vehicles.

• With the introduction of 'VIDA', Hero Motocorp aims to contribute significantly to reducing carbon emissions and promoting green mobility.

Q51. Answer: (a) B

According to the given information,

1) A is sitting at one of the corners and is the immediate neighbour of E and F.

2) C is sitting at one of the corners and to the immediate right of F.

3) D is sitting exactly opposite to A and to the immediate left of B.

4) G is not sitting at any of the corners.

Here, we can see that B is sitting exactly opposite to F.

Hence, the correct answer is "B".

Q52. Answer: (d) tungsten

The correct answer is tungsten

Key Points

• Tungsten is the most suitable material for making the filament of an incandescent bulb.

• Tungsten has a very high melting point of about 3422°C (6192°F), which allows it to glow brightly without melting.

• It also has good electrical conductivity and can be drawn into very fine wires that are necessary for the filament.

• The high melting point and durability make tungsten an ideal choice for withstanding the high temperatures required for incandescence.

Additional Information

• Incandescent bulbs produce light by heating a filament until it glows.

• Other materials like tin-lead alloy, nichrome, and manganin are not suitable for filaments due to their lower melting points and different electrical properties.

• LEDs (Light Emitting Diodes) and CFLs (Compact Fluorescent Lamps) are modern alternatives to incandescent bulbs, offering higher efficiency and longer lifespan.

• While incandescent bulbs are less energy-efficient compared to these modern alternatives, they are still used in some applications due to their simplicity and the quality of light they produce.

Q53. Answer: (d) 30º

Shortcut Trick

In a right-angled triangle, if the perpendicular is exactly half of the hypotenuse, the angle opposite to that perpendicular is always 30º.

Here, PQ = 3 cm and PR = 6 cm.

Since PQ = PR / 2, the angle opposite to PQ (which is angle PRQ) must be 30º.

Therefore The correct answer is 30º.

Alternate Method

Given: PQ = 3 cm, PR = 6 cm, and angle PQR = 90º.

Formula Used: sin θ = Perpendicular / Hypotenuse

In ΔPQR, for angle PRQ (θ):

=> Perpendicular = PQ = 3 cm

=> Hypotenuse = PR = 6 cm

=> sin(angle PRQ) = PQ / PR

=> sin(angle PRQ) = 3 / 6

=> sin(angle PRQ) = 1/2

=> angle PRQ = sin^(−1)(1/2)

=> angle PRQ = 30º

Therefore The correct answer is 30º.

Additional Information

Q54. Answer: (d) 115

The logic followed here is,

Hence, the correct answer is "115".

Q55. Answer: (d) Both statements I and II weaken the decision

The given decision is: Company K has a wide chain of grocery stores and sweet shops across all cities and even villages of Country M. The CEO of Company K has decided to discontinue cash payments completely from next month onwards.

Statements:

I. As per the reports of the last 3 years, around 24% of payments each month were through cash → Weakens (This statement indicates that a significant portion of transactions (24%) were made using cash. Discontinuing cash payments might disrupt these transactions).

II. 35% of the population of Country M is either illiterate or does not have access to bank accounts → Weakens (This statement highlights that a significant portion of the population may face difficulties with non-cash transactions due to illiteracy or lack of access to bank accounts. This could lead to decreased accessibility and convenience for a large group of customers, potentially affecting business and customer satisfaction).

Hence, the correct answer is "Both statements I and II weaken the decision".

Q56. Answer: (b) $3b^2 + c^2 + 3ab - 5bc - ac$

Shortcut Trick

Use the Value Substitution Method by letting a = 1, b = 1, and c = 1.

Expression: $(1 + 2\times1 - 1)(1 - 1) + (1 - 1)\times2\times1 + 1^2 \Rightarrow (2)(0) + (0)(2) + 1 = 1$.

Check the target result: $3(1)^2 + 1^2 + 3(1)(1) - 5(1)(1) - (1)(1) \Rightarrow 3 + 1 + 3 - 5 - 1 = 1$.

Since the values match, the simplified form is confirmed.

Therefore The correct answer is $3b^2 + c^2 + 3ab - 5bc - ac$.

Alternate Method

Given: $(a + 2b - c)(b - c) + (a - c)2b + b^2$

Method: Expand each part using the Distributive Property and combine Like Terms.

$\Rightarrow [(a \times b) - (a \times c) + (2b \times b) - (2b \times c) - (c \times b) + (c \times c)] + [2ab - 2bc] + b^2$

$\Rightarrow [ab - ac + 2b^2 - 2bc - bc + c^2] + 2ab - 2bc + b^2$

$\Rightarrow ab - ac + 2b^2 - 3bc + c^2 + 2ab - 2bc + b^2$

$\Rightarrow (2b^2 + b^2) + c^2 + (ab + 2ab) + (-3bc - 2bc) - ac$

$\Rightarrow 3b^2 + c^2 + 3ab - 5bc - ac$

Therefore The correct answer is $3b^2 + c^2 + 3ab - 5bc - ac$.

Additional Information

Distributive Property

It states that multiplying a sum by a number is the same as multiplying each addend by the number: $x(y + z) = xy + xz$.

Like Terms

These are terms that have the exact same variables raised to the same powers. Only like terms can be added or subtracted to simplify an expression.

Polynomial Multiplication

When multiplying two polynomials, every term in the first polynomial must be multiplied by every term in the second polynomial.

Q57. Answer: (c) The number of graduates who are also morning walkers but not girls is 33.

The given venn diagram is shown below,

Let's check each option,

1) The number of morning walkers who are also girls but not graduates is 19 → False (The correct number is 22).

2) The number of girls who are both graduates and morning walkers is 39 → False (The correct number is 15).

3) The number of graduates who are also morning walkers but not girls is 33 → True

4) The number of graduates who are also girls but not morning walkers is 22 → False (The correct number is 39).

Hence, the correct answer is "The number of graduates who are also morning walkers but not girls is 33".

Q58. Answer: (c) Only conclusion I follows

The least possible venn diagram is shown below,

Conclusions:

I. Some masks are caps → True (Some prizes are caps, and all prizes are masks implies that some of those masks which are prizes are also caps).

II. Some masks are medals → False (Some prizes are caps, all prizes are masks and some caps are medals implies that some masks can be medals. It is possible but not definite).

Hence, the correct answer is "Only conclusion I follows".

Q59. Answer: (b) 1.1 kW

The correct answer is 1.1 kW

Key Points

• The power of an electric device can be calculated using the formula: Power (P) = Voltage (V) × Current (I).

• Given the current (I) is 5 A and the voltage (V) is 220 V, the power can be calculated as follows:

• P = V × I = 220 V × 5 A = 1100 W.

• Since 1 kW = 1000 W, 1100 W is equivalent to 1.1 kW.

• Therefore, the power of the electric device is 1.1 kW.

Additional Information

• Electric power is the rate at which electrical energy is transferred by an electric circuit.

• The SI unit of power is the watt (W), which is equal to one joule per second.

• Electric devices convert electrical energy into other forms of energy, such as heat, light, or motion.

• Understanding the power rating of an electric device is important for ensuring it operates within safe limits and for energy efficiency considerations.

Q60. Answer: (b) 15 years

Shortcut Trick

Age difference between Chandra and Chandrika is always 10 years.

5 years later, Chandrika is twice as old as Chandra → Ratio = 2 : 1.

Difference in ratio parts (2 − 1) = 1 unit = 10 years.

Chandrika's age 5 years later = 2 × 10 = 20 years.

Chandrika's present age = 20 − 5 = 15 years.

Therefore The correct answer is 15 years.

Alternate Method

Let Chandrika's present age be x years.

Chandra's present age = (x − 10) years.

After 5 years:

Chandrika's age = x + 5

Chandra's age = (x − 10) + 5 = x − 5

According to the question:

=> (x + 5) = 2 × (x − 5)

=> x + 5 = 2x − 10

=> 2x − x = 10 + 5

=> x = 15

Therefore The correct answer is 15 years.

Additional Information

Constant Age Difference

The difference between the ages of two persons remains constant at any point in time (past, present, or future).

Ratio Method for Ages

If the ratio of ages changes over 'n' years, ensure the difference between ratio parts is consistent with the constant age difference to solve quickly.

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Q61. Answer: (d) 1-1.8 litres

The correct answer is 1-1.8 litres

Key Points

• The average amount of urine produced by an adult human in 24 hours is 1-1.8 litres.

• Urine production can vary based on factors such as fluid intake, temperature, and overall health.

• It is essential for the body to excrete urine to remove waste products and maintain fluid balance.

• Normal urine output is an indicator of kidney function and overall health.

Additional Information

• Factors such as diet, physical activity, and medical conditions can influence urine output.

• Hydration levels play a significant role in the amount of urine produced; higher fluid intake generally results in higher urine output.

• Monitoring urine output can be critical in medical settings to assess kidney function and fluid balance.

• Abnormal urine output, either too high or too low, can indicate potential health issues that may require medical attention.

Q62. Answer: (c) Maharashtra

The correct answer is Maharashtra

Key Points

• Maharashtra passed the Shakti Criminal Laws on 23 December 2021.

• The Shakti Act is aimed at strengthening laws against crimes such as rape, acid attacks, and child abuse.

• It includes provisions for faster investigation and trial, with a deadline of 30 days for investigation and 45 days for trial.

• The act also introduces stringent punishment, including the death penalty for severe cases.

• It is designed to ensure swift justice and act as a deterrent against heinous crimes, particularly those against women and children.

Additional Information

• The Shakti Act is named after the Marathi word for "power" or "strength," symbolizing empowerment and protection for victims.

• The act was inspired by the Disha Act passed in Andhra Pradesh, which also focuses on expediting the judicial process for crimes against women.

• Implementation of the act includes setting up exclusive courts for the trial of offenses under this law to ensure speedy justice.

• The state government has also planned awareness programs and training for law enforcement officials to effectively enforce the Shakti Act.

Q63. Answer: (b) All i, ii, iii

The correct answer is 2 Only.

Key Points

• An exothermic reaction is a chemical reaction that releases energy by light or heat.

• Examples of exothermic reactions include:

• Making of slaked lime (Calcium oxide reacts with water to form calcium hydroxide and releases heat.)

• Burning of natural gas (Methane reacts with oxygen to produce carbon dioxide, water, and heat.)

• Respiration (Glucose reacts with oxygen in our cells to produce carbon dioxide, water, and energy.)

• Therefore, all the given reactions, i.e., making of slaked lime, burning of natural gas, and respiration, are examples of exothermic reactions.

Q64. Answer: (c) There are no real roots.

Shortcut Trick

To find the nature of roots, calculate the Discriminant (D) = $b^2 - 4ac$.

For the equation $3x^2 - 6x + 5 = 0$: a = 3, b = −6, c = 5.

$D = (-6)^2 - 4 \times 3 \times 5 = 36 - 60 = -24$.

As D < 0, the quadratic equation has no real roots.

Therefore The correct answer is There are no real roots.

Alternate Method

Given:

The quadratic equation is $3x^2 - 6x + 5 = 0$.

Formula Used:

The nature of roots of a quadratic equation $ax^2 + bx + c = 0$ depends on the Discriminant (D):

1. If D > 0, roots are real and distinct.
2. If D = 0, roots are real and equal.
3. If D < 0, there are no real roots (roots are imaginary).

Calculations:

Comparing $3x^2 - 6x + 5 = 0$ with $ax^2 + bx + c = 0$:

=> a = 3

=> b = −6

=> c = 5

=> $D = b^2 - 4ac$

=> $D = (-6)^2 - 4 \times 3 \times 5$

=> D = 36 − 60

=> D = −24

=> Since −24 < 0, the equation satisfies the condition D < 0.

Therefore The correct answer is There are no real roots.

Additional Information

Discriminant (D)

The value $b^2 - 4ac$ is used to determine the characteristics of the roots without solving the equation.

Quadratic Formula

Roots are calculated as $x = [-b \pm \sqrt{D}] \div 2a$. If D is negative, the square root results in an imaginary number.

Perfect Square Discriminant

If D > 0 and D is a perfect square, the roots are rational. Otherwise, they are irrational.

Q65. Answer: (d) 96 cm2

Shortcut Trick

The Area of a Parallelogram is calculated by multiplying its Base by its Height (perpendicular distance).

Given: Base = 12 cm and Height = 8 cm.

Area = 12 × 8 = 96 cm^2.

Therefore The correct answer is 96 cm^2.

Alternate Method

Given:

Length of the parallel side (Base) = 12 cm

Perpendicular distance (Height) = 8 cm

Formula Used:

Area of Parallelogram = Base × Height

Calculations:

=> Area = Base × Height

=> Area = 12 cm × 8 cm

=> Area = 96 cm^2

Therefore The correct answer is 96 cm^2.

Additional Information

Perimeter of Parallelogram

The total boundary length is 2 × (sum of adjacent sides), similar to a rectangle.

Properties of Parallelogram

Opposite sides are equal and parallel; opposite angles are equal; diagonals bisect each other.

Area using Trigonometry

Area can also be calculated as $a \times b \times \sin(\theta)$, where a and b are adjacent sides and θ is the included angle.

Q66. Answer: (a) inverted, 1.5 cm

The correct answer is Real and Inverted; 1.5 cm.

Concept:

• Concave Mirror: A concave mirror is a spherical mirror that curves inward like a spoon. It can form real and inverted images or virtual and erect images depending on the position of the object.

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• Mirror Formula: The relationship between the object distance (u), the image distance (v), and the focal length (f) of a mirror is given by the mirror formula:

• 1/f = 1/v + 1/u

• Magnification: The magnification (m) of a mirror is the ratio of the height of the image (h') to the height of the object (h). It is also related to the object distance and the image distance as:

Key Points

• Focal length (f) = –18 cm (Concave mirror has negative focal length).

• Object distance (u) = –54 cm (Object is placed in front of the mirror, so negative).

• Using mirror formula:

1/v + 1/u = 1/f => 1/v = 1/–18 – 1/–54 = (–3 + 1)/54 = –2/54 => v = –27 cm

• Magnification (m) = v/u = –27/–54 = 0.5; Height of image = 0.5 × 3.0 = 1.5 cm

• But since image distance is negative, it lies in front, so image is real and inverted. Magnification is < 1 => Image height = 1.5 cm

Q67. Answer: (c) ΔBCA congruent to ΔRPQ

Shortcut Trick

To find the correct congruency order, match the corresponding sides of the two triangles: AB = RQ = 3 m, BC = PR = 4 m, and AC = PQ = 5 m.

Identify the vertex correspondence by looking at the sides meeting at each vertex: Vertex B (between 3m and 4m) corresponds to Vertex R (between 3m and 4m).

Similarly, Vertex C (between 4m and 5m) corresponds to Vertex P (between 4m and 5m), and Vertex A (between 3m and 5m) corresponds to Vertex Q (between 3m and 5m).

The mapping is B ↔ R, C ↔ P, and A ↔ Q. Therefore, the correct order is ΔBCA ~= ΔRPQ.

Therefore The correct answer is ΔBCA congruent to ΔRPQ.

Alternate Method

Given: In ΔABC, AB = 3 m, BC = 4 m, AC = 5 m. In ΔPRQ, PR = 4 m, PQ = 5 m, RQ = 3 m.

Formula Used: SSS (Side-Side-Side) Congruence Criterion states that two triangles are congruent if their corresponding three sides are equal in length.

Comparing the sides of ΔABC and ΔPRQ:

=> AB = 3 m and RQ = 3 m => AB = RQ

=> BC = 4 m and PR = 4 m => BC = PR

=> AC = 5 m and PQ = 5 m => AC = PQ

Since all three corresponding sides are equal, ΔABC ~= ΔQRP by SSS criterion.

To write the correct order as per the options:

=> Vertex B corresponds to R

=> Vertex C corresponds to P

=> Vertex A corresponds to Q

=> Therefore, ΔBCA ~= ΔRPQ.

Therefore The correct answer is ΔBCA congruent to ΔRPQ.

Additional Information

SSS Congruence Rule

Two triangles are congruent if the three sides of one triangle are equal to the corresponding three sides of the other triangle.

Vertex Correspondence

In congruency notation, the order of vertices must strictly follow the mapping of equal sides and equal angles.

Pythagorean Triplets

The sides 3, 4, and 5 form a right-angled triangle because $3^2 + 4^2 = 5^2$ (9 + 16 = 25).

Q68. Answer: (a) volt/ampere

The SI unit of resistance is the ohm (Ω). According to Ohm's Law, the resistance (R) of a conductor is the ratio of the voltage (V) across the conductor to the current (I) flowing through it:

R = V / I

The SI unit of voltage (V) is the volt (V), and the SI unit of current (I) is the ampere (A).

Therefore, the SI unit of resistance (ohm) can be expressed in terms of these fundamental units as:

1 ohm (Ω) = 1 volt / 1 ampere (V/A)

Now let's look at the given options:

1. Volt/ampere - This matches our derivation of the SI unit of resistance. 2) joule/coulomb - The SI unit of joule/coulomb is the volt (V), which is the unit of electric potential or voltage.

2. Coulomb/joule—This is the inverse of volt, so it is not the unit of resistance.

3. Ampere/volt—This is the inverse of ohm, so it is not the unit of resistance.

Therefore, the SI unit of resistance is equivalent to volt/ampere.

Q69. Answer: (c) repurchase agreement

The correct answer is repurchase agreement

Key Points

• Repurchase agreements (repos) are short-term borrowing agreements where one party sells securities to another with a promise to repurchase them at a specific date and price.

• Repos are typically used by central banks to control liquidity and manage monetary policy.

• They provide a way for financial institutions to obtain short-term funding by selling government securities with an agreement to buy them back at a later date.

• Repos are considered safe investments since they are collateralized by securities, usually government bonds.

Additional Information

• Outright open market operations involve the buying or selling of government securities in the open market without any agreement to repurchase.

• Reverse repos are the opposite of repos, where the central bank buys securities with an agreement to sell them back at a specific date and price.

• Interest Rate Swaps are financial derivatives used to exchange one stream of interest payments for another, based on a specified principal amount.

• Repos are a critical tool for central banks to implement monetary policy and ensure stability in the financial system.

Q70. Answer: (b) Bank of Maharashtra

The correct answer is Bank of Maharashtra

Key Points

• In March 2022, Bank of Maharashtra launched 'Project Banksakhi' in Odisha.

• The project aims to provide doorstep banking services in remote areas of Odisha.

• It is part of the bank's initiative to enhance financial inclusion and reach out to unbanked and underbanked regions.

• Under this project, women from self-help groups are trained as 'Banksakhis' to offer basic banking services.

• This initiative helps in empowering women by providing them with employment opportunities and financial literacy.

Additional Information

• Bank of Maharashtra is a major public sector bank in India with a significant presence in the state of Maharashtra.

• The bank was founded in 1935 and has its headquarters in Pune.

• It offers a wide range of banking products and services to its customers, including personal banking, corporate banking, and agricultural banking.

• The bank has been actively involved in various social and community development initiatives across the country.

Q71. Answer: (b) 42

Shortcut Trick

Let the numbers be 7x and 7y (where x and y are co-prime).

HCF × LCM = Product of numbers => 7 × 385 = 7x × 7y => xy = 55.

Sum: 7(x + y) = 112 => x + y = 16.

Factors of 55 that sum to 16 are 11 and 5.

Difference = 7(x − y) = 7(11 − 5) = 7 × 6 = 42.

Therefore The correct answer is 42.

Alternate Method

Given: LCM = 385, HCF = 7, Sum (A + B) = 112.

Formula: Product of numbers (A × B) = HCF × LCM

=> A × B = 7 × 385 = 2695

Using algebraic identity: $(A - B)^2 = (A + B)^2 - 4AB$

=> $(A - B)^2 = (112)^2 - 4(2695)$

=> $(A - B)^2 = 12544 - 10780$

=> $(A - B)^2 = 1764$

=> $A - B = \sqrt{1764} = 42$

Therefore The correct answer is 42.

Additional Information

Product Rule

For any two numbers, the product of the numbers is always equal to the product of their HCF and LCM ($A \times B = HCF \times LCM$).

Co-prime Property

If HCF is h, the numbers can be written as hx and hy, where x and y are co-prime (HCF of x, y = 1).

LCM Property

LCM of two numbers hx and hy is $h \times x \times y$.

Q72. Answer: (a) decomposition reaction

The correct answer is decomposition reaction

Key Points

• A decomposition reaction is a type of chemical reaction in which a single compound breaks down into two or more simpler substances.

• This reaction is generally endothermic, meaning it requires the input of energy in the form of heat, light, or electricity to occur.

• An example of a decomposition reaction is the breakdown of water (H2O) into hydrogen (H2) and oxygen (O2) gases when an electric current is passed through it.

• Decomposition reactions are important in various industrial processes and in the breakdown of organic matter in nature.

Additional Information

• Combination reaction is the opposite of a decomposition reaction, where two or more substances combine to form a single product.

• Displacement reaction involves an element reacting with a compound, displacing another element from the compound.

• Double displacement reaction involves the exchange of ions between two compounds to form two new compounds.

• Decomposition reactions can be classified into three types: thermal decomposition, electrolytic decomposition, and photolytic decomposition, based on the source of energy required.

Q73. Answer: (a) 29 and 71

The given series is: 29, 74, 93, 75, 19, 52, 75, 94, 93, 71

If the ten's and one's position is interchanged for all the numbers, we get → 92, 47, 39, 57, 19, 25, 57, 49, 39, 17

Here, the largest number is 92 → Its original number in the series is 29.

Here, the smallest number is 17 → Its original number in the series is 71.

Hence, the correct answer is "29 and 71".

Q74. Answer: (c) Arunachal Pradesh

The correct answer is Arunachal Pradesh

Key Points

• Urgelling Gompa is located in Tawang, Arunachal Pradesh.

• It is one of the oldest monasteries in Arunachal Pradesh and is significant in the Tibetan Buddhist culture.

• The monastery was founded in the 15th century by Urgen Sangpo, and it is the birthplace of the 6th Dalai Lama, Tsangyang Gyatso.

• Urgelling Gompa is known for its serene environment and historical importance.

• The monastery is part of the Gelugpa sect of Tibetan Buddhism.

Additional Information

• Tawang is also home to the famous Tawang Monastery, the largest monastery in India and the second-largest in the world.

• Arunachal Pradesh is known for its diverse cultural heritage and numerous monasteries, making it an important state for Buddhist tourism in India.

• The state shares international borders with Bhutan, China, and Myanmar.

• Arunachal Pradesh is characterized by its mountainous terrain and rich biodiversity.

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Q75. Answer: (c) Above and/or below the arrow

The correct answer is Above and/or below the arrow.

Key PointsReaction Conditions in Chemical Equations

• Reaction Conditions: In a chemical equation, the conditions under which the reaction occurs (such as temperature, pressure, and catalysts) are typically indicated above and/or below the arrow.

• Placement:

• Above the Arrow: This is the most common placement for conditions like temperature and catalysts.

• Below the Arrow: Less commonly used, this placement can also indicate specific environmental conditions or additional reactants that are not part of the main chemical equation.

• Both Above and Below: In some detailed reactions, both placements are used to provide all necessary information clearly.

• Importance:

• Indicating reaction conditions is crucial for replicating the experiment and ensuring consistent results.

• It provides context for the chemical reaction, helping chemists understand the environment in which the reaction was performed.

Additional Information

• Chemistry Context:

• Chemical equations represent the reactants and products in a chemical reaction, showing the transformation from one set of substances to another.

• The arrow (→) in a chemical equation points from the reactants to the products, denoting the direction of the reaction.

• Law of Conservation of Mass:

• A balanced chemical equation ensures that the mass of the reactants equals the mass of the products, adhering to the Law of Conservation of Mass.

• This principle requires that the number of atoms for each element is the same on both sides of the equation.

• Types of Chemical Reactions:

• Understanding reaction conditions helps in studying different types of chemical reactions, such as combination, decomposition, single-replacement, double-replacement, and combustion reactions.

Q76. Answer: (b) Testis → Vas deferens → Urethra → Penis

The correct answer is Option 2

Key Points

• The correct path that sperms take when they are released from the human male reproductive system is Testis → Vas deferens → Urethra → Penis.

• The testis is where sperms are produced.

• The vas deferens transports mature sperm from the testis to the urethra.

• The urethra serves as the final duct through which the sperms are ejaculated out of the penis.

Additional Information

• The ureter is not part of the path that sperms take; it is a duct that conducts urine from the kidneys to the bladder.

• The penis is the external organ through which the sperms are finally released.

• The male reproductive system also includes accessory glands like the seminal vesicles, prostate gland, and bulbourethral glands, which add fluids to the sperm to create semen.

• During ejaculation, muscular contractions propel the sperm through the vas deferens and urethra and out of the body.

Q77. Answer: (d) 6

The given number is: 4681342

If 1 is added to each odd digit and 2 is subtracted from each even digit, we get: 2462420

The highest digit in the newly formed number = 6

The lowest digit in the newly formed number = 0

Now, the difference between the highest and lowest digit = (6 - 0) = 6

Hence, the correct answer is "6".

Q78. Answer: (b) bar magnet

The correct answer is bar magnet

Key Points

• The magnetic field lines due to a current-carrying solenoid resemble those of a bar magnet.

• A solenoid creates a uniform magnetic field inside it, similar to the magnetic field inside a bar magnet.

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• The field lines emerge from one end of the solenoid (analogous to the north pole of a bar magnet) and enter the other end (analogous to the south pole).

• This pattern is due to the alignment of the magnetic dipoles within the solenoid, making it function like a bar magnet.

Additional Information

• A solenoid is a coil of wire that generates a magnetic field when an electric current passes through it.

• The strength of the magnetic field inside a solenoid is directly proportional to the number of turns in the coil and the current passing through it.

• Solenoids are used in various applications, including electromagnets, inductors, and valves.

• The concept of magnetic field lines helps visualize the direction and strength of the magnetic field, with lines closer together indicating a stronger field.

Q79. Answer: (b) Rs. 21,420

Shortcut Trick

Net discount = a + b − (a × b) ÷ 100

Net discount = 10 + 15 − (10 × 15) ÷ 100 = 25 − 1.5 = 23.5%

Selling Price = MP × (100 − Net Discount%) ÷ 100

Selling Price = 28,000 × 76.5 ÷ 100 = 280 × 76.5 = Rs. 21,420

Therefore The correct answer is Rs. 21,420.

Alternate Method

Given → Marked Price (MP) = Rs. 28,000, First Discount (d1) = 10%, Second Discount (d2) = 15%.

Formulas → SP = MP × (100 − d1)% × (100 − d2)%

=> Price after first discount = 28,000 × (90/100) = Rs. 25,200

=> Price after second discount (Final SP) = 25,200 × (85/100)

=> Final SP = 252 × 85 = Rs. 21,420

Therefore The correct answer is Rs. 21,420.

Additional Information

Successive Discounts

When two or more discounts are applied one after another on the reduced price, they are called successive discounts. The order of application does not change the final SP.

Marked Price & Discount

Discount is always calculated on the Marked Price (MP). Discount = MP − SP. Discount% = (Discount ÷ MP) × 100.

Q80. Answer: (c) Digital Sansad

The correct answer is Digital Sansad

Key Points

• Digital Sansad is the app launched to make the Indian Parliament proceedings accessible to the public.

• It was launched in January 2022.

• The app aims to bring the proceedings of Parliament closer to the citizens of India.

• It allows users to access various parliamentary documents, including speeches, debates, and questions raised by Members of Parliament.

• The app is part of the broader initiative to increase transparency and public engagement with the legislative process.

Additional Information

• The app is available for both Android and iOS platforms.

• It provides real-time updates on the proceedings of both the Lok Sabha and the Rajya Sabha.

• Users can also watch live telecasts of parliamentary sessions through the app.

• It includes features like search options, archived content, and notifications for important updates.

• The launch of the app aligns with the government's Digital India initiative aimed at promoting digital accessibility and transparency.

Q81. Answer: (d) 180°

The correct answer is 180º

Key Points

• 180º longitude is considered the International Date Line.

• The International Date Line is an imaginary line on the Earth's surface that roughly follows the 180º longitude.

• It serves as the "line of demarcation" between two consecutive calendar dates.

• When you cross the International Date Line from east to west, you subtract a day; when you cross from west to east, you add a day.

Additional Information

• The International Date Line deviates in some places to avoid splitting countries into different days.

• It passes through the middle of the Pacific Ocean, roughly equidistant from the Greenwich Meridian (0º longitude).

• Despite its name, the International Date Line is not an international agreement but rather a construct of convenience.

• Its main purpose is to ensure that the same date is not observed in two places in close proximity.

Q82. Answer: (a) 62

The venn diagram representing the people who eat pasta but not doughnut is shown below,

Here, we can see that the number of people is = (50 + 12) = 62

Hence, the correct answer is "62".

Q83. Answer: (c) 3

The given series is: 8 @ 4 * 7 ^ 5 3 # 9 1< 5 7 @ 4 $ # 2 * 6 ! 4 & 9 < 6

Numbers which are immediately preceded by a symbol and immediately followed by an odd number are shown below,

→ 8 @ 4 * 7 ^ (5) 3 # (9) 1 < (5) 7 @ 4 $ # 2 * 6 ! 4 & 9 < 6

Here, we can see that there are 3 such numbers.

Hence, the correct answer is "3".

Q84. Answer: (c) 22 March

The correct answer is Fri Mar 22.

Key Points

• World Water Day is celebrated annually on 22nd March to highlight the importance of freshwater and advocate for the sustainable management of freshwater resources.

• The day is observed to raise awareness about the 2.2 billion people living without access to safe water.

• Each year, World Water Day focuses on a specific aspect of freshwater, with themes such as water and climate change, water scarcity, and water quality.

• The United Nations General Assembly designated 22nd March as World Water Day in 1993 following the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro.

Additional Information

• Water is a critical resource for human survival, agriculture, industry, and ecosystem health.

• The Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015, include a dedicated goal (SDG 6) to ensure availability and sustainable management of water and sanitation for all.

• World Water Day is an opportunity to learn more about water-related issues, be inspired to tell others, and take action to make a difference.

• The theme for World Water Day 2024 is yet to be announced but will continue to emphasize the importance of water conservation and sustainable practices.

Q85. Answer: (b) Rs. 2,000

Shortcut Trick

Let the Cost Price (CP) be 100 units.

Profit = 260% of CP = 260 units.

Selling Price (SP) = CP + Profit = 100 + 260 = 360 units.

Given SP = Rs. 7,200.

360 units = Rs. 7,200 => 1 unit = 7,200 ÷ 360 = Rs. 20.

Cost Price = 100 units = 100 × 20 = Rs. 2,000.

Therefore The correct answer is Rs. 2,000.

Alternate Method

Given: Profit% = 260%, Selling Price (SP) = Rs. 7,200.

Formulas: SP = CP × (100 + Profit%) ÷ 100 | CP = SP × 100 ÷ (100 + Profit%)

=> Profit = 2.6 × CP

=> SP = CP + 2.6 × CP = 3.6 × CP

=> 7,200 = 3.6 × CP

=> CP = 7,200 ÷ 3.6

=> CP = 2,000

Therefore The correct answer is Rs. 2,000.

Additional Information

Profit Percentage Relation

Profit is always calculated on the Cost Price unless stated otherwise. If profit is 260%, it means for every Rs. 100 spent, the profit earned is Rs. 260.

Selling Price Components

Selling Price is the sum of Cost Price and Profit. In percentage terms: SP% = 100% + Profit%.

Q86. Answer: (b) 2 minutes before

The correct answer is 2 minutes before

Key Points

• The apparent sunrise occurs about 2 minutes before the actual sunrise due to atmospheric refraction.

• Atmospheric refraction bends the light rays coming from the sun, making the sun appear above the horizon when it is still below it.

• This phenomenon causes the sun to be seen earlier than its actual geometric position relative to the horizon.

• Similarly, during sunset, the sun is visible for about 2 minutes after it has actually set below the horizon.

• This effect is more pronounced at higher latitudes and during certain times of the year.

Additional Information

• Atmospheric refraction is the bending of light as it passes through the Earth's atmosphere, which has varying density layers.

• This bending of light causes celestial objects to appear higher in the sky than their actual geometric position.

• The phenomenon is also responsible for the apparent flattening of the sun's disk near the horizon.

• Understanding atmospheric refraction is crucial for accurate astronomical observations and navigation.

Q87. Answer: (a) D

According to the given information,

1) None of them have the exam before C and after B.

Monday	**C**
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	B

2) E has the exam on Tuesday and just before A.

Monday	**C**
Tuesday	E
Wednesday	A
Thursday	
Friday	
Saturday	B

3) F has the exam just after A and just before D.

Monday	**C**
Tuesday	E
Wednesday	A
Thursday	F

Friday	D
Saturday	B

Here, we can see that D has the exam on Friday.

Hence, the correct answer is "D".

Q88. Answer: (b) 3((a − b) (b − 2c) (−a + 2c))

Shortcut Trick

Check if the sum of the bases of the cubes is zero.

Sum = (a − b) + (b − 2c) + (−a + 2c) = a − a − b + b − 2c + 2c = 0.

Apply the shortcut identity: If x + y + z = 0, then $x^3 + y^3 + z^3 = 3xyz$.

The factorised form is: 3 × (a − b) × (b − 2c) × (−a + 2c).

Therefore The correct answer is 3((a − b) (b − 2c) (−a + 2c)).

Alternate Method

Given: $(a − b)^3 + (b − 2c)^3 + (−a + 2c)^3$

Formula Used: $x^3 + y^3 + z^3 − 3xyz = (x + y + z)(x^2 + y^2 + z^2 − xy − yz − zx)$

=> Let x = (a − b), y = (b − 2c), and z = (−a + 2c).

=> Calculating the sum of terms: x + y + z = (a − b) + (b − 2c) + (−a + 2c)

=> x + y + z = a − b + b − 2c − a + 2c = 0.

=> Since x + y + z = 0, the identity becomes: $x^3 + y^3 + z^3 − 3xyz = 0 × (x^2 + y^2 + z^2 − xy − yz − zx) = 0$.

=> Thus, $x^3 + y^3 + z^3 = 3xyz$.

=> Substituting the original values: $(a − b)^3 + (b − 2c)^3 + (−a + 2c)^3 = 3(a − b)(b − 2c)(−a + 2c)$.

Therefore The correct answer is 3((a − b) (b − 2c) (−a + 2c)).

Additional Information

Special Case of Cubic Identity

The condition $x^3 + y^3 + z^3 = 3xyz$ holds true under two specific conditions: either x + y + z = 0 or x = y = z.

Alternative Representation

The term $(x^2 + y^2 + z^2 − xy − yz − zx)$ can also be written as $1/2[(x − y)^2 + (y − z)^2 + (z − x)^2]$, which ensures the term is always non-negative for real numbers.

Cyclic Factors

Expressions involving (a − b), (b − c), and (c − a) are common in cyclic factorisation problems where their sum is naturally zero.

Q89. Answer: (a) 1800 m^3

Shortcut Trick

Volume of a cuboid = Length × Breadth × Height

Direct calculation: 12 × 10 × 15

=> 120 × 15 = 1800 m^3

Therefore The correct answer is 1800 m^3.

Alternate Method

Given:

Length (l) = 12 m

Breadth (b) = 10 m

Height (h) = 15 m

Formula Used:

Volume of Cuboid = l × b × h

Calculations:

=> Volume = 12 × 10 × 15

=> Volume = 120 × 15

=> Volume = 1800 m^3

Therefore The correct answer is 1800 m^3.

Additional Information

Total Surface Area of Cuboid

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The total area of all six faces is given by the formula 2(lb + bh + hl).

Lateral Surface Area of Cuboid

The area of the four side walls is calculated as 2h(l + b).

Diagonal of a Cuboid

The length of the longest rod that can fit in a cuboid is $\sqrt{(l^2 + b^2 + h^2)}$.

Q90. Answer: (c) 75 years

Shortcut Trick

Let the sum of children ages be S. Father age F = 2S.

After 15 years, Father grows by 15, but 3 children grow by 15 × 3 = 45.

New Equation: 2S + 15 = S + 45 => S = 30.

Current Father age = 2 × 30 = 60 years.

Father age 15 years from today = 60 + 15 = 75 years.

Therefore The correct answer is 75 years.

Alternate Method

Given: Current Father age (F) = 2 × (Sum of 3 children ages, S).

Formula: Age after n years = Current Age + n.

=> Let sum of 3 children ages = S

=> Father age F = 2S

=> After 15 years, Father age = F + 15

=> After 15 years, Sum of 3 children ages = S + (3 × 15) = S + 45

=> According to question: F + 15 = S + 45

=> 2S + 15 = S + 45

=> 2S − S = 45 − 15

=> S = 30

=> Present Father age = 2 × 30 = 60 years

=> Father age after 15 years = 60 + 15 = 75 years

Therefore The correct answer is 75 years.

Additional Information

Multiple Persons Age Growth

When calculating the sum of ages for n persons after t years, the total sum increases by (n × t) years.

Age Ratio Problems

The difference between the ages of two individuals remains constant regardless of how many years pass.

Linear Equation in Age

Always define variables for present ages first to simplify the formation of equations for past or future conditions.

Q91. Answer: (a) 24

The logic followed here is:

Logic: Ratio of the two numbers of the pair is 5 : 3.

35 : 21

→ Ratio = 5 : 3

20 : 12

→ Ratio = 5 : 3

Similarly,

40 : ?

→ 40/ ? = 5/3

→ ? = 40 × 3/5 = 24

Hence, the correct answer is "24".

Q92. Answer: (d) Both conclusions I and II are true

The given statement is: U ≤ W = V < Y > I ≥ F > N

Conclusions:

I. Y > U → True (There is a definite relation between them; U ≤ W = V < Y)

II. N < I → True (There is a definite relation between them; I ≥ F > N)

Hence, the correct answer is "Both conclusions I and II are true".

Q93. Answer: (d) 235%

Given:

Sales of shoes of size 8 in showroom C = 2480

Sales of shoes of size 9 in showroom C = 740

Formula used:

Percentage increase = [(Size 8 sales - Size 9 sales) / Size 9 sales] × 100

Calculation:

=> Percentage increase = [(2480 - 740) / 740] × 100

=> = [1740 / 740] × 100

=> ≈ 2.35 × 100

=> ≈ 235%

Therefore The sales of shoes of size 8 are approximately 235% more than the sales of shoes of size 9 in showroom C.

Q94. Answer: (a) United Nations Environment Programme

The correct answer is United Nations Environment Programme

Key Points

• The full form of UNEP is United Nations Environment Programme.

• UNEP is responsible for coordinating the United Nations' environmental activities and assisting developing countries in implementing environmentally sound policies and practices.

• It was established as a result of the United Nations Conference on the Human Environment in June 1972 and is headquartered in Nairobi, Kenya.

• UNEP's mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

Additional Information

• UNEP's work encompasses a wide range of activities, including climate change, disaster and conflict, ecosystem management, environmental governance, chemicals and waste, resource efficiency, and environment under review.

• It collaborates with various stakeholders, including governments, private sector, civil society, and international organizations, to promote sustainable development worldwide.

• UNEP plays a crucial role in the implementation of the environmental dimension of the 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs).

• It also produces key reports such as the Global Environment Outlook (GEO) to provide comprehensive assessments of the state of the global environment.

Q95. Answer: (a) WSCEUY

The given codes for the number/symbol are shown below,

Number/Symbol	**9**	**∞**	**8**	**4**	**÷**	**-/+**	**6**	**$**	**!**	**2**	**=**	**5**	**7**	**3**
Code	H	G	K	L	U	Q	S	U	W	Y	A	C	E	G

The given question is: 2675$!

→ Here, we can see that both conditions (i) and (iii) applies here.

As per the conditions given, the given question can be coded as shown below,

Number/Symbol	**2**	**6**	**7**	**5**	**$**	**!**
Code	W	S	C	E	U	Y

Hence, the correct answer is "WSCEUY".

Q96. Answer: (b) IISc Bengaluru

The correct answer is IISc Bengaluru

Key Points

• Param Pravega is India's most powerful supercomputer as of February 2022.

• It was launched at the Indian Institute of Science (IISc), Bengaluru.

• The supercomputer is part of the National Supercomputing Mission (NSM).

• It aims to boost India's computing power significantly and support various research and development activities.

• Param Pravega has a computing power of 3.3 petaflops.

Additional Information

• The National Supercomputing Mission (NSM) is an initiative by the Government of India to enhance the country's supercomputing capabilities.

• The mission is jointly steered by the Department of Science and Technology (DST) and the Ministry of Electronics and Information Technology (MeitY).

• The mission's objective is to install a network of supercomputers across academic and research institutions in India.

• These supercomputers will be used for various applications, including scientific research, weather forecasting, and drug discovery.

Q97. Answer: (d) 650

Given:

(23.01 + 16.986) + 2.023 × 4.05 - 41.999 + 643.999 = ?

Formula Used:

Basic arithmetic operations (addition, multiplication, subtraction)

Calculation:

Step-by-step calculation:

=> (23.01 + 16.986) + 2.023 × 4.05 - 41.999 + 643.999

First, calculate the addition inside the parentheses:

=> 39.996 + 2.023 × 4.05 - 41.999 + 643.999

Next, calculate the multiplication:

=> 39.996 + 8.1915 - 41.999 + 643.999

Now, perform the addition and subtraction in sequence:

=> 39.996 + 8.1915 = 48.1875

=> 48.1875 - 41.999 = 6.1885

=> 6.1885 + 643.999 = 650.1875

Approximate value:

≈ 650

The correct answer is option 4.

Q98. Answer: (b) None

According to the given information,

1) V is fourth from the top and immediately below R.

R
V

2) W is kept at the topmost position and immediately above P.

W
P
R

V

3) Only one box is there between S and T.

4) T is kept below S, and U is kept above Q.

W
P
R
V
S
U
T
Q

Here, we can see that there is no box between T and Q.

Hence, the correct answer is "None".

Q99. Answer: (c) Narinder Dhruv Batra

The correct answer is Narinder Dhruv Batra

Key Points

• Narinder Dhruv Batra is the President of the Indian Olympic Association as of March 2022.

• He has also served as the President of the International Hockey Federation (FIH).

• Batra has been actively involved in promoting and developing sports in India, particularly hockey.

• His leadership in the Indian Olympic Association has been marked by efforts to enhance India's performance in international sports events.

Additional Information

• The Indian Olympic Association (IOA) is the governing body for the Olympic Movement and the Commonwealth Games in India.

• The IOA is responsible for selecting athletes to represent India at the Olympic Games, Asian Games, and other international athletic meets.

• It also manages the Indian teams for the Commonwealth Games and South Asian Games.

• The association works towards the development of sports infrastructure and the promotion of sports culture in the country.

• The IOA was established in 1927 and is recognized by the International Olympic Committee (IOC).

• In addition to its role in organizing and managing India's participation in international sports events, the IOA also works to promote the Olympic values of excellence, friendship, and respect.

Q100. Answer: (d) Both (a) and (c)

The correct answer is 4 Only.

Key Points

• Statement (a): The direction of the magnetic field at a point can indeed be found by placing a magnetic compass at that point. The compass needle aligns itself along the magnetic field lines, indicating the direction of the magnetic field.

• Statement (b): A freely suspended magnetic needle points in the north-south direction, not the north-east direction. This is because the Earth itself acts as a giant magnet, and the needle aligns itself along the Earth's magnetic field lines.

• Statement (c): The magnetic field lines are indeed denser near the poles of a magnet. This indicates that the magnetic field is stronger near the poles.

• Statement (d): Two magnetic field lines can never intersect at a given point. If they did, it would imply that the magnetic field has two different directions at that point, which is impossible.

Therefore, the correct statements are (a) and (c), making option 4 the correct answer.

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